(Physical Page Count = 2,929)

Group FM

(Records Withheld In Part and In Their Entirety)

Package Total Pages:
Withheld in Entirety: 57
Withheld in Part: 2,928
Total Pages: 2,985

Group FM 1 of 2929

(The page(s) mentioned above represents 57 pages that have been withheld in their entirety)

(Records Withheld In Their Entirety)

Re: FOIA/PA-2012-0150

APPENDIX A
RECORDS BEING WITHHELD IN THEIR ENTIRETY
COMMISSIONER APOSTOLAKIS

NO.	DATE	DESCRIPTION/ (PAGE COUNT)/EXEMPTIONS
1.	Undated	Draft - Comments on SECY-11-0093 - ""Near Term Report and Recommendations for Agency Actions Following The Events in Japan" (2 pages) **EX. 5 – Predecisional/Deliberative Process**
2.	Undated	Draft - Comments on SECY-11-0093 - ""Near Term Report and Recommendations for Agency Actions Following The Events in Japan" (2 pages) **EX. 5 – Predecisional/Deliberative Process**
3.	Undated	Draft - Comments on SECY-11-0093 - ""Near Term Report and Recommendations for Agency Actions Following The Events in Japan" (2 pages) **EX. 5 – Predecisional/Deliberative Process**
4.	Undated	Draft – Staff Assessment and Prioritization of Near-Term Task Force (NTTF) Recommendations (51 pages) **EX. 5 – Predecisional/Deliberative Process**

Potential Long term Issues

1.) Is there a justifiable cost-benefit to off-loading from spent fuel pools all of the fuel that can be safely stored in dry casks? Removing all of the fuel that can be safely loaded in casks will not substantially reduce the heat load in the pool, but removing the fuel will increase the water volume in the pool. This will provide more time to boil off and uncovery in a SBO. Also, spreading the fuel out in the pool will enhance cooling in the event of an uncovery (e.g., no radiation heat source from adjacent assemblies) and may prevent or substantially delay melting.

2.) Are East and Gulf coast plants adequately protected from natural phenomena? There are reports that say that global warming is heating up the oceans, and this, in turn, spawns more violent hurricanes (e.g., Katrina). Have we conservatively estimated the storm surges associated with worst-case hurricanes that could hit the coasts, and are the plants along those coasts adequately protected from those storm surges and associated flooding?

3.) PWR Containments do not have filtered vents. It is also not clear if they have vents that can be operated without AC power. The benefits of putting a filtered vent on a PWR containment, along with vents that can be actuated without AC power (e.g. compressed air) should be evaluated.

4.) Do we need to revisit the need for non-AC dependent hydrogen igniters on IC plants?

5.) Are their accident management strategies in place for lower vessel flooding, and how well do we understand whether lower vessel flooding will work to retain a molten core inside the vessel?

6.) How well can we predict tsunami wave height? Can scale model testing help improve models?

7.) Do U.S. plants have the capability to inject ultimate heat sink water? How much time do plants with cooling ponds, like Palo Verde, have if they injected their ponds. Does that affect long term cooling strategies?

8.) Do plants have EDGs and their associated fuel tanks sufficiently protected from natural phenomena, especially floods?

9.) Do we need AC powered (with battery backup) hydrogen igniters in reactor buildings and/or in the vicinity of SFPs?

10.)Are there natural phenomena that can damage dry casks? Dry casks are designed for earthquakes. Do we know how well they can withstand a beyond DBA earthquake?

11.)Fukushima 3 had several MOX fuel assemblies in it. How would a core with more or a full load of MOX assemblies affect the outcome of severe accidents?

12.) Do we have sufficient instrumentation in plants to accurately assess plant conditions following an accident, including severe accidents (e.g., water levels at various locations)? Is the instrumentation sufficiently robust to survive in the accident conditions?

13.) The Fukushima event seemed to bring out shortcomings of our dose assessment codes, particularly RASCAL. Should we re-evaluate the need for improved, easy to use radiological dose assessment codes?

14.) During the evolution of the accident at Fukushima, there was not a lot of coordination (at least initially) among various agencies (e.g., DOE and NRC). Concern was that everyone was advising the Japanese, with no coordination. In the event of another reactor accident outside of the U.S., should U.S. agencies have worked out plans for coordination beforehand? Does the international community need to coordinate better?

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Filename:	Sheron Potential Long term Issues.docx
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Subject:	
Author:	Brian Walter Sheron
Keywords:	
Comments:	
Creation Date:	4/12/2011 1:24:00 PM
Change Number:	3
Last Saved On:	7/12/2011 1:07:00 PM
Last Saved By:	bws
Total Editing Time:	8 Minutes
Last Printed On:	12/2/2011 12:10:00 PM
As of Last Complete Printing	
Number of Pages:	3
Number of Words:	907 (approx.)
Number of Characters:	5,176 (approx.)

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Comments/Questions Re: 90-day Fukushima Task Force Report

WDR

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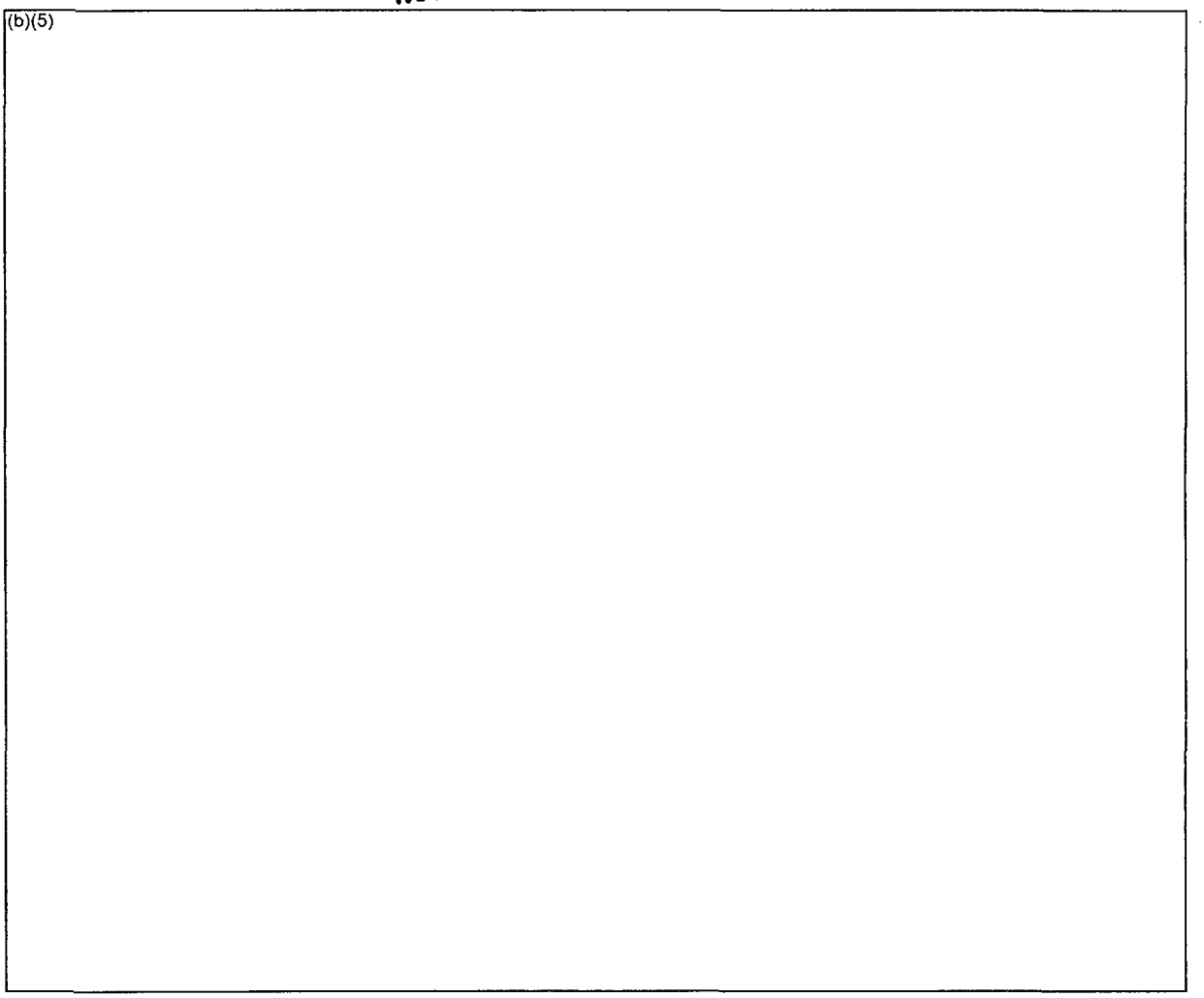
NVG

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Subject:	
Author:	William Reckley
Keywords:	
Comments:	
Creation Date:	7/14/2011 9:22:00 AM
Change Number:	11
Last Saved On:	7/16/2011 3:14:00 PM
Last Saved By:	nvg
Total Editing Time:	246 Minutes
Last Printed On:	12/2/2011 11:53:00 AM
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Number of Pages:	3
Number of Words:	1,261 (approx.)
Number of Characters:	7,193 (approx.)

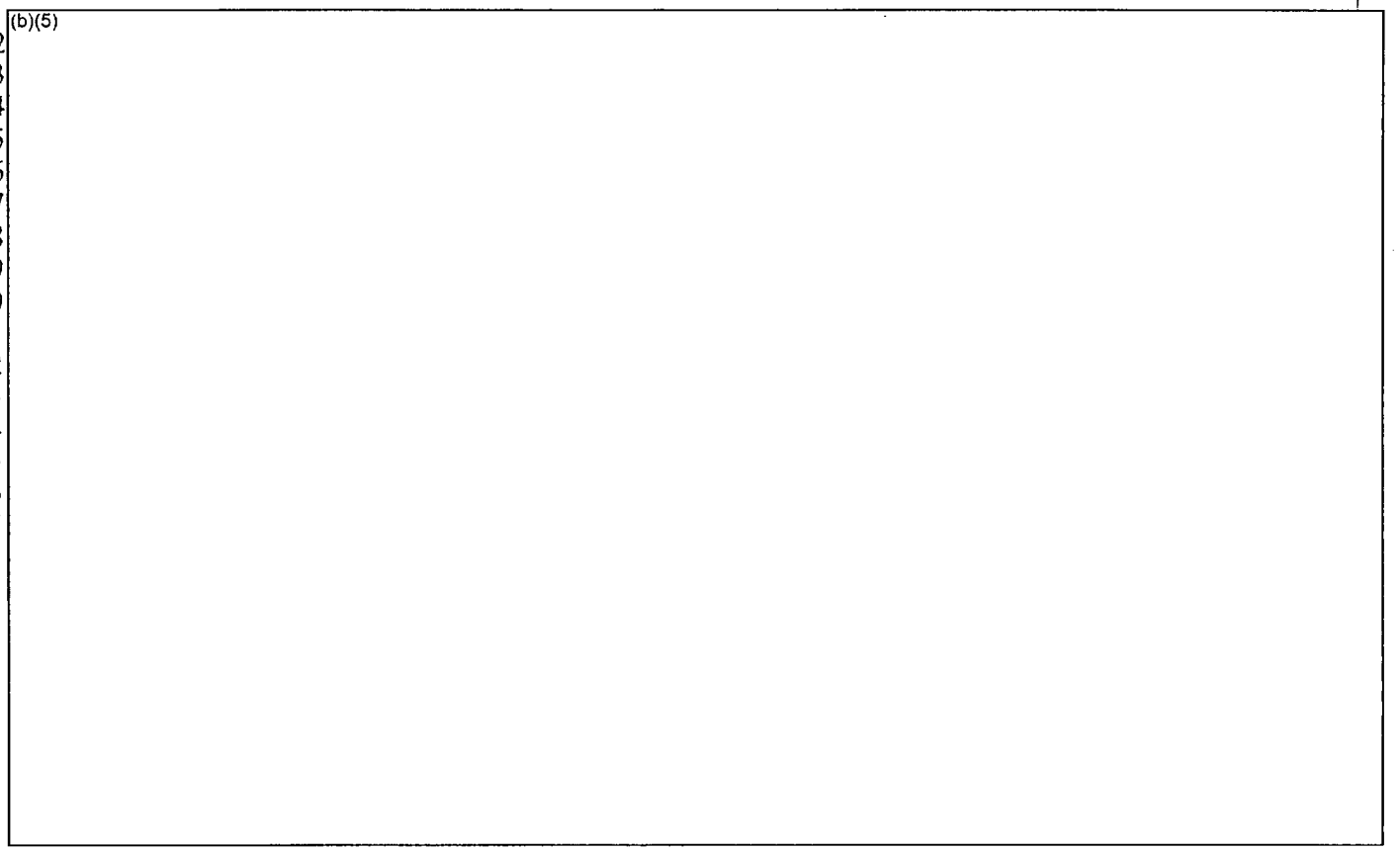
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Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

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Author:	nvg
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Creation Date:	7/22/2011 8:52:00 AM
Change Number:	9
Last Saved On:	7/22/2011 9:15:00 AM
Saved By:	George Apostolakis
Total Editing Time:	24 Minutes
Last Printed On:	12/2/2011 11:34:00 AM
As of Last Complete Printing	
Number of Pages:	2
Number of Words:	674 (approx.)
Number of Characters:	3,845 (approx.)

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Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

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Keywords:	
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Change Number:	1
Last Saved On:	7/25/2011 8:24:00 AM
Last Saved By:	nvg
Total Editing Time:	20 Minutes
Last Printed On:	12/2/2011 11:35:00 AM

As of Last Complete Printing

Number of Pages:	2
Number of Words:	859 (approx.)
Number of Characters:	4,899 (approx.)

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Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

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Last Saved By:	nvg
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Last Printed On:	12/2/2011 11:35:00 AM
As of Last Complete Printing	
Number of Pages:	2
Number of Words:	782 (approx.)
Number of Characters:	4,461 (approx.)

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Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

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Last Saved By:	George Apostolakis
Total Editing Time:	37 Minutes
Last Printed On:	12/2/2011 11:34:00 AM
As of Last Complete Printing	
Number of Pages:	2
Number of Words:	984 (approx.)
Number of Characters:	5,609 (approx.)

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Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

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Last Saved By:	nvg
Total Editing Time:	18 Minutes
Last Printed On:	12/2/2011 11:34:00 AM
As of Last Complete Printing	
Number of Pages:	2
Number of Words:	864 (approx.)
Number of Characters:	4,930 (approx.)

NOT FOR PUBLIC DISCLOSURE

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Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

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Total Editing Time:	18 Minutes
Last Printed On:	12/2/2011 11:35:00 AM
As of Last Complete Printing	
Number of Pages:	2
Number of Words:	755 (approx.)
Number of Characters:	4,306 (approx.)

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Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

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NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

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NOT FOR PUBLIC DISCLOSURE

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Last Saved By:	gea
Total Editing Time:	88 Minutes
Last Printed On:	12/2/2011 11:36:00 AM
As of Last Complete Printing	
Number of Pages:	3
Number of Words:	795 (approx.)
Number of Characters:	4,538 (approx.)

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NOTATION VOTE

RESPONSE SHEET

TO: Annette Vietti-Cook, Secretary

FROM: COMMISSIONER APOSTOLAKIS

SUBJECT: SECY-11-0124 – RECOMMENDED ACTIONS TO BE TAKEN WITHOUT DELAY FROM THE NEAR-TERM TASK FORCE REPORT

Approved __X__ **Disapproved** _____ **Abstain** _____

Not Participating _____

COMMENTS: **Below** ___ **Attached** _X_ **None** ___

_____
SIGNATURE

_____
DATE

Entered on "STARS" Yes ___ **No** ___

NOT FOR PUBLIC DISCLOSURE

Commissioner Apostolakis' Comments on SECY-11-0124
Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report

I commend the staff for evaluating promptly the Near-Term Task Force recommendations, engaging external stakeholders, and proposing actions that should be taken without delay. I approve the staff's recommendations with the following comments.

When the staff issues the requests for information to licensees pursuant to 10 CFR 50.54(f) to identify actions that have been taken or are planned to address plant-specific vulnerabilities associated with the reevaluation of seismic and flooding hazards (Recommendation 2.1), the staff should explain the meaning of "vulnerability". This concept has remained unclear since the IPEEE days.

The staff should inform the Commission, either through an Information Paper or a briefing of the Commissioners' Assistants, when it has developed the technical bases and acceptance criteria for implementing Recommendations 2.1, 2.3, 4.2, 5.1, and 9.3. The Orders contained in Recommendations 4.2 and 5.1 should be issued after the technical bases and acceptance criteria are established. I agree with Dr. Edwin S. Lyman of the Union of Concerned Scientists that "the process for implementing [Orders] should be transparent" and Orders "should be as clear and specific as possible when issued."

The staff should provide the Commission with an evaluation of the recommendation regarding seismic instrumentation made by Dr. William Leith of the U.S Geological Survey during the Commission meeting on September 14, 2011. This evaluation should be provided to the Commission through an Information Paper within three months of the Staff Requirements Memorandum on SECY-11-0124.

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Author:	jmt3
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Change Number:	2
Last Saved On:	9/26/2011 7:38:00 AM
Last Saved By:	nvg
Total Editing Time:	10 Minutes
Last Printed On:	12/2/2011 11:58:00 AM

As of Last Complete Printing

Number of Pages:	2
Number of Words:	329 (approx.)
Number of Characters:	1,876 (approx.)

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NOTATION VOTE

RESPONSE SHEET

TO: Annette Vietti-Cook, Secretary

FROM: COMMISSIONER APOSTOLAKIS

SUBJECT: SECY-11-0124 – RECOMMENDED ACTIONS TO BE TAKEN WITHOUT DELAY FROM THE NEAR-TERM TASK FORCE REPORT

Approved __X__ Disapproved _____ Abstain _____

Not Participating _____

COMMENTS: Below ___ Attached _X_ None ___

_____
SIGNATURE

_____
DATE

Entered on "STARS" Yes ___ No ___

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

Commissioner Apostolakis' Comments on SECY-11-0124
Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report

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Author:	jmt3
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Comments:	
Creation Date:	9/25/2011 11:46:00 AM
Change Number:	3
Last Saved On:	9/25/2011 11:47:00 AM
Last Saved By:	gea
Total Editing Time:	3 Minutes
Last Printed On:	12/2/2011 11:58:00 AM

As of Last Complete Printing

Number of Pages:	2
Number of Words:	359 (approx.)
Number of Characters:	2,051 (approx.)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

NOTATION VOTE

RESPONSE SHEET

TO: Annette Vietti-Cook, Secretary

FROM: COMMISSIONER APOSTOLAKIS

SUBJECT: SECY-11-0124 – RECOMMENDED ACTIONS TO BE TAKEN WITHOUT DELAY FROM THE NEAR-TERM TASK FORCE REPORT

Approved __X__ **Disapproved** _____ **Abstain** _____

Not Participating _____

COMMENTS: **Below** ___ **Attached** _X_ **None** ___

_____
SIGNATURE

_____
DATE

Entered on "STARS" Yes ___ **No** ___

NOT FOR PUBLIC DISCLOSURE

Commissioner Apostolakis' Comments on SECY-11-0124
Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report

(b)(5)

NOT FOR PUBLIC DISCLOSURE

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Change Number:	13
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Last Saved By:	gea
Total Editing Time:	98 Minutes
Last Printed On:	12/2/2011 11:58:00 AM

As of Last Complete Printing

Number of Pages:	2
Number of Words:	359 (approx.)
Number of Characters:	2,051 (approx.)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

The Honorable Fred Upton
Chairman, Committee on Energy and Commerce
United States House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

(b)(5)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

(b)(5)

Sincerely,

Gregory B. Jaczko

NOT FOR PUBLIC DISCLOSURE

Identical letters sent to:

The Honorable Fred Upton
United States House of Representatives
Washington, D.C. 20515

The Honorable Joe Barton
United States House of Representatives
Washington, D.C. 20515

The Honorable Cliff Stearns
United States House of Representatives
Washington, D.C. 20515

The Honorable Ed Whitfield
United States House of Representatives
Washington, D.C. 20515

The Honorable John Shimkus
United States House of Representatives
Washington, D.C. 20515

The Honorable Joseph K. Pitts
United States House of Representatives
Washington, D.C. 20515

The Honorable Mary Bono Mack
United States House of Representatives
Washington, D.C. 20515

The Honorable Greg Walden
United States House of Representatives
Washington, D.C. 20515

The Honorable Michael C. Burgess
United States House of Representatives
Washington, D.C. 20515

The Honorable Lee Terry
United States House of Representatives
Washington, D.C. 20515

The Honorable Marsha Blackburn
United States House of Representatives
Washington, D.C. 20515

The Honorable Sue Myrick
United States House of Representatives
Washington, D.C. 20515

The Honorable Brett Guthrie
United States House of Representatives
Washington, D.C. 20515

The Honorable Tim Murphy
United States House of Representatives
Washington, D.C. 20515

The Honorable David B. McKinley
United States House of Representatives
Washington, D.C. 20515

The Honorable Cathy McMorris Rodgers
United States House of Representatives
Washington, D.C. 20515

The Honorable John Sullivan
United States House of Representatives
Washington, D.C. 20515

The Honorable Brian P. Bilbrey
United States House of Representatives
Washington, D.C. 20515

The Honorable John Phillip Gingrey
United States House of Representatives
Washington, D.C. 20515

The Honorable Steve Scalise
United States House of Representatives
Washington, D.C. 20515

The Honorable Leonard Lance
United States House of Representatives
Washington, D.C. 20515

The Honorable Peter Olson
United States House of Representatives
Washington, D.C. 20515

The Honorable Gregg Harper
United States House of Representatives
Washington, D.C. 20515

The Honorable Robert E. Latta
United States House of Representatives
Washington, D.C. 20515

The Honorable Adam Kinzinger
United States House of Representatives
Washington, D.C. 20515

The Honorable H. Morgan Griffith
United States House of Representatives
Washington, D.C. 20515

The Honorable Henry A. Waxman
United States House of Representatives
Washington, D.C. 20515

The Honorable Diana DeGette
United States House of Representatives
Washington, D.C. 20515

The Honorable Bobby L. Rush
United States House of Representatives
Washington, D.C. 20515

The Honorable Gene Green
United States House of Representatives
Washington, D.C. 20515

The Honorable Frank Pallone, Jr.
United States House of Representatives
Washington, D.C. 20515

The Honorable G. K. Butterfield
United States House of Representatives
Washington, D.C. 20515

The Honorable Anna G. Eshoo
United States House of Representatives
Washington, D.C. 20515

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Sosa, Belkys
Sent: Friday, March 11, 2011 4:53 PM
To: Baggett, Steven
Subject: RE: for future ops center auto calls (b)(5) EOM

(b)(5) Belkys

From: Baggett, Steven
Sent: Friday, March 11, 2011 3:20 PM
To: Sosa, Belkys
Subject: for future ops center auto calls (b)(5) EOM

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

From: Apostolakis, George
Sent: Saturday, March 12, 2011 3:21 PM
To: Snodderly, Michael
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: Re: PSA 2011

I just spoke to the Chairman. He suggested that we go to NC, as scheduled.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

----- Original Message -----
From: Snodderly, Michael
To: Grantom, Carl <crgrantom@STPEGS.COM>
Cc: Henneke, Dennis (GE Power & Water) <dennis.henneke@ge.com>; Apostolakis, George; Sosa, Belkys
Sent: Sat Mar 12 14:11:10 2011
Subject: RE: PSA 2011

Right now we are still planning on coming unless something significant changes. I will let you know right away if something changes. Our next update is at 3:30 pm.

----Original Message-----
From: Grantom, Carl [mailto:crgrantom@STPEGS.COM]
Sent: Saturday, March 12, 2011 1:21 PM
To: Snodderly, Michael
Subject: PSA 2011

Mike,

I talked to Ed Halpin today and due to the Fukishima event and the media coverage he will not attend the conference. I will give his plenary talk.

Is Comm. Apostolakis still going to attend. I hope so, but I am not sure what NRC position on the Japan events will be.

Please let me know.

Rick

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George NOT FOR PUBLIC DISCLOSURE

From: Apostolakis, George
Sent: Saturday, March 12, 2011 11:54 AM
To: 'corradin@cae.wisc.edu'
Subject: Re: Fwd: Re: SPECULATION on TEPCO FUKUSHIMA PLANTS STATUS

No. We're all getting info from the same sources.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

----- Original Message -----
From: Michael Corradini <corradini@engr.wisc.edu>
To: apostola <apostola@mit.edu>
Sent: Sat Mar 12 11:31:53 2011
Subject: Fwd: Re: SPECULATION on TEPCO FUKUSHIMA PLANTS STATUS

GEA - I assume you know more?
--

Michael Corradini, Chair
Engineering Physics
University of Wisconsin
(608)263-1648 [Fax: 3-7451]
radini@engr.wisc.edu
p://www.engr.wisc.edu/ep

----- Forwarded message from nollet@wisc.edu -----
Date: Sat, 12 Mar 2011 10:26:11 -0600
From: "Billy K Nollet" <nollet@wisc.edu>
Reply-To: nollet@wisc.edu
Subject: Re: SPECULATION on TEPCO FUKUSHIMA PLANTS STATUS
To: "Michael Corradini" <corradin@cae.wisc.edu>

thanks for the updates!

On 03/12/11, Michael Corradini wrote:
>
> Folks,
>
> I am still at NRC and many of us are following the events via NEI and
> DOE and TEPCO news releases.
>
> Based on this here is my speculative analysis.

eneral comment: This accident is caused more by the tsunami but seems
imilar to TMI in results
>
> Detailed comment on current plant status: NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOS

> Fukushima #1 - Mark-I BWR - 400MWe (like Dresden design)
>
> Plant scrammed upon earthquake
>
> Station blackout - no offsite power available
>
> Diesel generators start for AC power to pumps
>
> DG's stop after an hour (assumed to due tsunami flooding)
>
> Isolation condenser is used to removed the decay heat
>
> Apparent small LOCA and loss of primary water inventory
>
> RCIC pumps on DC power used to replace inventory
>
> DC power from batteries consumed after 8 hours
>
> Complete station blackout (no AC power at all)
>
> Hours pass as inventory is lost and core degradation occurs (Zr oxidation, clad failure, eutectic formation)
>
> Portable diesel generators arrive on site
>
> AC power for pumps to replace inventory in RPV
>
> Pressure in the containment drywell rises as wetwell saturates
>
> Drywell is vented to outside reactor building
>
> Hydrogen produced from Zr oxidation is also released to reactor building
>
> Hydrogen in reactor building explodes and outer building collapses
>
> Drywell and RPV are reported to be intact but large amount of core degradation
>
> AC power for pumps to inject seawater into the RPV
>
> Radioactivity releases (from venting) appear to be decreasing
>
>
> THIS IS THE CURRENT STATUS ANALYSIS

----- End forwarded message -----

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

From: Apostolakis, George
Sent: Saturday, March 12, 2011 10:31 AM
To: (b)(6)
Subject: RE: News Alert: Japanese Official Confirms Explosion at Nuclear Plant

We don't know what exactly happened. The explosion due to hydrogen did not damage the reactor vessel. The news is very sketchy.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS 016 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

-----Original Message-----
From: (b)(6)
Sent: Saturday, March 12, 2011 8:19 AM
To: Apostolakis, Dr. G.
Subject: Fw: News Alert: Japanese Official Confirms Explosion at Nuclear Plant

George,
I am in Buenos Aires. How severe is this event?
Dimitris
-----Original Message------
From: NYTimes com News Alert
To: (b)(6)
ReplyTo: nytdirect@nytimes.com
Subject: News Alert: Japanese Official Confirms Explosion at Nuclear Plant
Sent: Mar 12, 2011 8:28 AM

NOT FOR PUBLIC DISCLOSURE

Breaking News Alert
The New York Times
Sat, March 12, 2011 -- 5:27 AM ET

Japanese Official Confirms Explosion at Nuclear Plant

Japanese officials said on Saturday there had been an explosion at a nuclear power plant following Friday's huge earthquake, blowing off the roof of the structure and causing a radiation leak of unspecified proportions.

The chief cabinet secretary Yukio Edano confirmed earlier reports of an explosion at the Fukushima Daiichi nuclear plant, 150 miles north of Tokyo.

Read More:
http://www.nytimes.com?emc=na

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New York, NY 10018

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Sent via BlackBerry by AT&T

Apostolakis, George

m: Apostolakis, George
t: Monday, March 14, 2011 1:17 PM
: Blake, Kathleen; Sosa, Belkys; Snodderly, Michael; Baggett, Steven; Davis, Roger; Lui, Christiana
Cc: Savoy, Carmel
Subject: Re: Newspaper TA NEA

I am not making public comments at this time.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Blake, Kathleen
To: Sosa, Belkys; Apostolakis, George; Snodderly, Michael; Baggett, Steven; Davis, Roger; Lui, Christiana
Cc: Savoy, Carmel
Sent: Mon Mar 14 11:56:43 2011
Subject: RE: Newspaper TA NEA

Ioannis just called (noon) and wanted the Cmr's cell phone number to talk to him due to the urgency in Japan. I told him that you were unavailable and traveling at this time, but I would let the Cmr know of his call and reply to him this afternoon.

ase advise.

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Sosa, Belkys
Sent: Monday, March 14, 2011 11:48 AM
To: Blake, Kathleen; Apostolakis, George; Snodderly, Michael; Baggett, Steven; Davis, Roger
Subject: RE: Newspaper TA NEA

Commissioner my recommendation is to stay away from any public comments other than the talking points that OPA has prepared. We can have Kathleen respectfully decline noting that you are traveling.

Thanks,
Belkys

From: Blake, Kathleen
t: Monday, March 14, 2011 9:23 AM
Apostolakis, George; Sosa, Belkys
oject: FW: Newspaper TA NEA

And here it is in English. kb

Kathleen M. Blake
Administrative Assistant
Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: CMRAPOSTOLAKIS Resource
Sent: Monday, March 14, 2011 9:05 AM
To: Blake, Kathleen
Subject: FW: Newspaper TA NEA

From: Giannis Papadopoulos (b)(6)
Sent: Sunday, March 13, 2011 11:40 AM
To: CMRAPOSTOLAKIS Resource
Subject: Newspaper TA NEA

Dear Mr. Apostolakis,
This is Ioannis Papadopoulos, reporter of the newspaper TA NEA. I interviewed you about you nomination at NRC in October 2009. I've been working at the Athens bureau of TA NEA since September. I would like to talk to you about the nuclear plants in Japan and how the earthquake is affecting their safety. Please let me know if you would be interested. Thank you.
Sincerely,
Ioannis Papadopoulos
tel. (+30)6977888693
(+30)2113658511

Sosa, Belkys ~~NOT FOR PUBLIC DISCLOSURE~~

From: Sosa, Belkys
Sent: Monday, March 14, 2011 4:05 PM
To: Blake, Kathleen
Subject: RE: Why are you silent?

No action

-----Original Message-----
From: Blake, Kathleen
Sent: Monday, March 14, 2011 4:01 PM
To: Sosa, Belkys
Subject: FW: Why are you silent?

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

~~NOT FOR PUBLIC DISCLOSURE~~

-----Original Message-----
From: CMRAPOSTOLAKIS Resource
Sent: Monday, March 14, 2011 3:29 PM
To: Blake, Kathleen
Subject: FW: Why are you silent?

-----Original Message-----
From: Roger Mattson (b)(6)
Sent: Monday, March 14, 2011 2:43 PM
To: CMRAPOSTOLAKIS Resource; CMRSVINICKI Resource; CMRMAGWOOD Resource; CMROSTENDORFF Resource; CMRJACZKO@nrc.gov
Cc: OPA Resource
Subject: Why are you silent?

Dear NRC Commissioners,

Having lived through the accident and the public relations nightmare of TMI, I have a special empathy for your current situation. However, I am writing to tell you that you are making a tragic mistake with respect to Fukushima.

Americans from coast to coast are concerned for the events unfolding there. Many of them write and call me asking for answers. However, I can speak to only a few of them and even then I have no reliable information. Meanwhile the media are full of wannabe experts operating on too little information. Confusion reigns and you remain silent. That is the mistake of which I speak.

I am sure that you too have a dearth of information, but you have more than the rest of us. And you can, if you choose, tell us what is really going on. In addition, sketchy information is beginning to leak out that causes more questions than it provides answers. For example, where is the fuel handling crane that we see missing from the satellite photos after the hydrogen explosion in Unit 3? Are all three reactor vessels at high pressure discharging steam through the SRVs to the torus or are they all at lower pressure discharging steam through the MSIVs to the turbines? Why isn't the sea water getting into the reactor vessels? If plant radiation is being detected 100 miles off shore, why have the IAEA and the Japanese classified this as a local event? I could go on, but you get the picture.

Once upon a time, in the heat of the moment, I asked NRC Chairman Hendrie who he was protecting by not ordering a precautionary evacuation at TMI. That simple question got us off the dime and we at least moved children and pregnant women away from the plant.

I ask you now: who are you protecting by remaining silent?

If it is the industry, then you are on the wrong course. The industry is way ahead of you in informing the public to the best of its ability. Marvin Fertel, NEI's president, is a hero in my book for going on "Meet the Press" yesterday, but I wager that his information is more sketchy than yours.

If it is your reputation, then you run a great risk. Your reputation and the respect that the American people have long held for the NRC are eroding hour by hour as this tragedy unfolds.

If it is our relations with the Japanese, then tell them that you must speak now to fulfill your obligations to Americans and then offer any aid with the accident and its aftermath that you can possibly provide.

Meanwhile, other federal agencies are doing their best to keep us informed, e.g., NOAA, NASA, and USGS. But you are the keepers of nuclear safety wisdom. We look to you for that, more than anyone else.

One of you should hold a news conference yet today and tell us what you know and what you do not know.

Speak! Please.

Roger

Roger J. Mattson, PhD
(b)(6)

Sosa, Belkys

From: Blake, Kathleen
Sent: Monday, March 14, 2011 5:08 PM
To: dmacconuladh@athensnews.eu
Cc: Sosa, Belkys
Subject: FW: Media request from the Athens News, Greece
Attachments: image003.jpg

Mr. Mac Con Uladh: I have spoken with the Commissioner and he is not making public comments at this time. kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Damian Mac Con Uladh [mailto:dmacconuladh@athensnews.eu]
Sent: Monday, March 14, 2011 1:26 PM
To: apostola@mit.edu
Subject: Media request from the Athens News, Greece

Dear Prof Apostolakis,

I'm a journalist at the *Athens News*, Greece, and, in the light of the Japanese earthquake, I'm working on an article that looks at Greece's vulnerability to nuclear disasters/radiation as a result of earthquakes. In October 2009, you spoke to a colleague of mine, Dimitris Yannopoulos, about your appointment to the NRC. In the interview (http://www.athensnews.gr/issue/13361/20332), you touched on the nuclear option in Greece, stating that: "It seems to me that, instead of rejecting it outright, nuclear power should be part of the longterm energy planning of the country, together with renewable sources of energy."

My questions would be

1. whether, given the explosions at two reactors in Japan, Greece, with its seismic activity, should still consider the nuclear option?
2. Whether Greece should have any concerns about nuclear facilities in neighbouring countries?

I would be very grateful if you could give your opinion on these questions at the earliest opportunity.

Looking forward to hearing from you,

Damian Mac Con Uladh

Damian Mac Con Uladh

Journalist

dmacconuladh@athensnews.eu

Athens News
Doiranis 181 and Feidiou 18
176 73 Athens (Kallithea)

www.athensnews.eu

Find us on Facebook
www.facebook.com/AthensNews

t: +30-213-0087-163
f: +30-210-9431-110
m: (b)(6)

Consider the environment - do you really need to print this email?

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Apostolakis, George

om: Apostolakis, George
nt: Monday, March 14, 2011 5:01 PM
: Blake, Kathleen
Subject: FW: Media request from the Athens News, Greece
Attachments: image003.jpg

Kathleen:

Please send to Mr. Damian Mac Con Uladh the same answer you sent to Mr. Papadopoulos (TA NEA).

Thanks.

GA

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

NOT FOR PUBLIC DISCLOSURE

---

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nt: Monday, March 14, 2011 1:26 PM
o: apostola@mit.edu
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mian Mac Con Uladh

--

Damian Mac Con Uladh
Journalist

acconuladh@athensnews.eu

Athens News
Doiranis 181 and Feidiou 18
176 73 Athens (Kallithea)

www.athensnews.eu

Find us on Facebook
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t: +30-213-0087-163
f: +30-210-9431-110
m: (b)(6)

Consider the environment - do you really need to print this email?

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Blake, Kathleen
Sent: Monday, March 14, 2011 4:01 PM
To: Sosa, Belkys
Subject: FW: Why are you silent?

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

-----Original Message-----
From: CMRAPOSTOLAKIS Resource
Sent: Monday, March 14, 2011 3:29 PM
To: Blake, Kathleen
Subject: FW: Why are you silent?

NOT FOR PUBLIC DISCLOSURE

-----Original Message-----
From: Roger Mattson (b)(6)
Sent: Monday, March 14, 2011 2:43 PM
To: CMRAPOSTOLAKIS Resource; CMRSVINICKI Resource; CMRMAGWOOD Resource; CMROSTENDORFF Resource; CMRJACZKO@nrc.gov
Cc: OPA Resource
Subject: Why are you silent?

Dear NRC Commissioners,

Having lived through the accident and the public relations nightmare of TMI, I have a special empathy for your current situation. However, I am writing to tell you that you are making a tragic mistake with respect to Fukushima.

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If it is our relations with the Japanese, then tell them that you must speak now to fulfill your obligations to Americans and then offer any aid with the accident and its aftermath that you can possibly provide.

Meanwhile, other federal agencies are doing their best to keep us informed, e.g., NOAA, NASA, and USGS. But you are the keepers of nuclear safety wisdom. We look to you for that, more than anyone else.

One of you should hold a news conference yet today and tell us what you know and what you do not know.

Speak! Please.

Roger

Roger J. Mattson, PhD
(b)(6)

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

From: Blake, Kathleen
Sent: Monday, March 14, 2011 4:52 PM
To: Apostolakis, George; Sosa, Belkys
Subject: FW: Newspaper TA NEA

Fyi - kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

NOT FOR PUBLIC DISCLOSURE

From: Giannis Papadopoulos (b)(6)
Sent: Monday, March 14, 2011 4:51 PM
To: Blake, Kathleen
Subject: RE: Newspaper TA NEA

Dear Ms. Blake,
Thank you for your response. Please let me know if Mr. Apostolakis will be willing to talk sometime in the future. Thank you.
Sincerely,
Giannis Papadopoulos

--- Στις **Δευτ., 14/03/11, ο/η Blake, Kathleen <*Kathleen.Blake@nrc.gov*>** έγραψε:

Από: Blake, Kathleen <Kathleen.Blake@nrc.gov>
Θέμα: RE: Newspaper TA NEA
Προς: (b)(6)
Ημερομηνία: Δευτέρα, 14 Μάρτιος 2011, 20:43

Mr. Papadopoulos: I spoke with the Commissioner and he is not making public comments at this time.

Kathleen M. Blake

Administrative Assistant

to Commissioner Apostolakis

U.S. Nuclear Regulatory Commission

11555 Rockville Pike

Rockville, Maryland 20852

301-415-1810

From: Giannis Papadopoulos (b)(6)
Sent: Sunday, March 13, 2011 11:40 AM
To: CMRAPOSTOLAKIS Resource
Subject: Newspaper TA NEA

Dear Mr. Apostolakis,
This is Ioannis Papadopoulos, reporter of the newspaper TA NEA. I interviewed you about you nomination at NRC in October 2009. I've been working at the Athens bureau of TA NEA since September. I would like to talk to you about the nuclear plants in Japan and how the earthquake is affecting their safety. Please let me know if you would be interested. Thank you.
Sincerely,
Ioannis Papadopoulos
tel. (+30)6977888693
(+30)2113658511

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Blake, Kathleen
Sent: Monday, March 14, 2011 5:06 PM
To: Apostolakis, George
Cc: Sosa, Belkys
Subject: RE: Media request from the Athens News, Greece
Attachments: image001.jpg

Will do. kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Apostolakis, George
Sent: Monday, March 14, 2011 5:01 PM
To: Blake, Kathleen
Subject: FW: Media request from the Athens News, Greece

Kathleen:

Please send to Mr. Damian Mac Con Uladh the same answer you sent to Mr. Papadopoulos (TA NEA).

Thanks.

GA

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

NOT FOR PUBLIC DISCLOSURE

(301) 415-1810

From: Damian Mac Con Uladh [mailto:dmacconuladh@athensnews.eu]
Sent: Monday, March 14, 2011 1:26 PM
To: apostola@mit.edu
Subject: Media request from the Athens News, Greece

Dear Prof Apostolakis,

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to me that, instead of rejecting it outright, nuclear power should be part of the longterm energy planning of the country, together with renewable sources of energy."

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2 Whether Greece should have any concerns about nuclear facilities in neighbouring countries?

I would be very grateful if you could give your opinion on these questions at the earliest opportunity.

Looking forward to hearing from you,

Damian Mac Con Uladh

--
Damian Mac Con Uladh
Journalist

dmacconuladh@athensnews.eu

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176 73 Athens (Kallithea)

www.athensnews.eu

Find us on Facebook
www.facebook.com/AthensNews

t: +30-213-0087-163
f: +30-210-9431-110
m: (b)(6)

Consider the environment - do you really need to print this email?

Sosa, Belkys

From: Davis, Roger
Sent: Tuesday, March 15, 2011 11:23 PM
To: Sosa, Belkys; Apostolakis, George; Baggett, Steven; Snodderly, Michael; Blake, Kathleen
Subject: Re: Query: Plant Tour with Senator Feinstein- interested?

(b)(5)

----- Original Message -----
From: Sosa, Belkys
To: Apostolakis, George; Baggett, Steven; Snodderly, Michael; Blake, Kathleen; Davis, Roger
Sent: Tue Mar 15 20:36:09 2011
Subject: Query: Plant Tour with Senator Feinstein- interested?

Cmr, the Chairman would like to know if you would like to accompany Senator Feinstein in a tour of Diablo Canyon or Dresden on Tuesday morning?
She is a member of the Senate Appropriations committee and Chairs the Energy and Water subcommittee.
Please advice?
They want confirmation tonight.
My recommendation is yes!
Thks

ent from an NRC Blackberry
elkys Sosa
(b)(6)

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

n: Apostolakis, George
nt: Tuesday, March 15, 2011 9:48 AM
o: Blake, Kathleen; Sosa, Belkys
Cc: Davis, Roger; Snodderly, Michael; Baggett, Steven; Savoy, Carmel; Lui, Christiana
Subject: Re: Newspaper TA NEA

This statement is good. Please change "another country" to "another country's". I suggest you delete the last paragraph. Thanks.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Blake, Kathleen
To: Apostolakis, George; Sosa, Belkys
Cc: Davis, Roger; Snodderly, Michael; Baggett, Steven; Savoy, Carmel; Lui, Christiana
Sent: Tue Mar 15 09:17:07 2011
Subject: RE: Newspaper TA NEA

Cmr: This is the standard language that Belkys recommends sending for requests like this. OK with you? kb

Papadopoulos: Commissioner Apostolakis will not comment on the status of another country lear power plants. Please check the NRC web site for the latest information on NRC actions. tp://www.nrc.gov/

Our thoughts and prayers are with the people of Japan during this ongoing crisis.

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Apostolakis, George
Sent: Tuesday, March 15, 2011 9:15 AM
To: Blake, Kathleen; Sosa, Belkys
Cc: Davis, Roger; Snodderly, Michael; Baggett, Steven; Savoy, Carmel; Lui, Christiana
Subject: Re: Newspaper TA NEA

I still cannot speak to him. Perhaps you could send him the latest NRC press release. Steve and Mike: Could you help hleen? GA.

orge Apostolakis
ommissioner, US NRC
Blackberry (b)(6)

NOT FOR PUBLIC DISCLOSURE

~~NOT FOR PUBLIC DISCLOSURE~~

m: Blake, Kathleen
apostolakis, George; Sosa, Belkys
Davis, Roger; Snodderly, Michael; Baggett, Steven; Savoy, Carmel; Lui, Christiana
Sent: Tue Mar 15 08:37:10 2011
Subject: FW: Newspaper TA NEA

Cmr: How to respond? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

~~NOT FOR PUBLIC DISCLOSURE~~

From: Giannis Papadopoulos (b)(6)
Sent: Tuesday, March 15, 2011 7:02 AM
To: Blake, Kathleen
Subject: RE: Newspaper TA NEA

Dear Ms. Blake,
I'm sorry to insist. I just wanted to ask if Mr. Apostolakis would be willing to talk off the record about the ushima nuclear plant in Japan. Thank you.
erely,
annis Papadopoulos

Apostolakis, George

m: Bilge Yildiz [byildiz@MIT.EDU]
t: Tuesday, March 15, 2011 11:36 PM
o: Neil Todreas
Cc: Michael Golay; Ronald Ballinger; nse-prof@mit.edu
Subject: Re: Fukushima Spent Fuel Pool Information
Attachments: Fukushima spent fuel location.doc

Attached is a screen capture from NHK Japanese news website (broadcast also in English). It is cartoon, but I captured it during their talking about the spent fuel pool issues, so I believe to the top left of the vessel (I marked it with red circle) is where the spent fuel pool is.

Bilge

Quoting Neil Todreas <todreas@MIT.EDU>:

> Has this been answered. Would be very useful to have. Neil On Mar 15,
> 2011, at 9:07 AM, Michael Golay wrote:
>
>> Does anyone have info re the layouts of the reactor bldgs.?
>> Particularly where the spent fuel pools are. Mike
>>
>>

Michael W. Golay
Prof. of Nuclear Science and Engineering Room 24-223 Massachusetts
>> Institute of Technology
>> 77 Massachusetts Ave.
>> Cambridge MA 02129
>> Office: 617 253 5824
>> Fax: 617 258 8863
>> Cell: (b)(6)
>> golay@mit.edu
>>
>>
>> On Mar 15, 2011, at 8:38 AM, Ronald Ballinger wrote:
>>
>>>
>>>
>>>
>>>
>>> From: Lake Barrett [mailto:Lake@Lbarrett.com]
>>> Sent: Tuesday, March 15, 2011 8:25 AM
>>> To: Science Panel Science Panel
>>> Subject: Fukushima Spent Fuel Pool Information
>>>
>>>

In my last email late last night I told you about a reported fire in
>> Unit 4 that seemed to be related to the spent fuel pool there. But
>>> that information was so garbled and confused it was impossible to
>>> rationalize what the situation truly is. But I wanted you to know

>>> right away that whatever the fire was, it is now reportedly out.
>>>
>>>
>>> Clearly the spent fuel pools in all 6 units there (1,2,&3 which were
>>> operating and now have destroyed cores and Units 4 (where the fire
>>> was
>>> reported) and 5 & 6).
>>>
>>>
>>>
>>> Here is my simple take on the pools. All pools need to be kept
>>> filled with water to cool the fuel at the bottom of the pool. There
>>> is approximately 30 feet of water over the top of the fuel. These
>>> Fukushima Diachi pools are on
>>> average 85% full (~1,700 MTU). There is no active cooling anymore. This
>>> means the pool temperatures will rise slowly and eventually boil. Boiling
>>> is good because it removes the heat as steam. Boiling increases
>>> local doses, but compared to everything else that is happening there
>>> it is inconsequential. But the boiled away water needs to be
>>> replaced somehow. A fire hose is all that is needed.
>>>
>>>
>>>
>>> It takes many days for a pool to boil down 30 feet to reach the top
>>> of the fuel. So they should be able to keep pools cooled, unless
>>> there was major structural damage to the pool itself. If they
>>> don't add makeup water, the fuel could become uncovered, heat up
>>> (because air is a poor coolant), overheat, and freshly removed fuel
>>> from the reactor that has a relatively high thermal output could
>>> oxidize (burn) creating hydrogen. This would basically be a spent fuel pool fire.
>>>
>>>
>>>
>>> It would be very bad because there would be energy from the "fire"
>>> to lift particulate biologically significant nuclides, Cesium and
>>> Strontium, into the air and cause significant offsite impacts.
>>> Since these pools contain decades of old spent fuel in them, the
>>> potential release scenarios can be large with an unmitigated fire.
>>> In some ways comparable to reactor core fragmentation and partial
>>> melting (like has already happened in Units 1,3, & 2). There is no
>>> primary containment structure around these spent fuel pools.
>>> The Unit 1 and 3 pools are exposed to the air since their building
>>> roofs are gone. Debis fell down all over the refueling floor and
>>> likely into the units 1 & 3 pools as well. Debris from the units 1
>>> 73 explosions could have penetrated the sheet metal roofs of the
>>> other four spent fuel pools also. I just do not know.
>>>
>>>
>>>
>>> Exhaust fan and air filtration systems in the other buildings have
>>> unknown capability. I suspect, that they are inoperable as it seems
>>> most systems seem to be. How the Unit 1 and 3 pools are after the
>>> building explosions happened is completely unknown to me.
>>>
>>>
>>>

>>> I can't take the time to speculate on all the scenarios in this
>>> email. All
>>> I can say is that spent fuel pool cooling is very important.
Comparable to
reactor cooling efforts. It is much easier to deal with than
>>> cooling the damaged reactor cores. I hope the now reduced station
>>> staff of 50 people are capable of keeping the pools cooled and deal
>>> with the reactors as well.
>>>
>>>
>>>
>>> I have pasted below some of the reports from last night relative to
>>> this. I warn you these are snippets of a translation of people who
>>> may or may not know the facts. They may be completely out of
>>> context. My bottom line is that we don't know what the true
>>> situation is there except that it is bad and could get worse.
>>>
>>>
>>>
>>> Lake
>>>
>>> Unit 1 Fukushima Daiichi] 1F-4 Fire Reactor building of 1F-4 is on fire.
>>> Efforts are being made to extinguish the fire.
>>> The cause of this fire is estimated hydrogen explosion due to
>>> increase of spent fuel pool temperature.
>>>
>>> At 10:22 a.m. on March 15, monitoring result shown 30 mSv/hr between
>>> unit 2 and 3, 400 mSv/hr near unit 3, 100 mSv/hr near unit 4.
The reason of this high value is attributed to the fire at unit 4.
(Monitoring results before and after the unit 2 explosion changed
>>> little.)
>>>
>>> Number of Personnel at the site was 800 at 6:00am, now reduced to
>>> 50, necessary for water injection to unit 1,2 and 3. Water injection
>>> to units
>>> 1,2 and 3 are in progress. Reactor pressure is stable.
>>>
>>> Tokyo Electric, which over the weekend said it had 1,400 people
>>> working at the complex, evacuated all but 50 workers
>>>
>>>
>>>
>>> <winmail.dat>
>>
>
>



NOW ON AIR



[redacted]

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NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Blake, Kathleen
Sent: Tuesday, March 15, 2011 10:41 AM
To: Sosa, Belkys
Subject: FW: Pool

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Herr, Linda
Sent: Tuesday, March 15, 2011 10:35 AM
To: Blake, Kathleen
Subject: RE: Pool

Morning kb:

Yes, we rec'd the same email addressed to "Bill." Any significance? I had Sunny print and circulate as mail.

From: Blake, Kathleen
Sent: Tuesday, March 15, 2011 10:32 AM
To: Herr, Linda; Lepre, Janet; Crawford, Carrie
Subject: FW: Pool

Ladies: Did you receive this email to your Commissioner Resource as well? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Sosa, Belkys
Sent: Tuesday, March 15, 2011 10:28 AM
To: Blake, Kathleen; Apostolakis, George
Cc: Davis, Roger
Subject: RE: Pool

thleen, please check with other Commissioner's offices to see if they got the same message. Thanks, -
elkys

NOT FOR PUBLIC DISCLOSURE

From: Blake, Kathleen
Sent: Tuesday, March 15, 2011 9:30 AM NOT FOR PUBLIC DISCLOSURE
To: Apostolakis, George; Sosa, Belkys
Subject: FW: Pool

fyi - kb

Kathleen H. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: CMRAPOSTOLAKIS Resource
Sent: Tuesday, March 15, 2011 9:24 AM
To: Blake, Kathleen
Subject: FW: Pool

NOT FOR PUBLIC DISCLOSURE

From (b)(6)
Sent: Tuesday, March 15, 2011 8:57 AM
To: CMRAPOSTOLAKIS Resource
Subject: Pool

Dear George

Japan's government and nuclear industry is in a desperate race to stave off multiple Fukushima reactor meltdowns as well as potential fires in spent fuel pools. More than 200,000 people have been evacuated as radiation have increased. The number of military emergency responders has jumped from 51,000 to 100,000. Meanwhile, Unit 2 of the Tokai nuclear complex, which is near Kyodo and just 75 miles north of Tokyo, has a coolant pump failure. Japan's nuclear safety agency has declared a state of emergency at the Onagawa nuclear power plant in northeastern Japan because of high radiation levels. The damage from the massive earthquake and the tsunamis that followed have profoundly damaged the reactor sites' infrastructure, leaving them without power and their electrical and piping systems destroyed. Hydrogen explosions complicate matters and efforts to divert seawater into the reactors are uncertain as gauges don't show the water rising.

Along with the struggle to cool the reactors is the danger from an inability to cool the spent fuel pools. They contain very large concentrations of radioactivity, can catch fire, and are in much more vulnerable buildings. The pools, typically rectangular basins about 40 feet deep, are made of reinforced concrete walls 4 to 5 feet thick lined with stainless steel. The boiling-water reactors at Fukushima are 40 years old and designed by GE, have spent fuel pools several stories above ground adjacent to the top of the reactor. The hydrogen explosion may have blown off the roof covering the pool, as it's not under containment. The pool requires water

circulation to remove decay heat. If this doesn't happen, the water will evaporate and boil off. If a pool wall or support is compromised, then drainage is a concern. Once the water drops to 5-6 feet above the assemblies, dose rates could be life-threatening near the reactor building. If significant drainage occurs, after several hours the zirconium cladding around the irradiated uranium could ignite. Then all bets are off.

Spent fuel pools hold 5 to 10 times more long-lived radioactivity than a reactor core with large amounts of cesium-137, which contain 20 to 50 million curies of this dangerous radioactive isotope. With a half-life of 30 years, cesium-137 gives off highly penetrating radiation and is absorbed in the food chain as if it were potassium. Chernobyl only released 40% of the reactor core's 6 million curies. A 1997 report for NRC by Brookhaven National Laboratory found that a severe pool fire could render 188 square miles uninhabitable, cause as many as 28,000 cancer fatalities, and cost $59 billion in damage. A single spent fuel pool holds more cesium-137 than was deposited by all atmospheric nuclear weapons tests in the Northern Hemisphere combined. Earthquakes and acts of malice are the primary events that can cause a major loss of pool water.

If a spent fuel pool were drained in America, a major release of cesium-137 from a pool fire could render an area uninhabitable greater than Chernobyl. The National Academy of Sciences reported in 2004 that a "partially or completely drained a spent fuel pool could lead to a propagating zirconium cladding fire and release large quantities of radioactive materials to the environment." Given what's happening in Japan and spent fuel older than 5 years comprise 75% of US spent fuel pools, it's time for a serious rethink of what we consider to be improbable. We the people are very concerned about our own safety and urge NRC to stop dithering and **place spent fuel older than 5 years in dry hardened casks like what Germany did 25 years ago.**

We The People

Eddy Nguyen

Titan Capital

Sosa, Belkys

From: Blake, Kathleen
Sent: Tuesday, March 15, 2011 11:39 AM
To: Giannis Papadopoulos
Subject: RE: Newspaper TA NEA

Mr. Papadopoulos:

Commissioner Apostolakis will not comment on the status of another country's nuclear power plants. Please check the NRC web site for the latest information on NRC actions. http://www.nrc.gov/

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Giannis Papadopoulos (b)(6)
Sent: Tuesday, March 15, 2011 7:02 AM
To: Blake, Kathleen
Subject: RE: Newspaper TA NEA

Dear Ms. Blake,
I'm sorry to insist. I just wanted to ask if Mr. Apostolakis would be willing to talk off the record about the Fukushima nuclear plant in Japan. Thank you.
Sincerely,
Ioannis Papadopoulos

~~NOT FOR PUBLIC DISCLOSURE~~

Sosa, Belkys

From: Sosa, Belkys
Sent: Tuesday, March 15, 2011 12:16 PM
To: Blake, Kathleen; Brenner, Eliot
Cc: Davis, Roger
Subject: Re: phone call re interview w Clean Channel for Adelphia in Philadelphia, PA

Kathleen, please forward all press interview requests to OPA.
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Blake, Kathleen
To: Sosa, Belkys
Cc: Davis, Roger
Sent: Tue Mar 15 11:43:43 2011
Subject: phone call re interview w Clean Channel for Adelphia in Philadelphia, PA

Belkys:

I received a call from Sunny Dang (b)(6) from Clean Channel for Adelphia in Philadelphia, PA wanting an interview with you (since Cmr is out) re the affect of natural disasters and the devastation in Japan.

I wanted to confirm that I can say the one-liner to all calls and requests before I do. Or do you want me to take a message with the caller's name, etc for the record?

Please advise. kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

~~NOT FOR PUBLIC DISCLOSURE~~

Sosa, Belkys

From: Blake, Kathleen
Sent: Tuesday, March 15, 2011 12:42 PM
To: Crawford, Carrie
Subject: RE: Pool

Thanks Carrie. kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Crawford, Carrie
Sent: Tuesday, March 15, 2011 12:41 PM
To: Blake, Kathleen
Subject: RE: Pool

Kathleen, Commisioner Magwood did receive the letter below. Thanks/carrie

From: Blake, Kathleen
Sent: Tuesday, March 15, 2011 10:32 AM
To: Herr, Linda; Lepre, Janet; Crawford, Carrie
Subject: FW: Pool

Ladies: Did you receive this email to your Commissioner Resource as well? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Sosa, Belkys
Sent: Tuesday, March 15, 2011 10:28 AM
To: Blake, Kathleen; Apostolakis, George
Cc: Davis, Roger
Subject: RE: Pool

Kathleen, please check with other Commissioner's offices to see if they got the same message. Thanks, - Belkys

From: Blake, Kathleen
Sent: Tuesday, March 15, 2011 9:30 AM
To: Apostolakis, George; Sosa, Belkys
Subject: FW: Pool

Fyi - kb

NOT FOR PUBLIC DISCLOSURE

Kathleen H. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

NOT FOR PUBLIC DISCLOSURE

From: CMRAPOSTOLAKIS Resource
Sent: Tuesday, March 15, 2011 9:24 AM
To: Blake, Kathleen
Subject: FW: Pool

From: (b)(6)
Sent: Tuesday, March 15, 2011 8:57 AM
To: CMRAPOSTOLAKIS Resource
Subject: Pool

Dear George

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Along with the struggle to cool the reactors is the danger from an inability to cool the spent fuel pools. They contain very large concentrations of radioactivity, can catch fire, and are in much more vulnerable buildings. The pools, typically rectangular basins about 40 feet deep, are made of reinforced concrete walls 4 to 5 feet thick lined with stainless steel. The boiling-water reactors at Fukushima are 40 years old and designed by GE, have spent fuel pools several stories above ground adjacent to the top of the reactor. The hydrogen explosion may have blown off the roof covering the pool, as it's not under containment. The pool requires water circulation to remove decay heat. If this doesn't happen, the water will evaporate and boil off. If pool wall or support is compromised, then drainage is a concern. Once the water drops to 5-6 feet above the assemblies, dose rates could be life-threatening near the reactor building. If

significant drainage occurs, after several hours the zirconium cladding around the irradiated uranium could ignite. Then all bets are off.

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If a spent fuel pool were drained in America, a major release of cesium-137 from a pool fire could render an area uninhabitable greater than Chernobyl. The National Academy of Sciences reported in 2004 that a "partially or completely drained a spent fuel pool could lead to a propagating zirconium cladding fire and release large quantities of radioactive materials to the environment." Given what's happening in Japan and spent fuel older than 5 years comprise 75% of US spent fuel pools, it's time for a serious rethink of what we consider to be improbable. We the people are very concerned about our own safety and urge NRC to stop dithering and **place spent fuel older than 5 years in dry hardened casks like what Germany did 25 years ago.**

We The People

Eddy Nguyen

Titan Capital

From: Sosa, Belkys
Sent: Tuesday, March 15, 2011 8:36 PM
To: Apostolakis, George; Baggett, Steven; Snodderly, Michael; Blake, Kathleen; Davis, Roger
Subject: Query: Plant Tour with Senator Feinstein- interested?

Cmr, the Chairman would like to know if you would like to accompany Senator Feinstein in a tour of Diablo Canyon or Dresden on Tuesday morning?
She is a member of the Senate Appropriations committee and Chairs the Energy and Water subcommittee.
Please advice?
They want confirmation tonight.
My recommendation is yes!
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

~~NOT FOR PUBLIC DISCLOSURE~~

Sosa, Belkys

From: Sosa, Belkys
Sent: Tuesday, March 15, 2011 10:36 PM
To: Snodderly, Michael
Subject: Re: : Newal's Interview with Commissioner Apostolakis

Well the Japanese are not letting jim trapp and tony listen on their briefings real time. We have a serious problem with access to data. Let's hope every thing is better tomorrow. Take care.
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

---- Original Message -----
From: Snodderly, Michael
To: Sosa, Belkys
Sent: Tue Mar 15 21:55:25 2011
Subject: Re: : Newal's Interview with Commissioner Apostolakis

There was a lot of discussion with John Kelly from DOE and GE executives. Universal frustration with the lack of data. Both GE and Sandia (Randy Gantt, good guy) are geared up and ready to analyze the situation once we have better data. I hated that table that gave 3 different pressures for the reactor, vessel and drywell. Doesn't make sense if SRVs actuated and passive vacuum breakers work.

Sent from my NRC Blackberry
(b)(6)

----- Original Message -----
From: Sosa, Belkys
To: Snodderly, Michael
Sent: Tue Mar 15 21:44:32 2011
Subject: Re: : Newal's Interview with Commissioner Apostolakis

Thks Mike. How are u holding up? I'm feeling very anxious about the event in Japan..its crazy!

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

----- Original Message -----
From: Snodderly, Michael
To: Sosa, Belkys; Baggett, Steven; Apostolakis, George; Davis, Roger; Blake, Kathleen
Sent: Tue Mar 15 21:41:33 2011
Subject: Re: : Newal's Interview with Commissioner Apostolakis

I would not refer to the U S president instead President Obama.

State of ????? Should be state of knowledge.

Sent from my NRC Blackberry

at (b)(6)

NOT FOR PUBLIC DISCLOSURE

----- Original Message -----
From: Sosa, Belkys
To: Snodderly, Michael; Baggett, Steven; Apostolakis, George; Davis, Roger; Blake, Kathleen
Sent: Tue Mar 15 18:48:11 2011
Subject: : Newal's Interview with Commissioner Apostolakis

Here are the draft responses from the interview. Please review and comment.
Thks

Sent from an NRC Blackberry
Belkys Sosa

(b)(6)

NOT FOR PUBLIC DISCLOSURE

----- Original Message -----
From: Michelle Yong <michelle@qoinfo.com>
To: Sosa, Belkys
Sent: Tue Mar 15 18:13:31 2011
Subject: Newal's Interview with Commissioner Apostolakis

Hi Belkys,

Newal thanks you and Commissioner Apostolakis for the time and interview at the Regulatory Information Conference. We would like to include the interview in the March-April issue of Nuclear Plant Journal. We are ready to go to press, therefore would like you to turn it around by March 18th.

Please see attached and make any necessary changes. We also need a 75-word professional bio of the Commissioner Apostolakis with a head and shoulders photograph.

Please let me know if you have any questions.

--
Thank you,
Michelle Gaylord
Assistant Editor and Marketing Manager
Nuclear Plant Journal
O: 630-858-6161 x103
D: 630-364-4780
F: 630-852-8787
Website: www.NuclearPlantJournal.com

From: Blake, Kathleen
Sent: Wednesday, March 16, 2011 11:01 AM
To: Sosa, Belkys
Subject: RE: Query: Plant Tour with Senator Feinstein- interested?

Belkys: So should I hold Tuesday, March 22 from 9-noon? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

-----Original Message-----
From: Sosa, Belkys
Sent: Wednesday, March 16, 2011 10:58 AM
To: Apostolakis, George; Davis, Roger; Baggett, Steven; Snodderly, Michael; Blake, Kathleen
Subject: RE: Query: Plant Tour with Senator Feinstein- interested?

At one point, the senator hoped both CA plants, but she seems focused on Diablo at this point. Amy (OCA) plans to talk with her staff in between Hill events today to get more info, timing, and other details.

Thanks,
Belkys

-----Original Message-----
From: Apostolakis, George
Sent: Wednesday, March 16, 2011 7:07 AM
To: Davis, Roger; Sosa, Belkys; Baggett, Steven; Snodderly, Michael; Blake, Kathleen
Subject: Re: Query: Plant Tour with Senator Feinstein- interested?

Why Dresden? Do you mean San Onofre?

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

----- Original Message -----
From: Davis, Roger
To: Sosa, Belkys; Apostolakis, George; Baggett, Steven; Snodderly, Michael; Blake, Kathleen
Sent: Tue Mar 15 23:22:45 2011
Subject: Re: Query: Plant Tour with Senator Feinstein- interested?

(b)(5)

NOT FOR PUBLIC DISCLOSURE

----- Original Message -----
From: Sosa, Belkys
To: Apostolakis, George; Baggett, Steven; Snodderly, Michael; Blake, Kathleen; Davis, Roger
Sent: Tue Mar 15 20:36:09 2011
Subject: Query: Plant Tour with Senator Feinstein- interested?

Cmr, the Chairman would like to know if you would like to accompany Senator Feinstein in a tour of Diablo Canyon or Dresden on Tuesday morning?
She is a member of the Senate Appropriations committee and Chairs the Energy and Water subcommittee.
Please advice?
They want confirmation tonight.
My recommendation is yes!
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Blake, Kathleen
Sent: Wednesday, March 16, 2011 9:06 AM
To: Apostolakis, George; Sosa, Belkys; Baggett, Steven; Snodderly, Michael; Davis, Roger; Lui, Christiana; Savoy, Carmel
Cc: Taylor, Renee; Wyatt, Melissa; Langlie, Liz; Seltzer, Rickie; Kenney, Susan; Giitter, Joseph
Subject: FW: VERY striking NY times photos of Japan's tsunami damage

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Gordie [mailto:(b)(6)
Sent: Wednesday, March 16, 2011 12:14 AM
To: ;
Subject: Fw: VERY striking NY times photos of Japan's tsunami damage

Hi,
A friend sent these to me and I thought you might like to see the "before and after" pictures of the terrible earthquake in Japan.
These unfortunately are not pictures to be "enjoyed", but to be "informed" of what happened there.
Gordie

Subject: Fw: VERY striking NY times photos of Japan's tsunami damage

Beyond words and belief.

There is a white line down the middle of the pictures with a blue slider. Slide that middle line back and forth to see the before and after shots.

http://www.nytimes.com/interactive/2011/03/13/world/asia/satellite-photos-japan-before-and-after-tsunami.html?src=tp

Sosa, Belkys

From: Blake, Kathleen
Sent: Wednesday, March 16, 2011 10:12 AM
To: Apostolakis, George; Sosa, Belkys
Subject: FW: Radio Interveiw

NOT FOR PUBLIC DISCLOSURE

Fyi - kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: CMRAPOSTOLAKIS Resource
Sent: Wednesday, March 16, 2011 10:07 AM
To: Blake, Kathleen
Subject: FW: Radio Interveiw

From: Angela Hoffman (b)(6)
Sent: Tuesday, March 15, 2011 6:56 PM
To: CMRAPOSTOLAKIS Resource
Subject: Radio Interveiw

Dear Public Affairs,

Please consider this a formal request for Labor of Commissioner George Apostolakis to appear as a guest on "Hutchinson Report" on either his KTYM 1460 AM Radio Show, Friday 9:30 to 10:00 AM PST and/or KPFK 90.7 FM, Saturday, from Noon to 1:00 PM PST. If your schedule does not permit an in studio or telephone guest appearance, we can pre-record an interview at any time or day for any length of time you choose to accommodate your schedule.

We appreciate your consideration.

The Hutchinson Report is one of Southern California's most popular, listened to news and public affairs talk shows on public radio in Southern California. The show is streamed worldwide on ktym.com and kpfk.org and internet TV simulcast on Hutchinsonreport.tv.

We will follow-up by phone within 24 hours to determine your availability.

Thank you
Angela

Angela Hoffman- Program Producer
"The Hutchinson Report"

NOT FOR PUBLIC DISCLOSURE

KPFK 90.7 FM Los Angeles
323.630.2649 Direct

(b)(6)

http://thehutchinsonreportnews.com

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Saturdays Noon to 1:00 PM PST
Streamed on http://www.kpfk.org/programs/181-hutchinson-report.html
http://twitter.com/earlhutchinson
View Hutchinson Report TV
on ustream.tv

"Never mistake activity for achievement"

-Coach John Wooden

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Sosa, Belkys
Sent: Wednesday, March 16, 2011 11:25 PM
To: Apostolakis, George; Davis, Roger; Baggett, Steven; Snodderly, Michael; Blake, Kathleen
Subject: FYI: Update re: CA trip

This is all I got so far...

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

----- Original Message -----
From: Powell, Amy
To: Sosa, Belkys; Collins, Elmo
Cc: Batkin, Joshua; Schmidt, Rebecca
Sent: Wed Mar 16 20:20:19 2011
Subject: Update re: CA trip

I spoke briefly with staff to Sen. Feinstein. They are having an office meeting tomorrow to scope out details for her CA trip next week. The only thing that seems solid as this point is travel Monday, site visit(s) Tuesday. Still up in the air is whether one or both CA plants are in play. More tomorrow.

Amy

my Powell
ssociate Director
Office of Congressional Affairs
U. S. Nuclear Regulatory Commission
Phone: 301-415-1673

Sent from my Blackberry

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys NOT FOR PUBLIC DISCLOSURE

From: Sosa, Belkys
Sent: Wednesday, March 16, 2011 12:12 PM
To: Blake, Kathleen
Subject: Re: Radio Interveiw

Kathleen, OPA will respond.

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Blake, Kathleen
To: Sosa, Belkys
Sent: Wed Mar 16 11:03:40 2011
Subject: RE: Radio Interveiw

Belkys: how to respond then to Angela re Friday/Saturday's radio interview? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Sosa, Belkys
Sent: Wednesday, March 16, 2011 10:54 AM
To: Blake, Kathleen; Apostolakis, George; Davis, Roger
Subject: RE: Radio Interveiw

The recommendation is still the same. I understand the Chairman is planning a close meeting early next week with the Commission to discuss the issues on the Japan events.

Thanks,
Belkys

NOT FOR PUBLIC DISCLOSURE

From: Angela Hoffman (b)(6)
Sent: Tuesday, March 15, 2011 6:56 PM
To: CMRAPOSTOLAKIS Resource
Subject: Radio Interveiw

Dear Public Affairs,

Please consider this a formal request for Labor of Commissioner George Apostolakis to appear as a guest on "Hutchinson Report" on either his KTYM 1460 AM Radio Show, Friday 9:30 to 10:00 AM PST and/or KPFK 90.7 FM, Saturday, from Noon to 1:00 PM PST. If your schedule does not permit an in studio or telephone guest appearance, we can pre-record an interview at any time or day for any length of time you choose to accommodate your schedule.

We appreciate your consideration.

The Hutchinson Report is one of Southern California's most popular, listened to news and public affairs talk shows on public radio in Southern California. The show is streamed worldwide on ktym.com and kpfk.org and internet TV simulcast on Hutchinsonreport.tv.

We will follow-up by phone within 24 hours to determine your availability.

Thank you
Angela

Angela Hoffman- Program Producer
"The Hutchinson Report"
KPFK 90.7 FM Los Angeles
323.630.2649 Direct

(b)(6)
http://thehutchinsonreportnews.com

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Streamed on http://www.kpfk.org/programs/181-hutchinson-report.html
http://twitter.com/earlhutchinson
View Hutchinson Report TV
on ustream.tv

"Never mistake activity for achievement"

-Coach John Wooden

Sosa, Belkys

From: Sosa, Belkys
Sent: Wednesday, March 16, 2011 2:40 PM
To: Baggett, Steven
Subject: RE: Query: Plant Tour with Senator Feinstein- interested?

I'm planning to go.

-----Original Message-----
From: Baggett, Steven
Sent: Wednesday, March 16, 2011 2:30 PM
To: Sosa, Belkys
Subject: Re: Query: Plant Tour with Senator Feinstein- interested?

Belkys

Are you going with GA or will Mike or Roger?

Steve

----- Original Message -----
From: Sosa, Belkys
To: Apostolakis, George; Davis, Roger; Baggett, Steven; Snodderly, Michael; Blake, Kathleen
Sent: Wed Mar 16 10:58:06 2011
Subject: RE: Query: Plant Tour with Senator Feinstein- interested?

t one point, the senator hoped both CA plants, but she seems focused on Diablo at this point. Amy (OCA) ans to talk with her staff in between Hill events today to get more info, timing, and other details.

Thanks,
Belkys

-----Original Message-----
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Subject: Re: Query: Plant Tour with Senator Feinstein- interested?

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George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

----- Original Message -----
From: Davis, Roger
To: Sosa, Belkys; Apostolakis, George; Baggett, Steven; Snodderly, Michael; Blake, Kathleen
Sent: Tue Mar 15 23:22:45 2011
Subject: Re: Query: Plant Tour with Senator Feinstein- interested?

(b)(5)

(b)(5)

--- Original Message -----
From: Sosa, Belkys
To: Apostolakis, George; Baggett, Steven; Snodderly, Michael; Blake, Kathleen; Davis, Roger
Sent: Tue Mar 15 20:36:09 2011
Subject: Query: Plant Tour with Senator Feinstein- interested?

Cmr, the Chairman would like to know if you would like to accompany Senator Feinstein in a tour of Diablo Canyon or Dresden on Tuesday morning?
She is a member of the Senate Appropriations committee and Chairs the Energy and Water subcommittee.
Please advice?
They want confirmation tonight.
My recommendation is yes!
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

~~NOT FOR PUBLIC DISCLOSURE~~

Sosa, Belkys

From: Sosa, Belkys
Sent: Wednesday, March 16, 2011 2:42 PM
To: Brenner, Eliot
Subject: FYI: BBC Radio- London

Importance: High

Eliot, more requests for interviews. Thanks, - belkys

From: Apostolakis, George
Sent: Wednesday, March 16, 2011 2:29 PM
To: Blake, Kathleen; Sosa, Belkys
Subject: Fw: BBC Radio- London
Importance: High

Standard reply.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

~~NOT FOR PUBLIC DISCLOSURE~~

From: Tamsin Barber <Tamsin.Barber@bbc.co.uk>
To: apostola@mit.edu <apostola@mit.edu>
Sent: Wed Mar 16 12:20:48 2011
Subject: BBC Radio- London

Dear Professor Apostolakis,
I am working for BBC Radio 4 in London on the weekly science programme Material World. For this week's programme, we are focussing on the earthquake/Tsunami in Japan and the potential risks from the nuclear plant. In particular, we are interested in looking at the design and safety precautions of building a nuclear power plant in an area where there is seismic activity and Tsunami risk i.e. are there any design implications, general risks, what precautions/risk assessments are taken etc. We would be interested in talking about Japan/US and other countries.

I wondered if I could talk to you about your work in this area via telephone today, with a view to a possible interview for the programme? If we do go ahead with an interview we would be looking to record between 12-1pm (Boston time) tomorrow Thursday 17th March. The interview would be live and would need to be from the nearest radio studio or if this is not possible, via telephone.

However, if this is not an area that you are familiar with, would you be able to recommend someone for us to talk to?
Many thanks and Kind Regards,

Tamsin Barber
Assistant Producer
BBC Science Radio Unit
T 44 207 557 2476

http://www.bbc.co.uk
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Please note that the BBC monitors e-mails sent or received.
Further communication will signify your consent to this.

~~NOT FOR PUBLIC DISCLOSURE~~

Sosa, Belkys

From: Sosa, Belkys
Sent: Wednesday, March 16, 2011 2:43 PM
To: Brenner, Eliot
Subject: FYI: ΠΡΟΣΚΛΗΣΗ ΓΙΑ ΤΗΛΕΦΩΝΙΚΗ ΣΥΝΕΝΤΕΥΞΗ ΕΤ-3

This one is literally in Greek. Thanks - Belkys

From: Apostolakis, George
Sent: Wednesday, March 16, 2011 2:28 PM
To: Blake, Kathleen; Sosa, Belkys
Subject: Fw: ΠΡΟΣΚΛΗΣΗ ΓΙΑ ΤΗΛΕΦΩΝΙΚΗ ΣΥΝΕΝΤΕΥΞΗ ΕΤ-3

Please send the standard reply.

~~NOT FOR PUBLIC DISCLOSURE~~

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Panajotis Kostas (b)(6)
To: apostola@mit.edu <apostola@mit.edu>
Sent: Wed Mar 16 12:24:42 2011
Subject: ΠΡΟΣΚΛΗΣΗ ΓΙΑ ΤΗΛΕΦΩΝΙΚΗ ΣΥΝΕΝΤΕΥΞΗ ΕΤ-3

Επιθυμούμε να συνομιλήσουμε μαζί σας στο κεντρικό δελτίο ειδήσεων του σταθμού μας στις 22.00 (ώρα Ελλάδος) για τα πυρηνικά εργοστάσια της Ιαπωνίας και την επιστημονική προσέγγιση. Τηλέφωνο (b)(6) (b)(6) (Δημήτρης Ντόζης - Διευθυντής ειδήσεων ΕΤ-3)

Σας ευχαριστούμε.

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Sosa, Belkys
Sent: Wednesday, March 16, 2011 2:46 PM
To: Brenner, Eliot
Subject: FW: INQUIRY ERT TV GREECE- (MANOLIS)

This one has a family plead...

From: Apostolakis, George
Sent: Wednesday, March 16, 2011 2:24 PM
To: Blake, Kathleen; Sosa, Belkys
Subject: Re: INQUIRY ERT TV GREECE- (MANOLIS)

Belkys: The standard reply should be sent to this guy also. Perhaps you may add that I regret I cannot speak with him. GA

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Blake, Kathleen
To: Apostolakis, George; Sosa, Belkys
Sent: Wed Mar 16 13:31:45 2011
Subject: FW: INQUIRY ERT TV GREECE- (MANOLIS)

Belkys – since this guy knows GA's cousin, should he reply with our standard line or shall I? kb

Commissioner Apostolakis will not comment on the status of another country's nuclear power plants. Please check the NRC web site for the latest information on NRC actins. http://www.nrc.gov/

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

NOT FOR PUBLIC DISCLOSURE

From: CMRAPOSTOLAKIS Resource
Sent: Wednesday, March 16, 2011 1:27 PM
To: Blake, Kathleen
Subject: FW: INQUIRY ERT TV GREECE- (MANOLIS)

From: Theofanis Papathanasiou [mailto (b)(6)
Sent: Wednesday, March 16, 2011 11:20 AM
To: CMRAPOSTOLAKIS Resource
Subject: INQUIRY ERT TV GREECE- (MANOLIS)

Hello Dr. Apostolaki:

My apologies for this message out of the blue. I happen to be a good friend and colleague in ERT with your cousin Manolis Tsakiris. He has contacted you as well for this. Please allow me to introduce myself. My name is Fanis Papathanasiou and I am anchor and international correspondent working for ERT (Greek Public Television) in Athens. .

I am wondering if you are available for a live short interview from DC in our main newscast at 9 o clock (local time) about the situation in Japan. We can provide you with topics -questions.

Thank for your attention to this request.

Fanis Papathanasiou
ERT TV anchor / senior international correspondent
News Department
Mesogion AVE 432,
Agia Paraskevi, 15342 Athens
Mob (b)(6)

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Sosa, Belkys
Sent: Wednesday, March 16, 2011 2:45 PM
To: Apostolakis, George; Blake, Kathleen
Subject: RE: INQUIRY ERT TV GREECE- (MANOLIS)

Will do. Please note that I'm also forwarding all this inquiries to OPA for their action. Thanks, - Belkys

From: Apostolakis, George
Sent: Wednesday, March 16, 2011 2:24 PM
To: Blake, Kathleen; Sosa, Belkys
Subject: Re: INQUIRY ERT TV GREECE- (MANOLIS)

Belkys: The standard reply should be sent to this guy also. Perhaps you may add that I regret I cannot speak with him. GA

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Blake, Kathleen
To: Apostolakis, George; Sosa, Belkys
Sent: Wed Mar 16 13:31:45 2011
Subject: FW: INQUIRY ERT TV GREECE- (MANOLIS)

Belkys – since this guy knows GA's cousin, should he reply with our standard line or shall I? kb

Commissioner Apostolakis will not comment on the status of another country's nuclear power plants. Please check the NRC web site for the latest information on NRC actins. http://www.nrc.gov/

Kathleen M. Blake
Administrative Assistant
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11555 Rockville Pike
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301-415-1810

NOT FOR PUBLIC DISCLOSURE

From: CMRAPOSTOLAKIS Resource
Sent: Wednesday, March 16, 2011 1:27 PM
To: Blake, Kathleen
Subject: FW: INQUIRY ERT TV GREECE- (MANOLIS)

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Sent: Wednesday, March 16, 2011 11:20 AM
To: CMRAPOSTOLAKIS Resource
Subject: INQUIRY ERT TV GREECE- (MANOLIS)

Hello Dr. Apostolaki:

My apologies for this message out of the blue. I happen to be a good friend and colleague in ERT with your cousin Manolis Tsakiris. He has contacted you as well for this. Please allow me to introduce myself. My name is Fanis Papathanasiou and I am anchor and international correspondent working for ERT (Greek Public Television) in Athens. .

I am wondering if you are available for a live short interview from DC in our main newscast at 9 o clock (local time) about the situation in Japan. We can provide you with topics -questions.

Thank for your attention to this request.

Fanis Papathanasiou
ERT TV anchor / senior international correspondent
News Department
Mesogion AVE 432,
Agia Paraskevi, 15342 Athens
Mob (b)(6)

Sosa, Belkys

From: Blake, Kathleen
Sent: Wednesday, March 16, 2011 2:57 PM
To: (b)(6)
Subject: RE: ΠΡΟΣΚΛΗΣΗ ΓΙΑ ΤΗΛΕΦΩΝΙΚΗ ΣΥΝΕΝΤΕΥΞΗ ET-3

Mr. Kostas:

The Commissioner regrets that he cannot talk to you. He will not comment on the status of another country's nuclear power plants. Please check the NRC web site for the latest information on NRC actions. http://www.nrc.gov/

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Panajotis Kostas (b)(6)
To: apostola@mit.edu <apostola@mit.edu>
Sent: Wed Mar 16 12:24:42 2011
Subject: ΠΡΟΣΚΛΗΣΗ ΓΙΑ ΤΗΛΕΦΩΝΙΚΗ ΣΥΝΕΝΤΕΥΞΗ ET-3

Επιθυμούμε να συνομιλήσουμε μαζί σας στο κεντρικό δελτίο ειδήσεων του σταθμού μας στις 22.00 (ωρα Ελλάδος) για τα πυρηνικά εργοστάσια της Ιαπωνίας και την επιστημονική προσέγγιση. Τηλέφωνο (b)(6) (b)(6) Δημήτρης Ντόζης - Διευθυντής ειδήσεων ET-3)

Σας ευχαριστούμε.

Sosa, Belkys

From: Powell, Amy
Sent: Wednesday, March 16, 2011 3:12 PM
To: Sosa, Belkys
Subject: Re: Any luck?

No - called several times. Will try again after Sen briefing

Amy Powell
Associate Director
Office of Congressional Affairs
U. S. Nuclear Regulatory Commission
Phone: 301-415-1673

Sent from my Blackberry

----- Original Message -----
From: Sosa, Belkys
To: Powell, Amy
Sent: Wed Mar 16 15:10:47 2011
Subject: Re: Any luck?

Amy, do you have any info yet?

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

----- Original Message -----
From: Powell, Amy
To: Sosa, Belkys; Batkin, Joshua
Sent: Wed Mar 16 10:41:56 2011
Subject: Re: Any luck?

At one point, she hoped both CA plants, but seems focused on Diablo at this point.

Amy Powell
Associate Director
Office of Congressional Affairs
U. S. Nuclear Regulatory Commission
Phone: 301-415-1673

Sent from my Blackberry

----- Original Message -----
From: Sosa, Belkys
To: Powell, Amy; Batkin, Joshua
Sent: Wed Mar 16 10:40:12 2011
Subject: RE: Any luck?

Meant either Diablo or one of the other two. Not sure which one she was considering.

-----Original Message-----
From: Powell, Amy
Sent: Wednesday, March 16, 2011 10:36 AM
To: Sosa, Belkys; Batkin, Joshua
Subject: Re: Any luck?

NOT FOR PUBLIC DISCLOSURE

My understanding is just Diablo Canyon, but I plan to talk with her staff in between Hill events today to get more info, timing, and other details.

Amy Powell
Associate Director
Office of Congressional Affairs
U. S. Nuclear Regulatory Commission
Phone: 301-415-1673

Sent from my Blackberry

----- Original Message -----
From: Sosa, Belkys
To: Powell, Amy; Batkin, Joshua
Sent: Wed Mar 16 10:34:24 2011
Subject: RE: Any luck?

Amy, can you confirm which plant the senator will be visiting. Josh mentioned Diablo Canyon and I thought Dresden but maybe he meant San Onofre?

Thanks,
Belkys

-----Original Message-----
From: Powell, Amy
Sent: Tuesday, March 15, 2011 9:28 PM
To: Batkin, Joshua; Sosa, Belkys
Subject: RE: Any luck?

Got it - I'll reach out to Doug tonight.

Thanks Belkys,
Amy

-----Original Message-----
From: Batkin, Joshua
Sent: Tuesday, March 15, 2011 9:11 PM
To: Sosa, Belkys; Powell, Amy
Subject: Re: Any luck?

Awesome! Thanks. Handing you off to Amy to make it happen. Amy, can you please let Doug know tonight its a go? We will have to work his travel schedule around an as yet unscheduled (probably monday) Commission meeting.

Joshua C. Batkin
Chief of Staff
Chairman Gregory B. Jaczko
(301) 415-1820

NOT FOR PUBLIC DISCLOSURE

----- Original Message -----
From: Sosa, Belkys
To: Batkin, Joshua
Sent: Tue Mar 15 21:05:57 2011
Subject: Re: Any luck?

NOT FOR PUBLIC DISCLOSURE

Josh, yes! he is on board. I'll wait to hear all the details sometime tomorrow.
Stay strong and get some zzz.
Thks,

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

----- Original Message -----
From: Batkin, Joshua
To: Sosa, Belkys
Sent: Tue Mar 15 20:46:49 2011
Subject: Re: Any luck?

Thanks

Joshua C. Batkin
Chief of Staff
Chairman Gregory B. Jaczko
(301) 415-1820

----- Original Message -----
From: Sosa, Belkys
To: Batkin, Joshua
Sent: Tue Mar 15 20:45:40 2011
Subject: Re: Any luck?

I haven't heard; but I'm recommending him to say yes. My guess is that he will. He is on board an aircraft carrier or some Navy ship at this time. Will probably contact me after dinner. I'll text you as soon as I here from him.
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

----- Original Message -----
From: Batkin, Joshua
To: Sosa, Belkys
Sent: Tue Mar 15 20:40:21 2011
Subject: Any luck?

We'll make sure he doesn't miss the Commission meeting

Joshua C. Batkin
Chief of Staff
Chairman Gregory B. Jaczko
(301) 415-1820

NOT FOR PUBLIC DISCLOSURE

CARNEGIE ENDOWMENT at

A New Vision for the Global Century

March 16, 2011

Honorable George Apostolakis
Commissioner
U.S. Nuclear Regulatory Commission
Mail Stop O-16G4
Washington, DC
20555-0001

Dear Dr. Apostolakis:

On behalf of the Carnegie Endowment for International Peace, we are pleased to invite you to be a panelist for a session currently titled, **"Implications of Japan's Nuclear Disaster"** at the **Carnegie International Nuclear Policy Conference** taking place on March 28 and 29, 2011. We currently anticipate your panel taking place on from **10:50 am to 12:30 pm** on **Monday, March 28**, but we encourage you to stay for the entire conference to attend other panels and meet other experts and officials.

We envision an informal session, with panelists sitting in easy chairs, and a moderator asking questions pertinent to each panelist, before turning to the audience for questions. Dick Meserve has agreed to be on the panel, as has Mark Hibbs of our staff, and V.S. Arunachalum, the former science advisor to the Prime Minister of India. We are also inviting John Rowe of Exelon Corporation.

This year's conference will spotlight the rising influence of new actors and how best to manage new challenges. Widely considered the premier event in the field, the conference will attract over 700 government officials, policy and technical experts, academics, and journalists from around the world. As such, it is one of the best forums for advancing important perspectives, new ideas and innovative approaches to critical nuclear policy challenges.

We have a stellar roster of plenary and panel speakers addressing topics along four tracks: nonproliferation, disarmament, nuclear energy, and strategic issues. As a speaker, we will waive the conference fee. If you are able to accept this invitation, please contact Kimberly Misher (kmisher@ceip.org; 202.939.2279) as soon as possible. We will then be in touch with you soon about session guidelines and conference logistics.

If you have any additional questions, please do not hesitate to contact us. We look forward to your participation as a speaker at this important event.

Sincerely,

George Perkovich
Director
Nuclear Policy Program

Sosa, Belkys

From: Baggett, Steven
Sent: Thursday, March 17, 2011 3:45 PM
To: Sosa, Belkys; Davis, Roger; Snodderly, Michael
Subject: RE: Given recent event in Japan

Should be an interesting meeting.

A point of interest, the President in is TV address, ongoing, noted that he directed the NRC to do an assessment of the NPP. Not sure what that means, but seems we have some direction.

From: Sosa, Belkys
Sent: Thursday, March 17, 2011 3:39 PM
To: Baggett, Steven; Davis, Roger; Snodderly, Michael
Subject: Re: Given recent event in Japan

Steve, my understanding of the Commission mtng on monday is that the Commission will discuss the staff priority work including scheduled Commission mtng.

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Baggett, Steven
To: Sosa, Belkys; Davis, Roger; Snodderly, Michael
Sent: Thu Mar 17 15:21:09 2011
Subject: Given recent event in Japan

All,

Staff provided an information paper (SECY-11-0032) on its plan to consider cumulative effects of regulation in rulemaking.

(b)(5)

Thanks

Steve

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Blake, Kathleen
Sent: Thursday, March 17, 2011 5:19 PM
To: Sosa, Belkys; Baggett, Steven; Apostolakis, George; Snodderly, Michael; Lui, Christiana; Davis, Roger
Cc: Savoy, Carmel
Subject: FW: INQUIRY ERT TV GREECE- (MANOLIS)

Fyi – kb

How to respond? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear **R**egulatory **C**ommission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Theofanis Papathanasiou (b)(6)
Sent: Thursday, March 17, 2011 4:57 PM
To: Blake, Kathleen
Subject: RE: INQUIRY ERT TV GREECE- (MANOLIS)

Dear Kathleen:

I understand that the Commissioner he cannot talk right now.
If something chances on this please let me know. I would like to come over and have a big story a special report/profile about him.

This of course needs a lot of planning and logistics.

Thanks for your attention to this request.

All the Best,

Fanis Papathanasiou
ERT TV
Greece

NOT FOR PUBLIC DISCLOSURE

--- On **Wed, 3/16/11, Blake, Kathleen** <*Kathleen.Blake@nrc.gov*> wrote:

From: Blake, Kathleen <Kathleen.Blake@nrc.gov>
Subject: RE: INQUIRY ERT TV GREECE- (MANOLIS)
To: (b)(6)

Date: Wednesday, March 16, 2011, 8:54 PM

Mr. Papathanasiou:

The Commissioner regrets that he cannot talk to you. He will not comment on the status of another country's nuclear power plants. Please check the NRC web site for the latest information on NRC actions. http://www.nrc.gov/

Kathleen M. Blake

Administrative Assistant

to Commissioner Apostolakis

U.S. Nuclear Regulatory Commission

11555 Rockville Pike

Rockville, Maryland 20852

301-415-1810

From: Theofanis Papathanasiou [mailto (b)(6)
Sent: Wednesday, March 16, 2011 11:20 AM
To: CMRAPOSTOLAKIS Resource
Subject: INQUIRY ERT TV GREECE- (MANOLIS)

Hello Dr. Apostolaki:

My apologies for this message out of the blue. I happen to be a good friend and colleague in ERT with your cousin (b)(6) He has contacted you as well for this. Please allow me to introduce myself. My name is Fanis Papathanasiou and I am anchor and international correspondent working for ERT (Greek Public Television) in Athens. .

I am wondering if you are available for a live short interview from DC in our main newscast at 9 o clock (local time) about the situation in Japan. We can provide you with topics -questions.

Thank for your attention to this request.

nis Papathanasiou
RT TV anchor / senior international correspondent

News Department
Mesogion AVE 432,
Agia Paraskevi, 15342 Athens
Mobi+(b)(6)

Sosa, Belkys

From: Davis, Roger
Sent: Thursday, March 17, 2011 5:48 PM
To: Sosa, Belkys
Subject: RE: Congressional Correspondence

That's OK. We can talk in the AM. Amy has conveyed limitations on GA's role at Diablo. While I think they constrain his ability to answer questions, it is likely that they will want him in whatever capacity he can appear. Looks as if Feinstein's staff wants to meet him in SF Tuesday morning, fly to Diablo, and then on to SONGs. We may get cut out entirely.

From: Sosa, Belkys
Sent: Thursday, March 17, 2011 5:45 PM
To: Davis, Roger
Subject: Re: Congressional Correspondence

Roger, I just got your message. Please call my bb anytime.
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Davis, Roger
To: Sosa, Belkys
Sent: Thu Mar 17 15:50:22 2011
Subject: RE: Congressional Correspondence

Belkys. Are you planning to return to day. I'd like to chat. Could you call if you are not? Thanks, Roger

From: Sosa, Belkys
Sent: Thursday, March 17, 2011 3:49 PM
To: Davis, Roger; Baggett, Steven; Snodderly, Michael; Collins, Elmo
Subject: Fw: Congressional Correspondence

Fyi

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Champ, Billie
To: Batkin, Joshua; Monninger, John; Sharkey, Jeffry; Sosa, Belkys; Bubar, Patrice; Nieh, Ho
Cc: Vietti-Cook, Annette; Jaegers, Cathy; Clayton, Kathleen; McKelvin, Sheila
Sent: Thu Mar 17 14:40:45 2011
Subject: Congressional Correspondence

I have attached for your information a letter from Senators Boxer and Carper dated March 17, 2011 re: Risks posed to nuclear reactors in the U.S.

Billie A. C-Lopes
March 17, 2011

From: Sosa, Belkys
Sent: Thursday, March 17, 2011 5:44 PM
To: Davis, Roger
Subject: Re: Ltr from Sens Boxer, Feinstein

Let's discuss with GA tomorrow. I think the senator was more interested in Diablo than Songs. I really think GA will have to go there.

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Davis, Roger
To: Sosa, Belkys
Sent: Thu Mar 17 15:58:25 2011
Subject: FW: Ltr from Sens Boxer, Feinstein

Becky Schmidt called earlier to confirm that we understood that she feels the need to have Amy be the third if only 3 can get on the plane. I said I thought we did and were aware that personal staff members would probably miss the San Onofre visit if the Cmr. went there by private plane.

It's nearly four hours to Diablo from LA or SF. Would have to fly there.

Have not heard from Amy yet After the Senators' staffs decide their schedules, I recommend we consider asking Sen. Feinstein's staff if Sen. Feinstein would accept Elmo without you at Diablo, with the understanding that she (and Senator Boxer if she comes) could meet you and the Cmr. at San Onofre. Considerations: Sen. Feinstein was not planning a media event at Diablo; GA has serious constraints at Diablo; they likely cannot accommodate GA personal staff on the trip between sites.

Roger

From: Sosa, Belkys
Sent: Thursday, March 17, 2011 3:16 PM
To: Collins, Elmo; Davis, Roger
Subject: Fw: Ltr from Sens Boxer, Feinstein

Hi Elmo, I hope all is well.
Please note that the trip to Diablo and SONGS will also include Senator Boxer. If you have any information on these plants that can help Cmr Apostolakis prepare for the site visit, we would really appreciate it. I'll send you the details of the Senators agenda ASAP. I'm waiting for OCA to provide.
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Powell, Amy
To: Blake, Kathleen
Cc: Davis, Roger; Sosa, Belkys

Sent: Thu Mar 17 14:04:10 2011
Subject: Ltr from Sens Boxer, Feinstein

~~NOT FOR PUBLIC DISCLOSURE~~

Kathleen,

Here is the letter that I referenced on my call this afternoon with Belkys and Roger.

Amy

Amy Powell
Associate Director
U. S. Nuclear Regulatory Commission
Office of Congressional Affairs
Phone: 301-415-1673

~~NOT FOR PUBLIC DISCLOSURE~~

Sosa, Belkys

From: Blake, Kathleen
Sent: Thursday, March 17, 2011 6:20 PM
To: Powell, Amy; Davis, Roger; Sosa, Belkys
Subject: RE: SONGS only for visit

Amy: here are her numbers. Kb

BB: (b)(6)
Home: (b)(6)

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

-----Original Message-----
From: Powell, Amy
Sent: Thursday, March 17, 2011 6:18 PM
To: Blake, Kathleen; Davis, Roger; Sosa, Belkys
Subject: SONGS only for visit

I am running into a mtg, but wanted to let you know that GEA only needs to be at SONGS. Belkys, is there a number where I cam reach you later?

Amy Powell
Associate Director
Office of Congressional Affairs
U. S. Nuclear Regulatory Commission
Phone: 301-415-1673

Sent from my Blackberry

Sosa, Belkys ~~NOT FOR PUBLIC DISCLOSURE~~

From: Sosa, Belkys
Sent: Thursday, March 17, 2011 6:57 PM
To: Powell, Amy; Blake, Kathleen; Davis, Roger
Subject: Re: SONGS only for visit

Amy you can call my bb anytime.
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

----- Original Message -----
From: Powell, Amy
To: Blake, Kathleen; Davis, Roger; Sosa, Belkys
Sent: Thu Mar 17 18:18:00 2011
Subject: SONGS only for visit

I am running into a mtg, but wanted to let you know that GEA only needs to be at SONGS. Belkys, is there a number where I cam reach you later?

Amy Powell
Associate Director
Office of Congressional Affairs
U. S. Nuclear Regulatory Commission
Phone: 301-415-1673

Sent from my Blackberry

~~NOT FOR PUBLIC DISCLOSURE~~

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Sosa, Belkys
Sent: Thursday, March 17, 2011 3:33 PM
To: Collins, Elmo
Subject: Re: Action: Ltr from Sens Boxer, Feinstein

Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Collins, Elmo
To: Sosa, Belkys
Cc: Virgilio, Martin; Sanfilippo, Nathan; Hay, Michael; Vegel, Anton; Kennedy, Kriss; Miller, Geoffrey; Lantz, Ryan
Sent: Thu Mar 17 15:29:54 2011
Subject: Action: Ltr from Sens Boxer, Feinstein

Thanks

We'll work through EDO to get prep material up

Elmo

From: Sosa, Belkys
To: Collins, Elmo; Davis, Roger
Sent: Thu Mar 17 15:15:54 2011
Subject: Fw: Ltr from Sens Boxer, Feinstein

Hi Elmo, I hope all is well.
Please note that the trip to Diablo and SONGS will also include Senator Boxer. If you have any information on these plants that can help Cmr Apostolakis prepare for the site visit, we would really appreciate it. I'll send you the details of the Senators agenda ASAP. I'm waiting for OCA to provide.
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Powell, Amy
To: Blake, Kathleen
Cc: Davis, Roger; Sosa, Belkys
Sent: Thu Mar 17 14:04:10 2011
Subject: Ltr from Sens Boxer, Feinstein

Kathleen,

Here is the letter that I referenced on my call this afternoon with Belkys and Roger.

Amy

NOT FOR PUBLIC DISCLOSURE

Amy Powell
Associate Director
U. S. Nuclear Regulatory Commission
Office of Congressional Affairs
Phone: 301-415-1673

Sosa, Belkys

From: Davis, Roger
Sent: Thursday, March 17, 2011 8:57 AM
To: Sosa, Belkys
Subject: RE: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)
Attachments: image001.gif; image002.png

I suppose one could repeat the Q&A's of the commission and prepare with the staff to speak and it might serve the Commission's interests but frankly I would check with the Chairman before accepting at a time like this, theoretically an emergency involving citizens in Japan at least. Negatives – this is almost last minute, with little time to prepare, and it does not seem like the right time or a Commissioner to get in the forefront on issues regarding an emergency unless the Chairman/agency desires it. In addition, controversy may develop about current agency views/differences with Japanese authorities.

From: Sosa, Belkys
Sent: Wednesday, March 16, 2011 6:12 PM
To: Davis, Roger
Subject: Fw: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

What do u think?

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Apostolakis, George
To: Sosa, Belkys
Sent: Wed Mar 16 17:09:47 2011
Subject: Fw: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

Could the staff or OPA help me prepare for this?

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Apostolakis, George
To: Blake, Kathleen; Sosa, Belkys
Sent: Wed Mar 16 15:59:32 2011
Subject: Re: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

We'll discuss tomorrow.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Blake, Kathleen
To: Sosa, Belkys; Apostolakis, George
Sent: Wed Mar 16 15:54:03 2011
Subject: FW: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

NOT FOR PUBLIC DISCLOSURE

Interested? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: CMRAPOSTOLAKIS Resource
Sent: Wednesday, March 16, 2011 3:32 PM
To: Blake, Kathleen
Subject: FW: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

NOT FOR PUBLIC DISCLOSURE

From: Kimberly Misher [mailto:KMisher@ceip.microsoftonline.com]
Sent: Wednesday, March 16, 2011 3:12 PM
To: CMRAPOSTOLAKIS Resource
Cc: (b)(6)
Subject: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

Sent on behalf of Eli Levite:

Dear George,

Long time since last in touch, I hope you are well.
We are adjusting our conference agenda to accommodate post-Japan outlook and would be truly thrilled if you could accommodate this short notice invite. Any chance? Dick Meserve also accepted today.

Eli



March 16, 2011

Honorable George Apostolakis
Commissioner

U.S. Nuclear Regulatory Commission
Mail Stop O-16G4
Washington, DC
20555-0001

Dear Dr. Apostolakis:

On behalf of the Carnegie Endowment for International Peace, we are pleased to invite you to be a panelist for a session currently titled, **"Implications of Japan's Nuclear Disaster"** at the **Carnegie International Nuclear Policy Conference** taking place on March 28 and 29, 2011. We currently anticipate your panel taking place on from **10:50 am to 12:30 pm** on **Monday, March 28**, but we encourage you to stay for the entire conference to attend other panels and meet other experts and officials.

We envision an informal session, with panelists sitting in easy chairs, and a moderator asking questions pertinent to each panelist, before turning to the audience for questions. Dick Meserve has agreed to be on the panel, as has Mark Hibbs of our staff, and V.S. Arunachalum, the former science advisor to the Prime Minister of India. We are also inviting John Rowe of Exelon Corporation.

This year's conference will spotlight the rising influence of new actors and how best to manage new challenges. Widely considered the premier event in the field, the conference will attract over 700 government officials, policy and technical experts, academics, and journalists from around the world. As such, it is one of the best forums for advancing important perspectives, new ideas and innovative approaches to critical nuclear policy challenges.

We have a stellar roster of plenary and panel speakers addressing topics along four tracks: nonproliferation, disarmament, nuclear energy, and strategic issues. As a speaker, we will waive the conference fee. If you are able to accept this invitation, please contact Kimberly Misher (kmisher@ceip.org; 202.939.2279) as soon as possible. We will then be in touch with you soon about session guidelines and conference logistics.

If you have any additional questions, please do not hesitate to contact us. We look forward to your participation as a speaker at this important event.

Sincerely,

George Perkovich
Director
Nuclear Policy Program

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Blake, Kathleen
Sent: Thursday, March 17, 2011 10:58 AM
To: Apostolakis, George; Sosa, Belkys
Subject: FW: GE

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: CMRAPOSTOLAKIS Resource
Sent: Thursday, March 17, 2011 8:23 AM
To: Blake, Kathleen
Subject: FW: GE

NOT FOR PUBLIC DISCLOSURE

From: (b)(6)
Sent: Thursday, March 17, 2011 8:11 AM
To: CMRAPOSTOLAKIS Resource
Subject: GE

Dear George

We the American people are deeply concerned that NRC is doing nothing to decommission GE and Toshiba-designed boiling water reactors like the ones failed or failing at Japan's Fukushima and Tokai complexes. All 13 emergency diesel generators (EDG) failed, and not because of the quake or tsunami but the crankshafts just failed. This was known way back in 1976 when 3 engineers quit GE after they blew the whistle on GE's Mark 1 reactor. The 1988 racketeering case about Shoreham plant in NY revealed that EDG tests were faked to pass seismic qualification. We know that Japan is at level 6 out of 7 now and 200,000 people have been evacuated from the contaminated nuclear sites with "partial" meltdowns. Systemic failure, where rods are overheating – Units 1, 3 and 4 at Fukushima exploded, sending up radioactive plumes – and malfunctioning coolants and EDG are reported all over the Japanese nuclear network. Scariest of all is that Japan's nuclear safety agency, with its long record of mendacity, is saying its reactors are under control.

The struggle to cool the reactors isn't the only problem as there is far greater danger of widespread radioactivity from an inability to cool Fukushima's spent fuel pools. These spent fuel pools hold far more radioactivity than the reactor core, and placing them on top the reactor

is another bad design which is as dangerous as putting a gasoline tank above the engine. There are reports of escaping cesium-137, a deadly isotope that gives off highly penetrating radiation and is absorbed in the food chain. While Japan insists that radiation released into the air at Fukushima would not be harmful, a number of Japanese workers have been hurt by radiation, and US sailors on their way to a rescue mission have been contaminated. We urge NRC to be truthful to the American people and not be like Japan, and learn their lesson that serving powerful companies at the expense of public safety and public benefit could be a capital crime of mass murder.

We urge NRC to demand full safety, EDG and 9.0 quake stress tests for all major 3rd generation reactors including GE Hitachi, Areva EPR, Mitsubishi, and Toshiba (Westinghouse AP-1000). Germany has shut down 7 out of 17 aged nuclear plants, and NRC must do the same in America. China has suspended the approval process for nuclear power stations so that safety standards can be revised, and we urge NRC to do likewise. NRC must require relevant departments to do **safety checks at existing plants, especially EDG stressed tested to the max** until they fail. Safety is our top priority in developing nuclear power plants, and we call for a **comprehensive safety check and enhanced management over existing plants**. All plants with fuel pools on top must be closed to prevent pool fire, and spent fuel must be shipped elsewhere. Before the revised safety standards are approved, all new nuclear power plants, including pre-construction, must be suspended. We also urge NRC to step up monitoring of radioactive substances and issue alerts timely with results on NRC website every day. We the people know more than the politicians many of which are corrupted by special interests and demand that you listen to us and not them, because our lives are at stake and **this is what democracy is all about**.

Thirty million Californians live between two nuclear stations, San Onofre down near San Diego and Diablo Canyon up by central California's San Luis Obispo. The operators insist "there is no immediate threat to the state" but the fact is **no mass evacuation is possible in a meltdown or fuel pool fire in California.** The fact that they don't even give us free iodine tablets showed that they and NRC don't really care about us. The operator of Diablo Canyon is Pacific Gas & Electric, the company sued by the small town of Hinkley after it allowed poisonous hexavalent chromium to leach into their groundwater and lied about it, as immortalized in the film Erin Brockovich. The Diablo reactor is built smack in the middle of four earthquake faults in a built-up suburbanized area. San Onofre has tallied ten times the number of safety complaints by workers who are afraid to speak out fearing retaliation. For good measure, San Onofre is sited between both offshore and inland San Andreas active seismic faults. Its nearest city San Diego has suffered 50% more earthquake activity since 1984.

We Americans have a virile tradition of whistleblowers, nuclear and otherwise, although Obama has declared war on leakers who expose government scandals. He won't succeed because **truth will always prevails** and because of Wikileaks, the internet, and Facebook so we demand that the NRC start regulating GE, Toshiba and the big boys and serve the people and not be beholden to the industry it is supposed to regulate. The poor Japanese have no such legacy, which is why they're in such a pickle. Japanese salarymen used to working for one

company their entire lives keep their mouths shut. They must have known what we know now, that Fukushima's operator, Tokyo Electric Power (Tepco), never tested EDG or safety for a quake-and-tsunami anywhere near the 9.0 that has devastated Japan. Tepco is the shogun of electricity and their nuclear watchdog looked the other way. The result is full-scale panic, because now they don't know what to do or how to do it. **NRC must not allow any Tepco in America, and must hold every manufacturer, contractor and operator to account.**

So there goes the nuclear renaissance trumpeted by Obama in his state of the union. To tamp down global warming and solve our energy needs, he boasted, "It means building a new generation of safe, clean nuclear power plants in this country." He aimed to give $36 billion to the nuclear power industry and a $4 billion loan guarantee for two new reactors on the Texan Gulf Coast to be built by Tepco, assisted by the same American company Stone &Webster now a nuclear unit of Shaw Construction that made false safety reports at New York's Shoreham nuclear plant. The liability for Tepco and Houston Power is capped at only $75 million, which is an insult to the people, because it must be at least $1 billion in the event of a megaquake and tsunami. The cost to generate nuclear power in Texas is twice that of wind power, so this project is uneconomical and will stick it to the taxpayers and the ratepayers. **Hello NRC, whose interests do you serve, the people or the industry?** The Gulf Coast has suffered enough from Katrina and BP, so we demand that you cancel the Texas deal and monitor all safety and EDG tests and not rely on contractors who will fake safety reports to save billions. We demand that you fulfill your oaths of office and **cancel all uneconomical deals that do not benefit taxpayers or ratepayers because projects must serve the people and not the industry.**

China is strong because its leaders heed the voices of their people and serve them, rooting out corruption, waste, fraud and special interests. Of the 104 old, fault-ridden, leaky, rickety nuclear power stations in the US, 23 are of a similar GE or Toshiba design that has failed catastrophically in Japan. If a reactor goes China Syndrome and melts all the way down as occurred at Chernobyl which made a huge area uninhabitable and caused hundreds of thousands of deaths, its radioactivity will contain 1,000 times as much as the Hiroshima bomb. We demand that NRC decommission all 23 such reactors and stop serving the industry or kowtow to its powerful lobby. We the people are your true masters, and we demand that you serve General People and not General Electric while you are still in office by heeding our voices and cater to our safety. We demand that you provide free potassium iodine 130mg tablets to residents of Southern California and other locations and fulfill your role as watchdog and make real enemies of the industry with the power to regulate and punish, and not be its lapdog as we the people know whassup and will hold all of you accountable.

We The People
Eddy Nguyen
Titan Capital

Apostolakis, George

om: Dennis Bley (b)(6)
nt: Thursday, March 17, 2011 11:14 AM
: George Apostolakis; John Stetkar
Subject: PRA and Japan

By about the second day of this event, I began thinking about how differently the situation might have progressed, before the advent of PRA. By later in the week, I began to wonder how differently it might have progressed had there been full-scope Level 3 PRAs including uncertainty and a thorough treatment of external events for every reactor.

While the opponents of PRA like to think that we are better off with fixed, inviolable rules for design and operations*, most may not realize that many of the almost rote responses to the events were developed to deal with insights from PRA. PWR PRAs routinely showed factors of 10 or more lower frequencies for LERF events (and the associated chance for early fatalities) compared to core damage events. So the containment was worth at least a factor of 10 on the health effects risk. It was quite a surprise when some BWR PRAs began to show almost no value for the BWR containment, i.e., LERF was only a little less likely than core damage. High pressures in containment were defeating cooling leading to both core damage and early release. (I don't remember the exact scenarios; perhaps you do. We could look them up.) In response to these results, the possibility of venting the containment was examined and that analysis led to the development of procedures for carrying this out. In Japan, this was done expeditiously. The resulting explosions might have been anticipated, and they proved a could trade-off. Without the knowledge of beyond-design-basis events gained through PRA, the reactors are likely to have melted down early on, with already open containments.

orough external events analyses for the plant in questions would have certainly included e risks of tsunamis, given the history of such events in Japan. It is hard to believe that a tsunami analysis, going beyond the design basis (which is what PRA implies) would not have discovered the sensitivity of the above-ground diesel fuel oil tanks, as well as any potential electrical effects of salt water flooding. If this had been considered as thoroughly as the possible need to vent containment, the reactor scenarios might have followed a much simpler and successful scenario. We might be talking about when the reactors could be restarted and supplying essential power to the devastated region. We would likely have also not seen the deterioration of SFP cooling and then level.

Full-scope PRA should include the SFPs, although not everyone in the U.S. agrees. Such an analysis would have demonstrated the long time available to restore cooling or make-up to the pools and would have made clear the necessary make-up, which in analyses we did years ago is quite easy to achieve--something on the order of 50-75 gpm. Although we do not have sufficient fact to prove it, this would appear to be the only human "error" thus far during the accident. It seems likely that they forgot to monitor the levels, while they were working so hard to save the reactors. I have not looked at our SMGs, but I hope that they include a warning to monitor the SFP temperature and level.

I have not thought much about this, but there must be other areas where PRA has helped the plants survive as long as they have. Of course, the symptom-bassed EOPs were developed using PRA-based prioritization schemes.

Finally I note that, if the workers, who are now beginning to accumulate significant, but not deadly, doses had been working in a shoe factory, for example, they would be dead and the ifinite half-life) noxious chemicals used for tanning the leather would be scattered among e debris or washed out to sea. I'd take my chances with an emergency dose of gammas.

NOT FOR PUBLIC DISCLOSURE

*I am incredulous that they really seem not to recognize that those rules can only be applied to a subset of the possible scenarios that could occur.

nnis

.s. Sometime along the line, we ought to get such ideas on the table. They need to be worked out more carefully. I am not sure who else to bring into such conversations at this time.

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

om: Apostolakis, George
nt: Thursday, March 17, 2011 11:15 AM
: Blake, Kathleen
Subject: RE: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

Let's wait until Belkys comes back.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Blake, Kathleen
Sent: Thursday, March 17, 2011 11:13 AM
To: Apostolakis, George; Baggett, Steven; Davis, Roger; Snodderly, Michael; Sosa, Belkys
Subject: RE: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

May I reply "yes" then? kb

thleen M. Blake
dministrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Apostolakis, George
Sent: Thursday, March 17, 2011 11:05 AM
To: Baggett, Steven; Blake, Kathleen; Davis, Roger; Snodderly, Michael; Sosa, Belkys
Subject: FW: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

From: Jaczko, Gregory
Sent: Thursday, March 17, 2011 11:03 AM
To: Apostolakis, George
Subject: Re: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

sure

---

m: Apostolakis, George
: Jaczko, Gregory
Sent: Thu Mar 17 11:01:06 2011

Subject: FW: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

Greg:

Do you think I should participate in this panel discussion? If I did, I would not be speaking on behalf of the NRC.

George

From: Ariel Levite [mailto (b)(6)
Sent: Wednesday, March 16, 2011 12:07 PM
To: George E. Apostolakis
Subject: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

Dear George,
Long time since last in touch, I hope you are well.
We are adjusting our conference agenda to accomodate post Japan outlook and would be truly thrilled if you could accommodate this short notice invite. Any chance? Dick Meserve also accepted today.

Eli
Sent from my IPhone, apologies for brevity and style

March 16,

George Apostolakis
Professor of Nuclear Science and Engineering

Department of Nuclear Science and Engineering

Massachusetts Institute of Technology

77 Massachusetts Ave, 24-221

Cambridge, MA 02139-4307

Dear Dr. Apostolakis:

On behalf of the Carnegie Endowment for International Peace, we are pleased to invite you to be a panelist fc session currently titled, **"Implications of Japan's Nuclear Disaster"** at the **Carnegie International Nuclea Policy Conference** taking place on March 28 and 29, 2011. We currently anticipate your panel taking place from **10:50 am to 12:30 pm** on **Monday, March 28**, but we encourage you to stay for the entire conference attend other panels and meet other experts and officials.

We envision an informal session, with panelists sitting in easy chairs, and a moderator asking questions pertii to each panelist, before turning to the audience for questions. Dick Meserve has agreed to be on the panel, as Mark Hibbs of our staff, and V.S. Arunachalum, the former science advisor to the Prime Minister of India. V are also inviting John Rowe of Exelon Corporation.

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We have a stellar roster of plenary and panel speakers addressing topics along four tracks: nonproliferation, disarmament, nuclear energy, and strategic issues. As a speaker, we will waive the conference fee. If you are to accept this invitation, please contact Kimberly Misher (kmisher@ceip.org; 202.939.2279) as soon as possi We will then be in touch with you soon about session guidelines and conference logistics.

If you have any additional questions, please do not hesitate to contact us. We look forward to your participati as a speaker at this important event.

Sincerely,



George Perkovich

Director

Nuclear Policy Program

Kimberly Misher
Program Manager
Nuclear Policy Program
Carnegie Endowment for International Peace
1779 Massachusetts Ave, NW
Washington, DC 20036

+1 202.939.2279 (office)
+1 202.483.4462 (fax)
kmisher@carnegieendowment.org
http://www.carnegieendowment.org/npp

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Apostolakis, George

m: Kimberly Misher [KMisher@ceip.microsoftonline.com]
t: Thursday, March 17, 2011 12:35 PM
o: Blake, Kathleen
Cc: Apostolakis, George; Sosa, Belkys
Subject: RE: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)
Attachments: image001.gif; image002.png

Dear Ms. Blake,

This is great news! I am running to a meeting, but will be in touch later today with logistics.

Best,

Kim

Kimberly Misher
Program Manager
Nuclear Policy Program
Carnegie Endowment for International Peace
1779 Massachusetts Ave, NW
Washington, DC 20036

202.939.2279 (office)
202.483.4462 (fax)
sher@carnegieendowment.org
p://www.carnegieendowment.org/npp

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From: Blake, Kathleen [mailto:Kathleen.Blake@nrc.gov]
Sent: Thursday, March 17, 2011 11:54 AM
To: Kimberly Misher
Cc: Apostolakis, George; Sosa, Belkys
Subject: RE: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

Kimberly:

Commissioner Apostolakis is pleased to accept your kind invitation to participate in the "Implications of Japan's Nuclear Disaster" panel at the Carnegie International Nuclear Policy Conference on Monday, March 28th at 10:50 a.m.

Kathleen M. Blake
ninistrative Assistant
ommissioner Apostolakis
.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852

301-415-1810

From: Kimberly Misher [mailto:KMisher@ceip.microsoftonline.com]
Sent: Wednesday, March 16, 2011 3:12 PM
To: CMRAPOSTOLAKIS Resource
Cc: (b)(6)
Subject: SPEAKER INVITATION: 2011 Carnegie International Nuclear Policy Conference (March 28-29, Washington, DC)

Sent on behalf of Eli Levite:

Dear George,

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Eli

2011 CARNEGIE INTERNATIONAL NUCLEAR POLICY CONFERENCE

March 16, 2011

Honorable George Apostolakis
Commissioner
U.S. Nuclear Regulatory Commission
Mail Stop O-16G4
Washington, DC
20555-0001

Dear Dr. Apostolakis:

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perspectives, new ideas and innovative approaches to critical nuclear policy challenges.

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If you have any additional questions, please do not hesitate to contact us. We look forward to your participation as a speaker at this important event.

Sincerely,

George Perkovich
Director
Nuclear Policy Program

n: Toula Balanis (b)(6)
Friday, March 18, 2011 2:13 AM
Apostolakis, George
Subject: Re: More on Japan

George
Thank you very much for your response. (b)(6)
(b)(6)

Toula

Sent from my Verizon Wireless BlackBerry

From: "Apostolakis, George" <George.Apostolakis@nrc.gov>
Date: Thu, 17 Mar 2011 16:30:36 -0400
To: Toula Balanis
(b)(6)
Subject: More on Japan

The NRC has announced that, if the Fukushima events were occurring in the US, we would be ordering evacuation to a ... of 50 miles from the plant. The Japanese authorities have not done that. I think they have ordered evacuation ... radius of about 12 miles and advised people within 19 miles to stay at home.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Powell, Amy
Sent: Friday, March 18, 2011 9:34 AM
To: Sosa, Belkys; Davis, Roger; Apostolakis, George
Subject: RE: SONGS Tour for California senators - Tues March 22

There may be some small tweaks, but you can using for travel planning purposes. Sen. Feinstein's scheduler is calling me this morning with the final.

From: Sosa, Belkys
Sent: Friday, March 18, 2011 9:17 AM
To: Davis, Roger; Apostolakis, George; Powell, Amy
Subject: FW: SONGS Tour for California senators - Tues March 22

Amy, is this agenda firm?

From: Snodderly, Michael
Sent: Friday, March 18, 2011 8:45 AM
To: Merzke, Daniel
Cc: Sosa, Belkys; Blake, Kathleen
Subject: RE: SONGS Tour for California senators - Tues March 22

I believe it is but I will confirm with the Chief of Staff.

From: Merzke, Daniel
Sent: Friday, March 18, 2011 7:20 AM
To: Snodderly, Michael
Subject: FW: SONGS Tour for California senators - Tues March 22

Mike, do you know if this agenda proposed below to meet with Senators Boxer and Feinstein at SONGS is finalized? Thanks.

Dan

From: Hall, Randy
Sent: Thursday, March 17, 2011 2:32 PM
To: Andersen, James
Cc: Merzke, Daniel
Subject: FW: SONGS Tour for California senators - Tues March 22

Jim,

Just received this info from OCA, but we're not sure if this is just proposed, or already agreed to by Comm. Apostolakis. Do you have any updated info?

Thanks,

Randy Hall, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

NOT FOR PUBLIC DISCLOSURE

USNRC
(301) 415-4032
Randy.Hall@nrc.gov

NOT FOR PUBLIC DISCLOSURE

From: Weil, Jenny
Sent: Thursday, March 17, 2011 1:06 PM
To: Schmidt, Rebecca; Powell, Amy; Hall, Randy; Lantz, Ryan; Uselding, Lara
Subject: Fw: SONGS Tour for California senators

This is the current schedule proposed by Feinstein/Boxer's staff, though they might try to see if Senators' schedule allow for more than an hour at the plant, per SCE's request.

Sent via BlackBerry
Jenny Weil
Congressional Affairs Officer
U.S. Nuclear Regulatory Commission
(b)(6)

From: Field, Katherine (Feinstein) <Katherine_Field@feinstein.senate.gov>
To: Weil, Jenny; Kathy.Yhip@sce.com <Kathy.Yhip@sce.com>
Cc: Bohigian, Tom (Boxer) <Tom_Bohigian@boxer.senate.gov>; Kaneko, Nicole (Boxer) <Nicole_Kaneko@boxer.senate.gov>; Kalligeros, Maria (Boxer) <Maria_Kalligeros@boxer.senate.gov>; Nelson, Matthew (Feinstein) <Matthew_Nelson@feinstein.senate.gov>; Clapp, Doug (Appropriations) <Doug_Clapp@appro.senate.gov>
Sent: Thu Mar 17 12:38:25 2011
Subject: SONGS Tour

Hi Kathy, Jenny,

Both Senator Feinstein and Senator Boxer are scheduled to tour SONGS at 1:30pm on Tuesday, March 22nd. This is the schedule I put together after advancing the site with Kathy on Tuesday. I have included Senator Boxer's staff on this email as well. Can you please advise us on the schedule, logistics and security required for the visit?

SONGS Tour

1:30pm

- From the gate , car tour to over look of the Power Plant.
  - The View will be of the Reactors, Holding Pools and sea wall

  This will take 15 minutes.
- Then proceed to the actual power plant where the reactors are.
  Security, sign in and base line radiation will be taken at this time. This should take 15 min.

1:45 pm

- Tour the facility

2:00 pm

- **Meeting with below, in conference room**

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

- US Senator Dianne Feinstein
- US Senator Barbara Boxer
- George Apostolakis, Commissioner, U.S. Nuclear Regulatory Commission
- Elmo Collins, Jr., Regional Administrator, U.S. Nuclear Regulatory Commission
- David Applegate, Senior Science Advisor for Earthquake & Geologic Hazards, U.S. Geologic Survey
- Pete Dietrich, Senior Vice President and Chief Nuclear Officer, Southern California Edison

2:30 pm **Depart for San Diego**

Thank you!

Katherine Field
U.S. Senator Dianne Feinstein
750 B Street, Suite 1030
San Diego, California 92101
(p) 619-231-9712 (f) 619-231-1108

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys NOT FOR PUBLIC DISCLOSURE

From: Apostolakis, George
Sent: Friday, March 18, 2011 11:19 AM
To: Sosa, Belkys; Snodderly, Michael
Subject: FW: Visit to SONGS

Need?

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810 NOT FOR PUBLIC DISCLOSURE

-----Original Message-----
From: Pete.Dietrich@sce.com [mailto:Pete.Dietrich@sce.com]
Sent: Friday, March 18, 2011 12:25 AM
To: Apostolakis, George
Cc: Rich.Stonge@sce.com; John Conway
Subject: Visit to SONGS

Commissioner,

I understand you may be traveling to visit San Onofre and Diablo Canyon next week with members of Congress. We look forward to your visit. If there is any information we can provide in advance to support your visit preparation please let me know.

Pete Dietrich
M (b)(6)

Sosa, Belkys

From: Sosa, Belkys
Sent: Friday, March 18, 2011 11:46 AM
To: Hay, Michael
Subject: RE: Query: Ltr from Sens Boxer, Feinstein

Hi Mike, we believe that the senators will be asking those types of questions during the visit. We would really appreciate any information you can provide to be able to address the questions at a high level. No need to include the responses in the briefing package. An attachment to an email sent anytime before Monday will do.

Thanks,
belkys

From: Hay, Michael
Sent: Friday, March 18, 2011 11:40 AM
To: Sosa, Belkys
Subject: RE: Query: Ltr from Sens Boxer, Feinstein

Belkys,
I'm working on the briefing package, we plan to have the material sent out later this afternoon. Responses to the specific questions from the Senators may not be ready today.

From: Sosa, Belkys
Sent: Friday, March 18, 2011 10:37 AM
To: Collins, Elmo
Cc: Virgilio, Martin; Sanfilippo, Nathan; Hay, Michael; Vegel, Anton; Kennedy, Kriss; Miller, Geoffrey; Lantz, Ryan; Leggett, Steven; Snodderly, Michael
Subject: Query: Ltr from Sens Boxer, Feinstein

Elmo,
I just wanted to confirm that the prep material will include responses to the specific questions on the subject letter and the background info on SONGS. Feel free to email to the material to both Commissioner and myself.

Thanks for your support,
Belkys

From: Collins, Elmo
Sent: Thursday, March 17, 2011 3:30 PM
To: Sosa, Belkys
Cc: Virgilio, Martin; Sanfilippo, Nathan; Hay, Michael; Vegel, Anton; Kennedy, Kriss; Miller, Geoffrey; Lantz, Ryan
Subject: Action: Ltr from Sens Boxer, Feinstein

Thanks

We'll work through EDO to get prep material up

Elmo

From: Sosa, Belkys
To: Collins, Elmo; Davis, Roger
Sent: Thu Mar 17 15:15:54 2011
Subject: Fw: Ltr from Sens Boxer, Feinstein

Hi Elmo, I hope all is well. ~~NOT FOR PUBLIC DISCLOSURE~~
Please note that the trip to Diablo and SONGS will also include Senator Boxer. If you have any information on these plants that can help Cmr Apostolakis prepare for the site visit, we would really appreciate it. I'll send you the details of the Senators agenda ASAP. I'm waiting for OCA to provide.
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Powell, Amy
To: Blake, Kathleen
Cc: Davis, Roger; Sosa, Belkys
Sent: Thu Mar 17 14:04:10 2011
Subject: Ltr from Sens Boxer, Feinstein

Kathleen,

Here is the letter that I referenced on my call this afternoon with Belkys and Roger.

Amy

Amy Powell
Associate Director
U. S. Nuclear Regulatory Commission
Office of Congressional Affairs
Phone: 301-415-1673

~~NOT FOR PUBLIC DISCLOSURE~~

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Sosa, Belkys
Sent: Friday, March 18, 2011 12:44 PM
To: Hay, Michael
Cc: Collins, Elmo; Markley, Michael
Subject: Re: Query: Ltr from Sens Boxer, Feinstein

Great! Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Hay, Michael
To: Sosa, Belkys
Cc: Collins, Elmo; Markley, Michael
Sent: Fri Mar 18 12:08:01 2011
Subject: RE: Query: Ltr from Sens Boxer, Feinstein

Hi Belkys,

Elmo and I just spoke, and we are all on the same page.

We'll get the standard briefing material to you soon as possible today, and I'll send you our initial responses to the Senators questions before Monday. As you know these answers are not the formal answers that the NRC will provide so our understanding is that they will just be used to support high level discussions next week.

Mike

From: Sosa, Belkys
Sent: Friday, March 18, 2011 10:46 AM
To: Hay, Michael
Subject: RE: Query: Ltr from Sens Boxer, Feinstein

Hi Mike, we believe that the senators will be asking those types of questions during the visit. We would really appreciate any information you can provide to be able to address the questions at a high level. No need to include the responses in the briefing package. An attachment to an email sent anytime before Monday will do.

Thanks,
belkys

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Sent: Friday, March 18, 2011 10:37 AM

NOT FOR PUBLIC DISCLOSURE

To: Collins, Elmo
Cc: Virgilio, Martin; Sanfilippo, Nathan; Hay, Michael; Vegel, Anton; Kennedy, Kriss; Miller, Geoffrey; Lantz, Ryan; Baggett, Steven; Snodderly, Michael
Subject: Query: Ltr from Sens Boxer, Feinstein

NOT FOR PUBLIC DISCLOSURE

Elmo,
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Thanks for your support,
Belkys

From: Collins, Elmo
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To: Sosa, Belkys
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Subject: Action: Ltr from Sens Boxer, Feinstein

Thanks

We'll work through EDO to get prep material up

Elmo

From: Sosa, Belkys
To: Collins, Elmo; Davis, Roger
Sent: Thu Mar 17 15:15:54 2011
Subject: Fw: Ltr from Sens Boxer, Feinstein

Elmo, I hope all is well.
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Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Powell, Amy
To: Blake, Kathleen
Cc: Davis, Roger; Sosa, Belkys
Sent: Thu Mar 17 14:04:10 2011
Subject: Ltr from Sens Boxer, Feinstein

Kathleen,

Here is the letter that I referenced on my call this afternoon with Belkys and Roger.

Amy

Amy Powell
Associate Director

U. S. Nuclear Regulatory Commission
Office of Congressional Affairs
Phone: 301-415-1673

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Sosa, Belkys
ent: Friday, March 18, 2011 1:27 PM
o: Apostolakis, George; Snodderly, Michael; Baggett, Steven; Davis, Roger
Subject: Fw: Congressional Correspondence
Attachments: 03-18-11 Markey.pdf

Fyi

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Champ, Billie
To: Batkin, Joshua; Sharkey, Jeffry; Sosa, Belkys; Bubar, Patrice; Nieh, Ho; Burns, Stephen
Cc: Vietti-Cook, Annette; McKelvin, Sheila; Jaegers, Cathy; Clayton, Kathleen
Sent: Fri Mar 18 13:24:02 2011
Subject: Congressional Correspondence

I have attached for your information incoming correspondence from Rep. Edward Markey re; request for information regarding the NRC's current assessments of damage as well as an assessment of the potential worst case consequences associated with the current nuclear emergency in Japan

Billie A. C-Lopes
March 18, 2011

NOT FOR PUBLIC DISCLOSURE

COMMITTEES

NATURAL RESOURCES
RANKING DEMOCRAT

ENERGY AND COMMERCE

EDWARD J. MARKEY
7TH DISTRICT, MASSACHUSETTS

2108 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-2107
(202) 225-2836

DISTRICT OFFICES:

5 HIGH STREET, SUITE 101
MEDFORD, MA 02155
(781) 396-2900

188 CONCORD STREET, SUITE 102
FRAMINGHAM, MA 01702
(508) 875-2900

http://markey.house.gov

Congress of the United States
House of Representatives
Washington, DC 20515–2107

March 18, 2011

The Honorable Greg Jaczko
Chairman
Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Dear Chairman Jaczko:

I write to request information regarding the Nuclear Regulatory Commission's (NRC's) current assessments of damage as well as an assessment of the potential worst-case consequences associated with the current nuclear emergency in Japan. As reports have noted, there has been some conflicting information regarding the status of the meltdowns and condition of the spent nuclear fuel ponds at the Fukushima Daiichi nuclear power plant.

As you know, focus of late has shifted to two questions: First, whether containment has been breached at any of the units, and second, whether there remains water (and if so how much) in the spent nuclear fuel ponds, especially in units 3 and 4. However, conflicting information is being provided by different parties.

For example, in your testimony in front of the House Energy and Commerce Committee on Wednesday, you indicated, with regard to unit 4, that you believed that "There is no water in the spent fuel pool and we believe that radiation levels are extremely high, which could possibly impact the ability to take corrective measures."

Following your statement, representatives from Tokyo Electric Power Company (TEPCO), the plant's operator stated that "We can't get inside to check, but we've been carefully watching the building's environs, and there has not been any particular problem," Hajime Motojuku, a spokesman for Tokyo Electric, said Thursday morning in Japan. After that, a spokesman for Japan's Nuclear and Industrial Safety Agency (NISA) said that, "Because we have been unable to go to the scene, we cannot confirm whether there is water left or not in the spent fuel pool at Reactor No. 4."[1] Later that evening, a press release issued by the Nuclear Energy Institute (NEI) stated that both TEPCO and NISA had refuted your statement, and that the spokesmen had stated that "the situation at

[1] http://www.nytimes.com/2011/03/18/world/asia/18nuclear.html?pagewanted=2&hp

Unit 4 has changed little during the day today and water remained in the fuel pool. However, both officials said that the reactor had not been inspected in recent hours."[2]

A similar situation exists with respect to the extent of damage to the containment structures of units 2 and 3. Numerous press reports have speculated that the hydrogen explosions experienced at these units may have created a path for radioactive materials to escape containment. One of these reports[3] states that officials have concluded that "the chambers surrounding units 2 and 3 now have been cracked, allowing radiation to escape." During a conference call on March 17 with Congressional staff, NRC staff indicated that the NRC believes that there has been a breach in or damage to the primary and/or secondary containment structures in units 1, 2 and 3. Yet earlier that day, the NEI released a statement[4] that said (in part), on the Fukushima Daiichi plant, that:

> "The reactors at the Fukushima Daiichi plant are in stable condition and are being cooled with seawater, but workers at the plant continue efforts to add cooling water to fuel pools at reactors 3 and 4.... Reactor 2 is in stable condition with seawater injection continuing. The reactor's primary containment may not have been breached, Tokyo Electric Power Co. and World Association of Nuclear Operators officials said on Thursday. Containment pressure is at 65 psig, an indication that containment has not been breached. Access problems at the site have delayed connection of a temporary cable to restore offsite electricity. The connection will provide power to the control rod drive pump, instrumentation, batteries, and power to the control room. Power has not been available at the site since the earthquake on March 11. Reactor 3 is in stable condition with seawater injection continuing. The primary containment is believed to be intact. Pressure in the containment has fluctuated due to venting of the reactor containment structure, but has been as high as 83 psig."

The information that is being received on a daily basis by Congress is currently limited to daily emails from the State Department, which contains some information related to the nuclear crisis in addition to the earthquake and tsunami relief and consular information provided. This is supplemented by multiple daily emails from the NEI, which as the principal trade association for manufacturers of nuclear power-plants, equipment, nuclear fuel, and owners of utilities which own nuclear plants (including Tokyo Electric Power, which owns the Fukushima Daiichi plants), has a clear vested interest in providing a highly optimistic assessment of the situation.

Now that NRC staff is on the ground in Japan, it is my hope that it will be able to add to the information that is currently being provided to Congress and the public on a daily basis. While I appreciate the daily conference calls your staff has begun to hold, I

---

[2] NEI's **Update 9:00pm March 16** Information on the Japanese Earthquake and Reactors in that Region

[3] http://www.voanews.com/english/news/asia/IAEA-Chief-Heads-to-Japan-to-Assess-Nuclear-Crisis-118105754.html

[4] NEI's Update 11:45am March 17 Information on the Japanese Earthquake and Reactors in that Region

believe that it is vitally important to all those who may be considering leaving the vicinity of the impacted reactors to be receiving accurate and unbiased written assessment of current conditions. It is also important that the American public fully understand the potential magnitude and timing associated with a worst-case core melt-down and radiation release or spent fuel fire. Members of Congress must also be kept similarly informed so that they can assist any of their constituents who may have family members currently in the impacted areas and so that they can continue their oversight efforts in assuring the safety of our domestic nuclear reactors. Consequently, I ask for your prompt response to the following questions:

1) I request that you please begin to provide Congress and the public with a daily "situation report" or other similar document that contains your staff's assessment of the conditions at the impacted reactors, the radiation readings at each unit, the status of efforts to halt the melt-downs and radiation releases from the spent-fuel storage areas, and any reports of radiation exposures experienced by those working at or located in the vicinity of the impacted reactors.
2) Please provide me with your assessment of the worst-case potential consequences (including the total radiation that could be released as well as the possible timing for such an event based on current situational awareness), for each of the Daiichi units regarding
    a. The loss of water in the spent fuel cooling ponds and subsequent fire and/or release of radiation
    b. A full core melt-down assuming that no further breaches in containment occur
    c. A full core melt-down assuming that the containment structures are breached.

Thank you very much for your prompt attention to this matter. Please provide me with your initial response to question 1 by close of business on Monday March 21, 2011 and on an ongoing basis thereafter. Please provide me with your response to question 2 by Friday March 25, 2011. If you have any questions or concerns, please have your staff call Dr. Michal Freedhoff of my staff at 202-225-2836.

Sincerely,

Edward J. Markey

Edward J. Markey

Sosa, Belkys

From: Sosa, Belkys
Sent: Friday, March 18, 2011 2:38 PM
To: Vietti-Cook, Annette
Cc: Sharkey, Jeffry; Svinicki, Kristine; Apostolakis, George; Magwood, William; Ostendorff, William; Jaczko, Gregory; Blake, Kathleen; Bubar, Patrice; Crawford, Carrie; Nieh, Ho; Zorn, Jason; Coggins, Angela; Batkin, Joshua; Burns, Stephen; Rothschild, Trip; Bates, Andrew; Bavol, Rochelle; Laufer, Richard; Borchardt, Bill; Pace, Patti; 3WFN Core Team List Resource
Subject: RE: Monday's Commission Briefing on NRC Response to Recent Nuclear Events in Japan

(b)(5)

From: Vietti-Cook, Annette
Sent: Friday, March 18, 2011 1:04 PM
To: Svinicki, Kristine; Apostolakis, George; Magwood, William; Ostendorff, William; Jaczko, Gregory
Cc: Sharkey, Jeffry; Lepre, Janet; Sosa, Belkys; Blake, Kathleen; Bubar, Patrice; Crawford, Carrie; Nieh, Ho; Zorn, Jason; Coggins, Angela; Batkin, Joshua; Burns, Stephen; Rothschild, Trip; Bates, Andrew; Bavol, Rochelle; Laufer, Richard; Borchardt, Bill; Pace, Patti; 3WFN Core Team List Resource
Subject: Monday's Commission Briefing on NRC Response to Recent Nuclear Events in Japan

The Chairman requested that (b)(5) (b)(5) Attached is the final scheduling note that is being posted to the web. We are delivering background books today, and maybe slides. If slides are not available today, they will be sent around by email this weekend.

SECY has coordinated with the rest of the agency on logistics but just want you to be aware the meeting will [illegible] broadcast to TWFN auditorium to handle overflow in Commission Hearing Room, lots of security will be on [illegible]nd, and CBS Broadcast Network pool camera will be in the room and will feed others, but lots of reporters [illegible]id photographers are expected (OPA is working this), space is being reserved in the hearing room for NRC staff that may need to answer questions, and press.

I need to leave a little early this afternoon ((b)(6)). Andy Bates is Acting for me this afternoon (415-1963). Richard Laufer is working details of Monday's Commission meeting (415-1661).

I am available by cell phone, from the time I leave and over the weekend. I will of course be here bright and early Monday.

Annette (b)(6) cell
blackberry
home

If you have any trouble reaching me, please contact the following people in this order for assistance:

Andrew Bates (b)(6)

Rochelle Bavo [illegible]ell
[illegible]ome

Rich Laufer

Ken Hart, although a SECY MVP, is not listed because he is working shift work at the ops center.

Sosa, Belkys NOT FOR PUBLIC DISCLOSURE

From: Sosa, Belkys
Sent: Friday, March 18, 2011 2:43 PM
To: Snodderly, Michael; Baggett, Steven; Davis, Roger
Subject: Action: Monday's Commission Briefing on NRC Response to Recent Nuclear Events in Japan
Attachments: 110321 NRC Response to Events in Japan VERSION B Scheduling Note.docx

Please prepare some proposed questions for the subject meeting. Thanks, - Belkys

From: Vietti-Cook, Annette
Sent: Friday, March 18, 2011 1:04 PM
To: Svinicki, Kristine; Apostolakis, George; Magwood, William; Ostendorff, William; Jaczko, Gregory
Cc: Sharkey, Jeffry; Lepre, Janet; Sosa, Belkys; Blake, Kathleen; Bubar, Patrice; Crawford, Carrie; Nieh, Ho; Zorn, Jason; Coggins, Angela; Batkin, Joshua; Burns, Stephen; Rothschild, Trip; Bates, Andrew; Bavol, Rochelle; Laufer, Richard; Borchardt, Bill; Pace, Patti; 3WFN Core Team List Resource
Subject: Monday's Commission Briefing on NRC Response to Recent Nuclear Events in Japan

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Annette (b)(6) cell
blackberry
home
If you have any trouble reaching me, please contact the following people in this order for assistance:
Andrew Bates (b)(6) home
cell
Rochelle Bavol (b)(6) cell
home
Rich Laufer (b)(6) home
cell
Ken Hart, although a SECY MVP, is not listed because he is working shift work at the ops center.

NOT FOR PUBLIC DISCLOSURE

~~NOT FOR PUBLIC DISCLOSURE~~

Final: 3/18/11

SCHEDULING NOTE

Title: **BRIEFING ON NRC RESPONSE TO RECENT NUCLEAR EVENTS IN JAPAN (Public Meeting)**

Purpose: To provide the Commission a status on the recent events in Japan, NRC's response, and planned actions.

Scheduled: **March 21, 2011**
9:00 am

Duration: Approx. 2 hours

Location: Commissioners' Conference Room OWFN

Participants: **Presentation**

NRC Staff Panel **50 mins.***

Bill Borchardt, Executive Director for Operations

Topics:

- Overview of Japanese event and U.S. response
- Discussion of general radiation health effects
- Discussion of current regulatory approaches for reactors
- Path forward; near term and longer term

Commission Q & A **50 mins.**

Discussion – Wrap-up **5 mins.**

Documents:
Background materials due to SECY: prior to the briefing.
Slides due to SECY: prior to the briefing.

~~NOT FOR PUBLIC DISC~~

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Blake, Kathleen
ent: Friday, March 18, 2011 5:28 PM
: Apostolakis, George; Sosa, Belkys; Baggett, Steven; Snodderly, Michael; Davis, Roger; Lui, Christiana; Savoy, Carmel; (b)(6)
Cc: Hackley, Elizabeth; Temp, GEA
Subject: Cmr GA's SONGS. CA itin
Attachments: 3.21.11 SONGS. CA.docx

Attached please find the Cmr and Belkys' itin for SONGS trip next Monday. kb

NOT FOR PUBLIC DISCLOSURE

ITINERARY



SONGS Power Plant
San Onofre, CA
March 21-23, 2011
Cmr Apostolakis
Belkys Sosa
(revised 11/3/11)

Monday, March 21, 2011

12:30 p.m. Driver : Mac: (b)(6)

2:47 p.m. Depart IAD - UA 219
5:43 p.m Arrive SFO
7:26 p.m. Depart SFO - UA 140
8:54 p.m. Arrive SNA

Note: Safety requirements
Shoes must enclose the foot
Shirts must have sleeves

Hertz Car - Belkys
Confirmation: (b)(6)
Rate: $191.61

Directions from Airport to Marriott Hotel
Straight across MacArthur street to Michelson.
Left on Von Karman Avenue.
Hotel is on right.

HOTEL
Irvine Marriott
18000 Von Karman Avenue
Irvine, CA
949-553-0100
Rate: $123.00
Confirmation: GA (b)(6)
BS

Tuesday, March 22, 2011

Directions from Irvine Marriott to SONGS (4 miles southeast of San Clemente, CA)

- Start out going SOUTHWEST on VON KARMAN AVE toward QUARTZ.
- Turn LEFT onto MICHELSON DR.
- Turn LEFT onto JAMBOREE RD.
- Merge onto I-405 S.
- I-405 S becomes I-5 S to San Clemente
- Take the BASILONE RD exit, EXIT 71. Take a right from the exit ramp
- Once you have exited at Basilone Road, head south on Old Coast Highway
- Turn right towards ocean shortly after the road narrows down to one lane
- At the 4-way stop, turn left
- Stop at the security post (north security gate) and provide your photo id. Your vehicle and person are subject to search

SONGS Tour
Mike McBrearty
San Onofre Nuclear Generating Station
Nuclear Regulatory Affairs
O: 949-368-7573
C: (b)(6)

PLANNED AGENDA

1:15 p.m.	Arrive at SONGS Perform OCA visitor badging and issue parking pass at north security officer post [Please note you will need NRC Identification and your vehicle will be searched] We will have a reserved parking space for the Commissioner inside the Owner Controlled Area.
1:30p.m.	Plant roof – overview of SONGS, discuss design basis and point out major features
1:45 p.m.	Mezzanine conference room - Distribute personal protective equipment Safety rules review & assembly instructions
1:55 p.m.	Process through the Security Search Train at the Protected Area entrance
2:10 p.m.	Enter Protected Area (PA) and proceed to Unit 2 emergency diesel generators - discuss emergency cooling provisions
2:20 p.m.	Walk west to the seawall

2:25 p.m. Seawall – discuss tsunami design criteria

2:35 p.m. Proceed to Technical Support Center (TSC) in the Control Building -
Overview of emergency preparedness planning
Observe Control Room from TSC overlook area

2:50 p.m. Return to PA entrance/exit area

2:55 p.m. Exit plant secured area

3:05 p.m. Exit through personnel radiation monitors and turnstiles to return to Mezzanine conference room

3:15 p.m. Respond to any additional questions and exit site

(b)(6)

Sheraton Hotel for Belkys
Sheraton
530 Pico Boulevard
Santa Monica, CA 90401
310-399-9344
Confirmation: C325033044
Rate: $180.00
Note: per diem is $123.00 but no hotels were available at that rate.

Wednesday, March 23, 2011

11:58 a.m. Depart LAX - UA 856
7:32 p.m. Arrive IAD

Driver: Mac: (b)(6)

Sosa, Belkys NOT FOR PUBLIC DISCLOSURE

From: Sosa, Belkys
Sent: Friday, March 18, 2011 5:44 PM
To: Powell, Amy; Collins, Elmo
Cc: Schmidt, Rebecca; Batkin, Joshua
Subject: RE: Updates re: Tuesday's California visits

Thanks Amy!

From: Powell, Amy
Sent: Friday, March 18, 2011 5:16 PM
To: Collins, Elmo; Sosa, Belkys
Cc: Schmidt, Rebecca; Batkin, Joshua
Subject: Updates re: Tuesday's California visits

I've spoken with Sen. Feinstein's staff, both here in DC and in CA, who are working on next week's visit. Here are a couple of points that may be helpful:

Discussion points:
-Sen. Feinstein's staff confirmed that the discussion session planned at each site (for Elmo, both Diablo and SONGS; for the Commissioner at SONGS) would be more Q&A, round-table format than formal presentations.

-Topics that Sen. Feinstein has on her mind include: seismic requirements for plants (including how these are determined), tsunami requirements (including how these are determined), power backup at plants, and requirements for spent fuel pool to withstand seismic, natural disasters, and accidents.

-I hope to have a call with Sen. Boxer's staff this afternoon/early evening. She will undoubtedly be interested in what the Commission plans to do moving forward after the President's request, but will also be interested in many of the same issues as Sen. Feinstein.

Logistics:
-I should have updated agendas for the trip either later today or over the weekend. I will share them with you. At this point, I anticipate only small tweaks and nothing that would impact travel plans.

-Elmo, having the Senior Resident Inspector/Resident Inspector at the door of the conference room at each site prior to the set meeting would fine. In fact, Sen. Feinstein's staff really liked the idea. Can we make that happen?

-Attire: FYI Sen. Feinstein's staff will be in business wear (suit and tie for the men) so let's take our cue from that.

Thanks for supporting this trip – this is very good opportunity to have two Chairman ("Madam Chairman," preference of both Senators) of a subcommittee and full committee integral to NRC's work spend focused time learning about what we do and how we do it. My cell number is (b)(6) I will also be checking e-mail over the weekend. Please call or e-mail with questions that you have.

Thanks again,
Amy

Amy Powell
Associate Director
U.S. Nuclear Regulatory Commission

NOT FOR PUBLIC DISCLOSURE

Office of Congressional Affairs
Phone: 301-415-1673

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

From: Apostolakis, George
Sent: Friday, March 18, 2011 2:57 PM
To: (b)(6)
Subject: Call

John:

I'd like to call you tomorrow at around 11:30am, if convenient. If not, please give me another time.

I have a few questions that will help me think about where the NRC should go after the events in Japan. One question, for example, is whether PRAs consider accident sequences initiated by an EQ followed by another event such as a tsunami, a fire, internal flood, and so on. Also, whether PRAs explore station blackout sequences for very long periods of time like days (I think we only go to about 8 hours but I am not sure).

I am reading a lot of material now and I am sure I'll have more questions for you.

So, can I call you and at what number?

George

PS: Senators Feinstein and Boxer will be visiting Diablo and SONGS on Tuesday. I will be with them at SONGS.

Commissioner George Apostolakis
Nuclear Regulatory Commission
White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

NOT FOR PUBLIC DISCLOSURE

~~NOT FOR PUBLIC DISCLOSURE~~

Sosa, Belkys

From: Sosa, Belkys
Sent: Friday, March 18, 2011 3:04 PM
To: Snodderly, Michael
Cc: Baggett, Steven; Davis, Roger
Subject: RE: Updated Fact Sheet on Radiation and Emergency Planning

Thanks Mike. I think this summary is great!

From: Snodderly, Michael
Sent: Friday, March 18, 2011 2:58 PM
To: Sosa, Belkys
Cc: Baggett, Steven; Davis, Roger
Subject: FW: Updated Fact Sheet on Radiation and Emergency Planning

Belkys,

Info to help Commissioner concerning NY Times Editorial

From: BUTLER, John [mailto:jcb@nei.org]
Sent: Friday, March 18, 2011 2:28 PM
To: Snodderly, Michael
Subject: FW: Updated Fact Sheet on Radiation and Emergency Planning

~~NOT FOR PUBLIC DISCLOSURE~~

Mike,

ached is a fact sheet we sent out today that I believe will assist you. Feel free to contact me or Ralph Andersen of , Senior Director, Radiation Protection and Environmental Protection, with further questions. Ralph can be reached a (b)(6)

John

John C. Butler
Senior Director, Engineering and Operations Support

Nuclear Energy Institute
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Washington, DC 20006
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P: 202-739-8108
F: 202-533-0113
M (b)(6)
E: jcb@nei.org

nuclear. clean air energy.

From: MALONEY, Jennifer
Sent: Friday, March 18, 2011 12:14 PM
ZZ All Lan E-mail Users ZZ (Systems Administrator
ject: FW: Updated Fact Sheet on Radiation and Emergency Planning

This went to media and 3rd Party Experts.

From: Steve Kerekes [mailto:sck@nei.org]
Sent: Friday, March 18, 2011 12:13 PM
To: MALONEY, Jennifer
Subject: Updated Fact Sheet on Radiation and Emergency Planning

Dear Media:

NEI has updated its fact sheet, Perspective on Radiation Releases and Emergency Planning at U.S. Nuclear Power Plants. We hope that this will assist you in your coverage today.

If you need further information please visit NEI's designated Web page on the Japan accident.

We also have several Twitter accounts:

@neiupdates: This account has updates on the Japan accident.
@Nei_media: This is our regular media account.
@N_E_I: This is NEI's general Twitter account.
@Nuclear_policy: This account is updated by our Senior Vice President of Communications.

We are posting on our blog, and posting videos on YouTube.

If you have media needs, please contact us at media@nei.org or 202.739.8000.

Regards,

Steve Kerekes
Senior Director, Media Relations

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NUCLEAR ENERGY INSTITUTE

Fact Sheet
Perspective on Radiation Releases and Emergency Planning
at U.S. Nuclear Power Plants

(Last updated March 18, 2011)

The nuclear energy industry fully supports federal government actions to protect the health and safety of Americans in Japan in the aftermath of the Fukushima accident. Given the lack of information on radiation levels at the plant, the analysis necessarily used conservative scenarios and models—including worst-case analysis—regarding radiation that could be released at the six-reactor site.

The government approach took into account the uncertainties associated with the limited information on radiation exposure rates at and near the Fukushima plant. While prudent for Americans in Japan for this situation, this action should not be interpreted as a standard that should be applied to U.S. reactor emergency planning policy, specifically the use of a 50-mile zone.

At U.S. nuclear power plants, detailed information regarding plant status and radiation exposure rates would be known to the Nuclear Regulatory Commission, state leaders and plant operators as an event progressed. This has been demonstrated in actual events and hundreds of emergency preparedness exercises at nuclear power plants.

Radiation levels near the Fukushima plant appear to have fluctuated considerably in recent days. The industry continues to seek accurate assessments of the radiation, but currently there is no health threat to the United States.

As context, radiation levels in the aftermath of the Chernobyl accident were 1 millirem per year in the United States and in Canada. By comparison, each person receives the same radiation dose from watching television over a year's time. Among countries neighboring the site of the Chernobyl accident, Bulgaria received the highest radiation dose from the Chernobyl accident at 76 millirem per year from Chernobyl, followed by Austria, 68 millirem per year, Greece, 59 millirem per year; Finland, 45 millirem per year.) The Nuclear Regulatory Commission's annual public radiation limit is 100 millirem.

While both the 10-mile emergency preparedness zone and 50-mile zone for monitoring the environment and food products were established for planning and preparedness purposes, in an actual emergency, response directors would designate protective actions beyond these zones should conditions require.

Decisions on whether to shelter or evacuate are made by state public safety officials, in consultation with local officials. This decision is based on information on the event provided by the affected nuclear power plant.

Some countries that are evacuating citizens from Japan are doing so due to lack of essential services rather than concern about radiation releases. Australia's Foreign Minister, Kevin Rudd, said: "There are problems in terms of electricity, power supply, as well as a whole range of other things as well."

Background on Emergency Planning at U.S. Nuclear Energy Facilities

In 1978, the U.S. Nuclear Regulatory Commission (NRC), the U.S. Environmental Protection Agency (EPA), and the Federal Emergency Management Agency (FEMA) formed a task force to study and develop guidelines in establishing designated emergency planning zones (EPZs) around U.S. nuclear plants as the planning basis for emergency preparedness.

For the United States, the task force determined an EPZ of a **10-mile radius** around a nuclear power facility, based on the best available science at the time. Principal immediate protective actions for the public within this zone typically include instructions for sheltering and/or evacuation. Supplemental protective actions within this zone might include the distribution of potassium iodide tablets to protect the thyroid from radioactive iodine.

The task force concluded that most hypothetical reactor accidents would not be a threat to public health and safety beyond the 10-mile zone. The slow pace at which an event unfolds – over several hours or days – provides time for orderly evacuation or sheltering, if necessary.

The task force established **a 50-mile zone** to limit public exposure to radioactive materials through consumption of contaminated water, milk or foods. No evacuation or sheltering would be needed in this area, however.

While both the 10-mile and 50-mile zones were established for planning and preparedness purposes, in an actual emergency, response directors have the discretion to designate protective actions beyond these zones should conditions call for them.

Nuclear power plants have instrumentation that continuously monitor in-plant radiological conditions. The instrumentation enables plant staff to remain cognizant of radiological conditions throughout the power plant and at the site boundary and take actions if conditions change.

Additionally, there are environmental monitors placed at designated locations beyond the site boundary that could record elevated radiation levels beyond naturally occurring radiation.

Planning for possible emergencies is an ongoing process and is done through partnership that includes the company that operates a nuclear plant, working alongside state and local officials.

Industry guidance and federal regulations require operators to have in place a range of actions to protect the public health and safety during the early phases of an emergency. These protective actions are recommended to local officials, who, under the authority of the state governor, decide which to implement.

Plant operators have the capability to make rapid calculations of radiation releases and projected "doses" to people. Depending on meteorological conditions and the severity of the accident, these projections are part of initial protective action recommendations provided to offsite public safety emergency management officials within 15 minutes of an event. More refined projections are typically provided within an hour of an emergency.

The U.S. nuclear energy industry takes continual steps to improve its emergency preparedness capabilities through:

- Constant upgrading of emergency response plans through lessons learned, regularly scheduled drills, exercises and critiques, and actual plan activations.

- An industrywide review following the events of Sept. 11, 2001, of management oversight of plant programs and communications approaches, applying lessons learned to strengthen emergency preparedness.

- Severe accident management guidance that deals with beyond design-basis scenarios addressing severe seismic or fire-related accident sequences resulting in complete loss of off-site and on-site emergency power and complete loss of cooling. This guidance was also revised for plant operator responses to the consequences of large aircraft impact.

- Training programs conducted annually for all emergency response personnel. The National Nuclear Accrediting Board accredits training programs for operators and technical staff who use emergency operating procedures.

- Upgraded facilities to aid in effective handling of emergencies, including offsite response centers that provide real-time plant data.

- Advancements in communications technology to notify appropriate plant employees, emergency response personnel and the public if an event were to occur.

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Sosa, Belkys

From: Sosa, Belkys
Sent: Friday, March 18, 2011 3:09 PM
To: Apostolakis, George
Cc: Snodderly, Michael; Davis, Roger; Baggett, Steven
Subject: FYI: Updated Fact Sheet on Radiation and Emergency Planning
Attachments: FactSheet_PerspectiveRadiationReleasesEmergencyPlanningNPP_3-18-11.pdf

Commissioner, please refer to the attached NEI summary, I think it addresses the issues raised by the NY Times editorial, We'll start a file on G:drive on Japan event to include the latest update of relevant documents; so that you can refer to it during your prep this weekend.

Thanks,
Belkys

From: Snodderly, Michael
Sent: Friday, March 18, 2011 2:58 PM
To: Sosa, Belkys
Cc: Baggett, Steven; Davis, Roger
Subject: FW: Updated Fact Sheet on Radiation and Emergency Planning

Belkys,

Info to help Commissioner concerning NY Times Editorial

NOT FOR PUBLIC DISCLOSURE

From: BUTLER, John [mailto:jcb@nei.org]
Sent: Friday, March 18, 2011 2:28 PM
To: Snodderly, Michael
Subject: FW: Updated Fact Sheet on Radiation and Emergency Planning

Mike,

Attached is a fact sheet we sent out today that I believe will assist you. Feel free to contact me or Ralph Andersen of NEI, Senior Director, Radiation Protection and Environmental Protection, with further questions. Ralph can be reached at (b)(6)

John

John C. Butler
Senior Director, Engineering and Operations Support

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P: 202-739-8108
F: 202-533-0113
M: (b)(6)
E: jcb@nei.org

Nuclear. clean air energy.

From: MALONEY, Jennifer
Sent: Friday, March 18, 2011 12:14 PM
To: ZZ All Lan E-mail Users ZZ (Systems Administrator
Subject: FW: Updated Fact Sheet on Radiation and Emergency Planning

This went to media and 3rd Party Experts.

From: Steve Kerekes [mailto:sck@nei.org]
Sent: Friday, March 18, 2011 12:13 PM
To: MALONEY, Jennifer
Subject: Updated Fact Sheet on Radiation and Emergency Planning

Dear Media:

NEI has updated its fact sheet, Perspective on Radiation Releases and Emergency Planning at U.S. Nuclear Power Plants. We hope that this will assist you in your coverage today.

If you need further information please visit NEI's designated Web page on the Japan accident.

We also have several Twitter accounts:

@neiupdates: This account has updates on the Japan accident.
@Nei_media: This is our regular media account.
@N_E_I: This is NEI's general Twitter account.
@Nuclear_policy: This account is updated by our Senior Vice President of Communications.

We are posting on our blog, and posting videos on YouTube.

If you have media needs, please contact us at media@nei.org or 202.739.8000.

Regards,

Steve Kerekes
Senior Director, Media Relations

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Sent through mail.messaging.microsoft.com

Sosa, Belkys ~~NOT FOR PUBLIC DISCLOSURE~~

From: Blake, Kathleen
Sent: Friday, March 18, 2011 3:24 PM
To: Mike.Mcbrearty@sce.com
Cc: Sosa, Belkys; Apostolakis, George
Subject: FW: Directions to SONGS and Current Agenda
Attachments: SONGSvisit.pdf

Mike: Many thanks.

Cmr/Belkys: I have added to your itin and blue folder. kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Mike.Mcbrearty@sce.com [mailto:Mike.Mcbrearty@sce.com]
Sent: Friday, March 18, 2011 2:52 PM
To: Blake, Kathleen
Subject: Directions to SONGS and Current Agenda

Kathleen,

In follow up to our discussion, attached please find directions to SONGS from John Wayne (Orange County) Airport, and information on footwear requirements inside the plant. I have also included the planned agenda.

Please let me know if you have any questions.

Best Regards,

Mike McBrearty
San Onofre Nuclear Generating Station
Nuclear Regulatory Affairs
949-368-7573
cell phone (b)(6)

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Directions and info on footwear requirements

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PLANNED AGENDA

1315 Arrive at SONGS
Perform OCA visitor badging and issue parking pass at north security officer post
[Please note you will need NRC Identification and your vehicle will be searched]
We will have a reserved parking space for the Commissioner inside the Owner Controlled Area.

1330 Plant roof – overview of SONGS, discuss design basis and point out major features

1345 Mezzanine conference room -
Distribute personal protective equipment
Safety rules review & assembly instructions

1355 Process through the Security Search Train at the Protected Area entrance

1410 Enter Protected Area (PA) and proceed to Unit 2 emergency diesel generators - discuss emergency cooling provisions

1420 Walk west to the seawall

1425 Seawall – discuss tsunami design criteria

1435 Proceed to Technical Support Center (TSC) in the Control Building -
Overview of emergency preparedness planning
Observe Control Room from TSC overlook area

1450 Return to PA entrance/exit area

1455 Exit plant secured area

1505 Exit through personnel radiation monitors and turnstiles to return to mezzanine conference room

1515 Respond to any additional questions and exit site

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Contact: Mike McBrearty 949 368-7573
(b)(6) mobile

Directions to SONGS

FROM SAN DIEGO AIRPORT (SAN DIEGO) (1 hour 15 minutes)
- Take Interstate 5 north to San Clemente.
- Take Basilone Road exit and turn left from the exit ramp, crossing over I5.

FROM LAX (LOS ANGELES) (2 hours)
- Take Interstate 405 south to Interstate 5 south.
- Take Basilone Road exit and turn right from the exit ramp.

FROM JOHN WAYNE AIRPORT (ORANGE COUNTY) (30 minutes)
- Take Interstate 405 south to Interstate 5 south to San Clemente.
- Take Basilone Road exit. Take a right from the exit ramp

Once you have exited at Basilone Road, head south on Old Coast Highway
- Turn right towards ocean shortly after the road narrows down to one lane
- At the 4-way stop, turn left
- Stop at the security post (north security gate) and provide your photo identification. Your vehicle and person are subject to search.

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CLOTHING AND FOOTWEAR REQUIREMENTS FOR SAN ONOFRE VISITORS

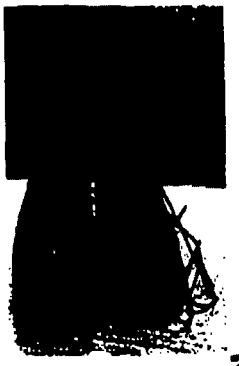
Clothing and footwear worn at San Onofre must satisfy safety requirements. Safety requirements minimize the potential for injury from industrial hazards at San Onofre.



SAFETY REQUIREMENTS FOR FOOTWEAR:

Shoes must be **sufficiently sturdy for an industrial work environment.**

- Shoe or boot that fully encloses the foot
- Firm toe, leather uppers
- Slip resistant heel less than 2 inches high and more than 1.5 inches wide



The following types of shoes are prohibited:

- Soles that collapse when a slight pressure is applied to the sides
- Heels more than 2 inches in height or that could become wedged in grating or in holes less than 1 inch in diameter
- **Open toes, open heels or open sides**
- No sandals or moccasins
- Nylon, canvas, or net uppers



REQUIREMENTS FOR CLOTHING:

The following types of clothes are prohibited:

- Tank tops – **shirts must have a sleeve (short or long)**
- Shorts of any kind
- Capris
- Dresses/skirts/kilts

SOUTHERN CALIFORNIA EDISON

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San Onofre Nuclear Generating Station



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SOUTHERN CALIFORNIA EDISON

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San Onofre Nuclear Generating Station

Visiting San Onofre Nuclear Generating Station

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All individual, their items, and vehicles on SONGS property are subject to search. The following restrictions apply:

- No alcohol
- No firearms
- No explosives
- No incendiary devices
- No mace
- No knives
- No illegal drugs or drug paraphernalia
- Bring photo identification and a second form of identification
- Please notify our staff if you have been treated with radioactive medication in the past ninety (90) days

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Sosa, Belkys

From: Sosa, Belkys
Sent: Friday, March 18, 2011 5:43 PM
To: Apostolakis, George
Subject: FYI: ADDENUM: Updates re: Tuesday's California visits

fyi

From: Powell, Amy
Sent: Friday, March 18, 2011 5:27 PM
To: Collins, Elmo; Sosa, Belkys
Cc: Schmidt, Rebecca; Batkin, Joshua
Subject: ADDENUM: Updates re: Tuesday's California visits

As I mentioned to each of you earlier, press is NOT invited to Tuesday's events. Additionally, the Senators will NOT do press availability after either visit at the site.

Amy

From: Powell, Amy
Sent: Friday, March 18, 2011 5:16 PM
To: Collins, Elmo; Sosa, Belkys
Cc: Schmidt, Rebecca; Batkin, Joshua
Subject: Updates re: Tuesday's California visits

've spoken with Sen. Feinstein's staff, both here in DC and in CA, who are working on next week's visit. Here 're a couple of points that may be helpful:

Discussion points:
-Sen. Feinstein's staff confirmed that the discussion session planned at each site (for Elmo, both Diablo and SONGS; for the Commissioner at SONGS) would be more Q&A, round-table format than formal presentations.

-Topics that Sen. Feinstein has on her mind include: seismic requirements for plants (including how these are determined), tsunami requirements (including how these are determined), power backup at plants, and requirements for spent fuel pool to withstand seismic, natural disasters, and accidents.

-I hope to have a call with Sen. Boxer's staff this afternoon/early evening. She will undoubtedly be interested in what the Commission plans to do moving forward after the President's request, but will also be interested in many of the same issues as Sen. Feinstein.

Logistics:
-I should have updated agendas for the trip either later today or over the weekend. I will share them with you. At this point, I anticipate only small tweaks and nothing that would impact travel plans.

-Elmo, having the Senior Resident Inspector/Resident Inspector at the door of the conference room at each site prior to the set meeting would fine. In fact, Sen. Feinstein's staff really liked the idea. Can we make that happen?

-Attire: FYI Sen. Feinstein's staff will be in business wear (suit and tie for the men) so let's take our cue from that.

Thanks for supporting this trip – this is very good opportunity to have two Chairman ("Madam Chairman," preference of both Senators) of a subcommittee and full committee integral to NRC's work spend focused time

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learning about what we do and how we do it. My cell number is (b)(6) I will also be checking e-mail over the weekend. Please call or e-mail with questions that you have.

Thanks again,
my

Amy Powell
Associate Director
U. S. Nuclear Regulatory Commission
Office of Congressional Affairs
Phone: 301-415-1673

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Baggett, Steven

m: Apostolakis, George
t: Monday, March 21, 2011 9:41 PM
Baggett, Steven; Davis, Roger; Snodderly, Michael; Sosa, Belkys
Subject: FW: COMGBJ-11-002 for comment
Attachments: COM GBJ11-0002 GA Comments1.docx

(b)(5)

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Apostolakis, George
Sent: Monday, March 21, 2011 9:35 PM
To: Baggett, Steven; Sosa, Belkys; Snodderly, Michael; Davis, Roger
Subject: RE: COMGBJ-11-002 for comment

(b)(5)

(b)(5)

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Baggett, Steven
Sent: Monday, March 21, 2011 6:49 PM
To: Sosa, Belkys; Apostolakis, George
Subject: FW: COMGBJ-11-002 for comment

Sorry, if this a duplicate, Just making sure you got Mike's proposal.

Steve

From: Snodderly, Michael
: Monday, March 21, 2011 4:14 PM
aggett, Steven; Davis, Roger
ubject: COMGBJ-11-002 for comment

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Please see attached for your review and comment. ~~NOT FOR PUBLIC DISCLOSURE~~

Thanks,

e Snodderly
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-2241
Email: michael.snodderly@nrc.gov

~~[illegible] PUBLIC DISCLOSURE~~

Commissioner,

A few questions for your consideration

Commission Briefing
Briefing on NRC Response to Recent Nuclear Events in Japan
March 21, 2011 9:00 – 11:00 am open to the public.

Commissioner Magwood will go first with questions

General:

(b)(5)

Apostolakis, George

From: Apostolakis, George
Sent: Monday, March 21, 2011 10:08 PM
To: Blake, Kathleen; Sosa, Belkys; Davis, Roger
Subject: Re: INQUIRY ERT TV GREECE- (MANOLIS)

We'll talk about it when I return.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Blake, Kathleen
To: Apostolakis, George; Sosa, Belkys; Davis, Roger
Sent: Mon Mar 21 15:03:04 2011
Subject: FW: INQUIRY ERT TV GREECE- (MANOLIS)

Cmr/Belkys: How to respond? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
[illegible]55 Rockville Pike
[illegible]ville, Maryland 20852
[illegible]-415-1810

From: Theofanis Papathanasiou [mailto (b)(6)
Sent: Thursday, March 17, 2011 4:57 P[illegible]
To: Blake, Kathleen
Subject: RE: INQUIRY ERT TV GREECE- (MANOLIS)

Dear Kathleen:

I understand that the Commissioner he cannot talk right now.
If something chances on this please let me know. I would like to come over and have a big story a special report/profile about him.

This of course needs a lot of planning and logistics.

Thanks for your attention to this request.

All the Best,

[illegible]s Papathanasiou
[illegible]TV
[illegible]ece

On **Wed, 3/16/11, Blake, Kathleen <*Kathleen.Blake@nrc.gov*>** wrote:

From: Blake, Kathleen <Kathleen.Blake@nrc.gov>
Subject: RE: INQUIRY ERT TV GREECE- (MANOLIS)
To: (b)(6)
Date: Wednesday, March 16, 2011, 8:54 PM

Mr. Papathanasiou:

The Commissioner regrets that he cannot talk to you. He will not comment on the status of another country's nuclear power plants. Please check the NRC web site for the latest information on NRC actions. http://www.nrc.gov/

[illegible] Blake

Administrative Assistant

to Commissioner Apostolakis

Nuclear Regulatory Commission

11555 Rockville Pike

Rockville, Maryland 20852

301-415-1810

From: Theofanis Papathanasiou [mailto (b)(6)
Sent: Wednesday, March 16, 2011 11:2[illegible] AM
To: CMRAPOSTOLAKIS Resource
Subject: INQUIRY ERT TV GREECE- (MANOLIS)

Hello Dr. Apostolaki:

My apologies for this message out of the blue. I happen to be a good friend and colleague in ERT with cousin (b)(6) He has contacted you as well for this. Please allow me to introduce myself. name is Fanis Papathanasiou and I am anchor and international correspondent working for ERT (Greek Public Television) in Athens. .

I am wondering if you are available for a live short interview from DC in our main newscast at 9 o clock (local time) about the situation in Japan. We can provide you with topics -questions.

nk for your attention to this request.

Fanis Papathanasiou
ERT TV anchor / senior international correspondent
News Department
Mesogion AVE 432,
Agia Paraskevi, 15342 Athens
Mob (b)(6)

Davis, Roger

m: Sosa, Belkys
t: Monday, March 21, 2011 11:50 AM
Baggett, Steven; Snodderly, Michael; Davis, Roger
ject: Re: COMGBJ-11-0002 (NRC Actions Following the Events in Japan))

I didn't assign it. Not sure who did. I agree Mike should handle it.
Thks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Baggett, Steven
To: Sosa, Belkys
Sent: Mon Mar 21 11:36:49 2011
Subject: COMGBJ-11-0002 (NRC Actions Following the Events in Japan))

Belkys,

The COM was in my box, as assigned to Roger. Seemed odd given the amount of time Mike has been involved with it. Sorry to question you but did you want Mike to handle it?

Thanks

ve

Apostolakis, George

m: Apostolakis, George
t: Sunday, March 27, 2011 11:45 AM
Davis, Roger; Baggett, Steven; Snodderly, Michael; Sosa, Belkys
Subject: RE: Help

I suggest we stop all efforts to help Prof. Catton with his request. GA.

From: Davis, Roger
Sent: Sunday, March 27, 2011 9:47 AM
To: Apostolakis, George; Baggett, Steven; Snodderly, Michael; Sosa, Belkys
Subject: Re: Help

Commissioner. I suggest we discuss tomorrow. It seems that the IAEA data base is not available to the public, and I suspect access is limited in ways that would preclude the requested access, at least at the present. In addition, I don't see an appropriate role for you in the consideration of the interest of specific non-NRC individuals (despite the former ACRS memberships) in obtaining the IAEA and Japanese data and performing such analysis. I imagine IAEA, NRC and its task force, and others will explore such questions. I think decisions about whether to obtain outside help and from whom are outside your portfolio at this point.

From: Apostolakis, George
To: Baggett, Steven; Davis, Roger; Snodderly, Michael; Sosa, Belkys
Sent: Sat Mar 26 11:56:03 2011
Subject: FW: Help

we be of any help here? Catton is a former ACRS member.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Ivan Catton [mailto:catton@ucla.edu]
Sent: Saturday, March 26, 2011 1:24 AM
To: George Apostolakis
Subject: Help

We (Bob Taylor and I) would like to explore the failure modes of emergency power systems in fission reactors and provide a dynamic strategy for limited power sharing based on our observations of the Fukushima event. To do this we need access to IAEA data base at http://www.iaea.org/programmes/a2/ and to get it we need your help.

major problems with an orderly cool down of the Fukushima plants are related to d damage of the emergency power system. It is assumed that a certain level of redundancy was installed but it is clear that these installations shared a common

vulnerability. We need detailed installed capability from the IAEA PRIS data base and from the Japanese for analysis.

Addition, it is not yet clear what the exact emergency power system hierarchy was when the batteries were engaged. Clearly the most important is to keep the system information flowing. The cooling of the core could be delayed for many hours but it is important to have battery power for instrumentation for days to know what is going on until mobile power can be obtained.

We would like to compare installed emergency capacities for some US reactors to those found at Fukushima. This includes software capabilities and manual over rides. Most of the needed information is probably available within the IAEA's PRIS data base .

We would use the available information to develop emergency procedures that are related to the selective failure of the emergency power system. The center of these procedures need to be based on the availability of real time data from the instrumentation. The emergency power system needs to be configured dynamically based on the best survival strategy in addition to the job of cooling the core and adding new emergency power capability with 24 hours.

Road and helicopter access needs to be identified for each reactor in question.

Some of the questions specific to Fukushima we are trying to answer are:

1) Where were the emergency diesels located and what was implemented and how the tsunami hit the system?

2) What did the operators do after the diesels stopped to optimize saving battery power?

3) How many independent battery systems do they have installed and what condition were they in?

4) How soon after the tsunami was the area ready for a helicopter to land with equipment and fuel?

5) Did Tokyo Electric have access to large helicopters?

6) How long was communication between the plant and Tokyo interrupted ?

7) What was the rank of personnel at the plant at the time of the tsunami?

8) Was the recent event where contract employees were contaminated typical of TEPCO or the result of too many days of stress?

9) Is the essence of Reg Guide 1.97 in its latest manifestation met by the Japanese (or the US for that matter) and is it adequate in light of the event (I don't think so)?

We are a couple of old retired (or near retired in my case) guys who have nothing better to do and are very concerned that the US will bite itself in the foot by totally abandoning nuclear power.

Ivan

Ivan Catton
Professor of Engineering
Department of Mechanical and Aerospace Engineering
University of California, Los Angeles
48-121 Engineering IV
Los Angeles, CA 90095-1597

Work: Tel: 310 825 5320 **Home: Tel:** (b)(6)
Fax: 310 206 4830 **Fax:** (b)(6)

ton@ucla.edu

Apostolakis, George

From: Ivan Catton [catton@ucla.edu]
Sent: Sunday, March 27, 2011 1:16 PM
To: Apostolakis, George
Subject: RE: IAEA

I guess I am not surprised. We will try to find what we need through other sources. Appreciate your trying.

Ivan

Ivan Catton
Professor of Engineering
Department of Mechanical and Aerospace Engineering
University of California, Los Angeles
48-121 Engineering IV
Los Angeles, CA 90095-1597

Work: Tel: 310 825 5320 **Home: Tel:** (b)(6)
Fax: 310 206 4830 **Fax:** (b)(6)

catton@ucla.edu

From: Apostolakis, George [mailto:George.Apostolakis@nrc.gov]
Sent: Sunday, March 27, 2011 8:45 AM
To: catton@ucla.edu
Subject: IAEA

Ivan:

I tried to help you but the lawyers intervened. See the following legal advice:

"It seems that the IAEA data base is not available to the public, and I suspect access is limited in ways that would preclude the requested access, at least at the present. In addition, I don't see an appropriate role for you in the consideration of the interest of specific non-NRC individuals (despite the former ACRS memberships) in obtaining the IAEA and Japanese data and performing such analysis. I imagine IAEA, NRC and its task force, and others will explore such questions. I think decisions about whether to obtain outside help and from whom are outside your portfolio at this point."

Sorry.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

Apostolakis, George

From: Ivan Catton [catton@ucla.edu]
Sent: Sunday, March 27, 2011 2:13 PM
To: Apostolakis, George
Subject: RE: IAEA

I reread the lawyer's statement and they seem to imply that you were looking for outside help. This is nonsense. We were requesting access as private citizens who have some knowledge in this area. Maybe the "at least at present" means they could change their minds. I am going to ask Feinstein and/or Boxer if they can get me access to the data base. Lawyers are always a problem.

Ivan

Ivan Catton
Professor of Engineering
Department of Mechanical and Aerospace Engineering
University of California, Los Angeles
48-121 Engineering IV
Los Angeles, CA 90095-1597

Work: Tel: 310 825 5320 **Home: Tel:** (b)(6)
Fax: 310 206 4830 **Fax:** (b)(6)

catton@ucla.edu

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Sorry.

Commissioner George Apostolakis
Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike

Rockville, MD 20852

(301) 415-1810

Apostolakis, George

From: Apostolakis, George
Sent: Monday, April 04, 2011 4:21 PM
To: Sosa, Belkys
Subject: Fw: ICAPP 2011- France/Nice- May 2 to 5

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

----- Original Message -----
From: CARRE Frank 086652 <franck.carre@cea.fr>
To: Apostolakis, George
Cc: bjolly@sfen.fr <'bjolly@sfen.fr'>
Sent: Mon Apr 04 15:41:10 2011
Subject: RE: ICAPP 2011- France/Nice- May 2 to 5

Dear George,

These are great news!
Thank you very much for your quick and positive reply to our invitation.
Best regards.
Frank

Frank Carre
CEA/DEN
Direction de l'Energie Nucléaire / Nuclear Energy Division Directeur scientifique / Scientific Director
Tel.: + 33 1 69 08 63 41

-----Message d'origine-----
De : Apostolakis, George [mailto:George.Apostolakis@nrc.gov]
Envoyé : lundi 4 avril 2011 21:31
À : CARRE Frank 086652
Cc :; 'georges.serviere@edf.fr'; 'jean-claude.gauthier@areva.com'; 'b.fouresto@nucsafeconsulting.com'; SAFA Henri 137483; (b)(6)
Objet : Re: ICAPP 2011- France/Nice- May 2 to 5

Dear Frank:

I will be pleased to participate.

George

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

----- Original Message -----
From: CARRE Frank 086652 <franck.carre@cea.fr>

To: Apostolakis, George
Cc: Bernard Jolly <bjolly@sfen.fr>; Georges SERVIERE <georges.serviere@edf.fr>; GAUTHIER Jean Claude (AREVA) <jean-claude.gauthier@areva.com>; b.fourest@nucsafeconsulting.com
<b.fourest@nucsafeconsulting.com>; SAFA Henri 137483 <Henri.SAFA@cea.fr>; Samim Anghaie
(b)(6)
Sent: Mon Apr 04 13:16:51 2011
Subject: RE: ICAPP 2011- France/Nice- May 2 to 5

Dear Dr. Apostolakis, Dear George,

As Program Chair of ICAPP-2011 I was delighted to learn in late December 2010 that you confirmed your participation in the first plenary session at the upcoming conference in Nice.

Today, I wish to extend the invitation of ICAPP's organizing Committee to a special session on the Fukushima accident that will be added to the program at 6:30 pm on Tuesday evening (May 3, right after Plenary Session 1).
As seen from today, this ~2 hour session will involve 4 or 5 panellists:
- Akira Omoto (JAEC) and another Japanese panellist who will report on facts about Fukushima accident and impacts (~45' in total)
- Yourself who could report on the impact in the US and NRC's plans for follow-up actions on the accident (~20')
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The panel may be chaired by the Conference's Honorary Chair from France (to be confirmed).

ICAPP's organizing Committee very much looks forward to your active participation in this key event of the conference and thanks you very much in advance for considering this invitation.
Sincerely yours.
Frank

Frank Carre
CEA/DEN
Direction de l'Energie Nucléaire / Nuclear Energy Division Directeur scientifique / Scientific Director
Tel.: + 33 1 69 08 63 41

-----Message d'origine-----
De : Apostolakis, George [mailto:George.Apostolakis@nrc.gov]
Envoyé : lundi 27 décembre 2010 18:33
À : 'Bernard Jolly'
Cc : Georges SERVIERE; GAUTHIER Jean Claude (AREVA); CARRE Frank 086652; b.fourest@nucsafeconsulting.com; SAFA Henri 137483; Samim Anghaie; Sylvie Delaplace; Marie-Hélène Lavergne Objet : RE: ICAPP 2011- France/Nice- May 2 to 5

Dear Mr. Jolly:

I will be pleased to participate in the first plenary session at ICAPP 2011.

I am looking forward to receiving more information as it becomes available.

Thank you.

George Apostolakis
Commissioner George Apostolakis
US Nuclear Regulatory Commission

One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

01) 415-1810

-----Original Message-----
From: Bernard Jolly [mailto:bjolly@sfen.fr]
Sent: Thursday, December 23, 2010 11:40 AM
To: CMRAPOSTOLAKIS Resource
Cc: apostola@mit.edu; Georges SERVIERE; GAUTHIER Jean Claude (AREVA); CARRE Frank 086652; b.fourest@nucsafeconsulting.com; SAFA Henri 137483; Samim Anghaie; Sylvie Delaplace; Marie-Hélène Lavergne
Subject: ICAPP 2011- France/Nice- May 2 to 5

Dear Dr.George Apostolakis,

Further to preliminary contacts between MM Ashok Thadani and Bernard Fourest, please find enclosed a letter of invitation to participate to the first plenary session of ICAPP 2011 due to be held in France/Nice on Tuesday afternoon May 3rd, 2011.
Awaiting your confirmation to accept our invitation, I remain, Yours very faithfully.

Bernard Jolly
Executive Director
French Nuclear Society
Tel:+33 1 53 58 32 25
Fax:+33 1 53 58 32 11
Cell:(b)(6)
mail: bjolly@sfen.fr

Apostolakis, George

om: Apostolakis, George
nt: Monday, April 04, 2011 10:23 AM
: Blake, Kathleen
Subject: FW: Integrated Disaster Risk Management conference. Los Angeles ,14-16 July 2011

Please mark my calendar. Thanks.

From: Apostolakis, George
Sent: Monday, April 04, 2011 10:16 AM
To: 'Aniello Amendola'
Cc: 'Rose, Adam'; 'Ana Maria Cruz'; 'Elisabeth Krausmann'
Subject: RE: Integrated Disaster Risk Management conference. Los Angeles ,14-16 July 2011

Dear Aniello:

It was great hearing from you.

I have been a NRC Commissioner for almost a year now having been nominated by President Obama and confirmed by the US Senate. We have moved to Washington (I am on leave from MIT).

I will be happy to participate in the Los Angeles panel. My expenses will be covered by the US Government.

I hope to see you there.

orge

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Aniello Amendola [mailto:aniello.amendola@tiscali.it]
Sent: Friday, April 01, 2011 5:44 AM
To: apostola@mit.edu
Cc: 'Rose, Adam'; 'Ana Maria Cruz'; 'Elisabeth Krausmann'
Subject: Integrated Disaster Risk Management conference. Los Angeles ,14-16 July 2011

Dear George,
It is a long time we do not meet.

(b)(6)

As you know I have spent a number of years at IIASA (where Detlof is now Director) and from time to time at DPRI, Kyoto University.
I am continuing cooperate with both organizations. With those we have organized a forum on Integrated Disaster Risk essment from 2001 to 2009 (information on the IIASA web Risk and Vulnerability program RAV). Since last year IDRM been organized as a professional society. This year the annual conference will take place in Los Angeles under the ost organization by Adam Rose. All information is available at http://idrim.org/?page_id=22.

The events in Japan are in some way changing the focus. Both Natural and Technological Risk Management are dominated by organizational factors. I read that also in the States violations are undetermined reliability of diesels and other safety systems.
We would be glad to have your contribution to a panel on Natechs in which experts from Japan are expected to participate. The panel is being organized by Elisabeth Krausmann from JRC Ispra and Ana Maria Cruz who is now fully involved in the organization the IDRIM association,
I am not involved with administrative questions but I do not think the funds are available for inviting guests. In reality funds were requested to a Japanese organization to promote international research sharing. However I doubt that priorities have not changed after what happened.
I hope you may be interested in joining our event. It would be great to meet you after so many years. Last event in the area was 1991 – SRA at Beverly Hills 20 years ago!
Un forte abbraccio
Aniello

Dr. Aniello Amendola
IIASA - International Institute for Applied Systems Analysis
Schlossplatz, 1
A-2361 Laxenburg, Austria
Tel: +43 2236/807 1
Fax: +43 2236/907 466
Web: www.iiasa.ac.at

e- mail: amendola@iiasa.ac.at; aniello.amendola@tiscali.it

NOT FOR PUBLIC DISCLOSURE NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

om: Apostolakis, George
nt: Monday, April 04, 2011 9:37 AM
o: Davis, Roger; Sosa, Belkys
Subject: FW: Integrated Disaster Risk Management conference. Los Angeles ,14-16 July 2011

What do you think? Would disaster management be useful to us?

From: Aniello Amendola [mailto:aniello.amendola@tiscali.it]
Sent: Friday, April 01, 2011 5:44 AM
To: apostola@mit.edu
Cc: 'Rose, Adam'; 'Ana Maria Cruz'; 'Elisabeth Krausmann'
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e- mail: amendola@iiasa.ac.at; aniello.amendola@tiscali.it

NOT FOR PUBLIC DISCLOSURE NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

om: Apostolakis, George
nt: Monday, April 04, 2011 3:19 PM
o: Blake, Kathleen; Davis, Roger; Sosa, Belkys; Snodderly, Michael
Cc: Smiroldo, Elizabeth
Subject: Re: ICAPP 2011- France/Nice- May 2 to 5

I will accept.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Blake, Kathleen
To: Davis, Roger; Apostolakis, George; Sosa, Belkys; Snodderly, Michael
Cc: Smiroldo, Elizabeth
Sent: Mon Apr 04 15:17:39 2011
Subject: RE: ICAPP 2011- France/Nice- May 2 to 5

Cmr:

You are currently participating in the May 3 Plenary Session #1: Nuclear New Build: Towards Internationalization which runs from 4:30-6:30 p.m. This session runs for 2 hours as well. You'll be hungry skipping dinner to attend the 6:30 p.m. session.

Shall I accept the invitation for you or will you? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

-----Original Message-----
From: Davis, Roger
Sent: Monday, April 04, 2011 2:52 PM
To: Apostolakis, George; Sosa, Belkys; Snodderly, Michael
Cc: Blake, Kathleen; Smiroldo, Elizabeth
Subject: RE: ICAPP 2011- France/Nice- May 2 to 5

I tend to think you should, recognizing a number of circumstances: it is still very soon after the accident, I don't think the agency won't have the Task Force's 30 day quick look report, you will be appearing in your capacity as an individual capacity(presumably) -- not agency spokesperson, need to rely on the NRC's public statements for descriptions of what the agency has done, etc. Suggest you also mention to the Chairman at next periodic.

-----Original Message-----

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

From: Apostolakis, George
Sent: Monday, April 04, 2011 2:30 PM
To: Sosa, Belkys; Snodderly, Michael; Davis, Roger
Cc: Blake, Kathleen; Smiroldo, Elizabeth
Subject: FW: ICAPP 2011- France/Nice- May 2 to 5

Should I accept this invitation?

GA

NOT FOR PUBLIC DISCLOSURE

-----Original Message-----
From: CARRE Frank 086652 [mailto:franck.carre@cea.fr]
Sent: Monday, April 04, 2011 1:17 PM
To: Apostolakis, George
Cc: Bernard Jolly; Georges SERVIERE; GAUTHIER Jean Claude (AREVA); b.fourest@nucsafeconsulting.com; SAFA Henri 137483; Samim Anghaie
Subject: RE: ICAPP 2011- France/Nice- May 2 to 5

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- Akira Omoto (JAEC) and another Japanese panellist who will report on facts about Fukushima accident and impacts (~45' in total)
- Yourself who could report on the impact in the US and NRC's plans for follow-up actions on the accident (~20')
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The panel may be chaired by the Conference's Honorary Chair from France (to be confirmed).

ICAPP's organizing Committee very much looks forward to your active participation in this key event of the conference and thanks you very much in advance for considering this invitation.
Sincerely yours.
Frank

Frank Carre
CEA/DEN
Direction de l'Energie Nucléaire / Nuclear Energy Division
Directeur scientifique / Scientific Director
Tel.: + 33 1 69 08 63 41

-----Message d'origine-----
De : Apostolakis, George [mailto:George.Apostolakis@nrc.gov]
Envoyé : lundi 27 décembre 2010 18:33
À : 'Bernard Jolly'
Cc : Georges SERVIERE; GAUTHIER Jean Claude (AREVA); CARRE Frank 086652; b.fourest@nucsafeconsulting.com; SAFA Henri 137483; Samim Anghaie; Sylvie Delaplace; Marie-Hélène Lavergne
Objet : RE: ICAPP 2011- France/Nice- May 2 to 5

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am looking forward to receiving more information as it becomes available.

Thank you.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

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Sent: Thursday, December 23, 2010 11:40 AM
To: CMRAPOSTOLAKIS Resource
Cc: apostola@mit.edu; Georges SERVIERE; GAUTHIER Jean Claude (AREVA); CARRE Frank 086652; b.fourest@nucsafeconsulting.com; SAFA Henri 137483; Samim Anghaie; Sylvie Delaplace; Marie-Hélène Lavergne
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Fax:+33 1 53 58 32 11
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e-mail: bjolly@sfen.fr

NOT FOR PUBLIC DISCLOSURE NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

om: Apostolakis, George
nt: Monday, April 04, 2011 2:30 PM
o: Sosa, Belkys; Snodderly, Michael; Davis, Roger
Cc: Blake, Kathleen; Smiroldo, Elizabeth
Subject: FW: ICAPP 2011- France/Nice- May 2 to 5

Should I accept this invitation? NOT FOR PUBLIC DISCLOSURE

GA

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Frank Carre
CEA/DEN
Direction de l'Energie Nucléaire / Nuclear Energy Division Directeur scientifique / Scientific Director
Tel.: + 33 1 69 08 63 41

-----Message d'origine-----
: Apostolakis, George [mailto:George.Apostolakis@nrc.gov]
voyé : lundi 27 décembre 2010 18:33
A : 'Bernard Jolly'

Cc : Georges SERVIERE; GAUTHIER Jean Claude (AREVA); CARRE Frank 086652; b.fourest@nucsafeconsulting.com; SAFA Henri 137483; Samim Anghaie; Sylvie Delaplace; Marie-Hélène Lavergne Objet : RE: ICAPP 2011- France/Nice- May 2 to 5

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Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS 016 G4
11555 Rockville Pike
Rockville, MD 20852

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From: Bernard Jolly [mailto:bjolly@sfen.fr]
Sent: Thursday, December 23, 2010 11:40 AM
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Bernard Jolly
Executive Director
French Nuclear Society
Tel:+33 1 53 58 32 25
Fax:+33 1 53 58 32 11
Cell (b)(6)
e-mail: bjolly@sfen.fr

Apostolakis, George

om: Apostolakis, George
nt: Tuesday, April 05, 2011 5:09 PM
o: Blake, Kathleen; Sosa, Belkys; Davis, Roger
Subject: Fw: Courtesy Visit, Blue Castle Holdings

Can we accommodate the former Chairman?

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Nils Diaz <nilsdiaz@bluecastleproject.com>
To: Apostolakis, George
Sent: Tue Apr 05 15:50:25 2011
Subject: Courtesy Visit, Blue Castle Holdings

Dear George,
I hope you are beginning to breathe better (surely not easier) from the accidents in Japan. I do not cease to be amazed at the response. Lots of work from it.
I would like to respectfully request a slot in your schedule for a short drop-in visit with the principals of Blue Castle Holdings (BCH), now that we have commenced pre-application activities for the Blue Castle Project ESP application. The purpose of the visit is to introduce you to BCH's CEO and COO, to the Company and the licensing plan.
We will be in the White Flint Area next week, with an already scheduled visit with the staff at 2 PM on Thursday, April 14, 2011. Thursday would be ideal but we could also do Wednesday, April 13. I apologized for the short noticed but Fukushima disturbed our scheduling.
I would also be available for a separate discussion, as needed.
Please have your staff contacted me at this additional email address or at (b)(6)
Best regards,

Nils Diaz
Chief Strategic Officer
Blue Castle Holdings, Inc.

Apostolakis, George

From: Apostolakis, George
Sent: Wednesday, April 06, 2011 7:34 AM
To: Baggett, Steven; Sosa, Belkys; Snodderly, Michael; Davis, Roger
Subject: Re: NMSS Staff Interests

Let's discuss this at the staff meeting tomorrow.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Baggett, Steven
To: Sosa, Belkys; Apostolakis, George
Cc: Blake, Kathleen; Savoy, Carmel
Sent: Wed Apr 06 05:23:29 2011
Subject: FW: NMSS Staff Interests

Commissioner, Belkys,

For awareness.

Steve

From: Doolittle, Elizabeth
Sent: Friday, April 01, 2011 3:42 PM
To: Baggett, Steven
Cc: Haney, Catherine
Subject: NMSS Staff Interests

Hi Steve,

Here are some thoughts expressed by our staff that Commissioner Apostolakis might consider commenting on as our featured speaker at the NMSS All Staff Meeting on April 13. We are very much looking forward to his joining us here in EBB for the meeting, and will benefit from any and all topics he would like to talk to us about.

What are your perspectives on the impacts the events in Japan will have on the U.S. nuclear industry, both in the short term and over the long run? Will new seismic vulnerability assessments need to be performed for existing licensed reactor facilities? Will new reactor plant construction in the U.S. be effected?

For fuel cycle facilities, how have your views evolved over recent months on the need for PRAs as a regulatory tool? What should be our policy with regard to addressing external events in these risk assessments?

In terms of revising the fuel cycle oversight process, what cornerstones are most significant in your mind?

What are your thoughts about incorporating the PRA into the licensing process for reprocessing facilities when and if the time comes? How should human performance be addressed?

If you need more information, don't hesitate to give me a call. Looking forward to seeing you in EBB the week after next!

Beth Doolittle

Elizabeth L. Doolittle
Technical Assistant to the Office Director
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
(301) 492-3238

Apostolakis, George

om: Apostolakis, George
nt: Monday, April 04, 2011 10:10 PM
o: Sosa, Belkys
Subject: Re: Query: Friday interview?

We are in a bus to Knoxville. Don't know when we'll get there.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Sosa, Belkys
To: Apostolakis, George; Blake, Kathleen; Davis, Roger; Snodderly, Michael
Sent: Mon Apr 04 21:12:23 2011
Subject: Re: Query: Friday interview?

Ok. I'll let him know you are interested. I'll ask Elliott for intell..
I hope the travel delays are not too bad. Let me know if I can do anything to help.

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

---

om: Apostolakis, George
To: Sosa, Belkys; Blake, Kathleen; Davis, Roger; Snodderly, Michael
Sent: Mon Apr 04 19:00:10 2011
Subject: Re: Query: Friday interview?

I suppose we can do it this Friday.

PS: We are in Asheville, NC. The Knoxville airport is closed due to weather. We are waiting for updates from UA.

George Apostolakis
Commissioner, US NRC
Blackberr (b)(6)

From: Sosa, Belkys
To: Blake, Kathleen; Apostolakis, George; Davis, Roger; Snodderly, Michael
Sent: Mon Apr 04 18:01:51 2011
Subject: Query: Friday interview?

Commissioner, are you interested in the interview request from the NY Times editorial writer? This one is a little different and unusual. Roger mentioned that both Diaz and Klein were interviewed while Chairman. We could negotiate a different date, if you are interested.

anks,
lkys ~~NOT FOR PUBLIC DISCLOSURE~~

From: Boffey, Philip [mailto:phboff@nytimes.com]
Sent: Monday, April 04, 2011 4:01 PM
To: Sosa, Belkys
: CMRAPOSTOLAKIS Resource
bject: Friday interview?

Hi Belkys:

I'm the primary editorial writer at the Times dealing with nuclear issues. In the wake of the Japanese nuclear plant accident, it seems clear that I will need to follow the nuclear safety issue in this country and abroad closely for the forseeable future.

I'm wondering if it would be feasible for me to interview Dr. Apostolakis and you or other appropriate staff members for, say, half an hour on this coming Friday, April 8th. The interview would be on background, would seek your views on the key issues to keep my eye on, and mostly just let you size me up for future reference. I'm hoping to establish enough mutual confidence that I can bounce questions off of Dr. Apostolakis and you and and get background replies as key issues arise. I've done that with mutually satisfactory results on health care reform issues, mostly because key officials recognize that I'm not looking for breaking news or direct quotes but rather for guidance on how to interpret information that is publicly available.

I'll be making a similar request of other commission members and their chiefs of staff.

Philip M. Boffey
Editorial Writer
The New York Times
620 Eighth Avenue
New York, N.Y. 10018
Phone: (212) 556-4485
Fax: 212-556-3815
Email: phboff@nytimes.com

Apostolakis, George

om: Achilles Adamantiades [aadaman@icgaeolian.com]
nt: Thursday, April 07, 2011 11:11 AM
o: CMRAPOSTOLAKIS Resource
Subject: Presentation by Prometheas

Dear George,

The Prometheas Society, a cultural organization in our area for many years, has decided to organize a panel discussion on the Japanese earthquake/tsunami and nuclear accident at Fukushima. Naturally, your name came up as a potential and most suitable panelist to which we would be pleased to invite you. We understand, of course, the sensitivity of the matter and especially the delicate position of a Commissioner of the government and we would be prepared to accept you position if you decline the invitation. The event is being organized for the beginning of May.

If you have a private e-mail address and wish to continue our communication this way, please, let me have it.

Best regards,

Achilleas

Achilles G. Adamantiades, Ph.D.
Consultant
Energy and the Environment

500 K Str., NW, Ste. 650 | Washington, DC 20006
l: 202-783-4700 (x824) | Fax: 202-783-4701
Direct: 202-719-8824
Cell: (b)(6)
aadaman@icgaeolian.com

Apostolakis, George NOT FOR PUBLIC DISCLOSURE

From: kiyoshi_yamauchi@mnes-us.com
Sent: Friday, April 08, 2011 4:10 PM
To: Apostolakis, George
Cc: frank_gillespie@mnes-us.com; masayuki_fujisawa@mnes-us.com; shinji_kawanago@mnes-us.com
Subject: Mitsubishi Statement on Northeastern Earthquake and Tsunami in Japan
Attachments: MNES Statement on North Eastern Earthquake and Tsunami in Japan.pdf

U.S. Nuclear Regulatory Commision
Commisioner
Dear Mr. George Apostolakis

I highly appreciate the efforts taken by the strong leadership of the NRC to support current nuclear energy fleet with high safety and reliability following the Fukushima Daiichi event caused by the northeastern Japan earthquake and resulting tsunami.

We at Mitsubishi Nuclear Energy Systems(MNES),subsidiary to Mitsubishi Heavy Industries(MHI), posted our statement on our home page attached below (http://www.mnes-us.com/) expressing our sympathies to all victims affected by the desaster and also describing Mitsubishi contribution our technology and experience wherever possible to help resolve the situation at the Fukushima Daiichi site. It is noted that Mitsubishi is also continuing to give complete technical support to the clients of the 24 PWR units in Japan, which Mitsubishi supplied, in order to immediately implement the new highest safety measures required by the Japanese government.

We also emphasize that we have formed the "MNES Response & Support Team for Fukushima Event", collecting and sharing related information, investigating US-APWR design considering the NRC instructions, supporting US customers and enhancing public relations.

We think co-operation with the same direction between US and Japan to overcome this event is quite important not onlt in the area of government but also in the area of industries. Lessones learned should be shared timely and good results should be obtained as the best practice by the co-operated activities.

Our responsibility is quite large in continuing to provide the highest level of safety and reliable nuclear plants here in the USA.

We will be pleased to be advised if you have any comments or you need any support.

Best Regards, Kiyoshi Yamauchi

President and CEO
Mitsubishi Nuclear Energy Systems, INC.
1001 19th Street North, Suite 2000
Arlington, VA 22209
Tel:703.908.4340
Cell (b)(6)
Fax:703.908.4399

NOT FOR PUBLIC DISCLOSURE

cc:Frank Gillespie, MNES
Shinji Kawanago, MNES
Masayuki Fujisawa, MNES

NOT FOR PUBLIC DISCLOSURE

This e-mail and any of its attachments are intended only for the use of the individual or entity to which they are addressed and may contain information that is legally privileged, confidential and exempt from disclosure. If you are not the intended recipient, you are hereby notified that any dissemination, distribution, or copying of this message, or any attachment, is strictly prohibited. If you have received this message in error, please notify the original sender or the IT Manager of Mitsubishi Nuclear Energy Systems, Inc., Arlington Office immediately by telephone (703-908-8040) or by return e-mail and delete this message, along with any attachments, from your computer. Thank you.

NOT FOR PUBLIC DISCLOSURE

MNES
Mitsubishi Nuclear Energy Systems

MNES Statement on North Eastern Earthquake and Tsunami in Japan

We at Mitsubishi Heavy Industries (MHI) and Mitsubishi Nuclear Energy Systems (MNES) send our deepest sympathies to all victims affected by the earthquake and the resulting tsunami that devastated the coast of northeastern Japan on Friday, March 11th.

Since the day of the events, the Japanese Government and Tokyo Electric Power Company have been making every possible effort to ensure plant safety for the Fukushima Daiichi site that was severely impacted by the earthquake and tsunami.

As an expression of our grave concern and strong desire to offer our utmost assistance at this tragic time, MHI, which is a leading pressurized water reactor (PWR) nuclear power plant supplier, and its group companies including MNES pledged on Monday, March 14th, to contribute an amount equivalent to $6 million to support relief and recovery efforts in the affected areas.

Mitsubishi will continue to contribute our technology and experience wherever possible to help resolve the situation at the Fukushima Daiichi site. In addition, on Thursday, March 30th, the Japanese government ordered all utilities operating nuclear power plants in Japan to implement emergency safety measures by the end of April based on the Fukushima incidents. Mitsubishi has supplied 24 PWR units in Japan and although these units were not impacted by the earthquake and tsunami, Mitsubishi is continuing to give its complete technical support to its client utilities in order to immediately implement the new emergency safety measures.

Through these activities, MNES, as MHI's U.S. affiliate, will ensure that US-APWR plants planned for construction in the United States are of the highest level of safety and reliability.

###

PRESS CONTACTS:
Patrick Boyle
703-528-5493
Patrick@longbottomcommunications.com

Apostolakis, George

From: Neil Todreas [todreas@MIT.EDU]
Sent: Monday, April 11, 2011 1:02 PM
To: nse-prof; Hanninen Hannu; Michael Podowski Z
Subject: Ninokata : Japan Times News Article

FYI neil

Begin forwarded message:

From: "Hisashi NINOKATA " <hninokat@nr.titech.ac.jp>
Date: April 11, 2011 10:00:02 AM EDT
To: "Woody Epstein" <sep@scandpower.com>
Cc: "Neil Todreas" <todreas@MIT.EDU>, "Dr Jason Chao" (b)(6) <Shchang@kaist.ac.kr>, "Xiaodong Sun" <sun.200@osu.edu>, <ricottime@teletu.it>, "Hisashi NINOKATA " <hninokat@nr.titech.ac.jp>
Subject: Japan Times News Article

Woody,

I have been in TEPCO all day and in JSC (Japan Science Council in NOGI-ZAKA). I attended two consecutive meetings on current NPP status and on the long term mitigation strategy. With so much information to confirm our thinking and to share with a technical group of representatives from TEPCO, together with Hitachi, Toshiba, NISA, and JAEA, I will talk to you tomorrow afternoon.

Japan Times has interviewed me the last Saturday and put a special report on one month of the Fukushima Daiichi Nuclear Accident. They have skipped mentioning I am sharing information as well as working together with you. Except that and a few misunderstandings I found, I m impressed the article is well written. The following is included in the article tomorrow:

``The leakage (from the reactors) has to be stopped. Leaking means the water inside the reactors is decreasing. So the water has to be replenished, and then it leaks again. This cycle has to be stopped,'' said Hisashi Ninokata, professor of nuclear reactor engineering at Tokyo Institute of Technology.

But now some experts, including Ninokata, have started floating the idea of adding a brand new external cooling system to the reactors as a temporary measure, given the daunting task of removing the highly contaminated water from the building housing the RHRS.

``It will probably take half a year or a year to restart the RHRS, so the external cooling system needs to be used during that period of time,'' he said, adding that the work to set up an external cooling system could be finished in a few weeks once such a decision has been made.

Ninokata added that there is a chance the existing RHRS was severely damaged by the tsunami, so it might even be better, in addition to a new external cooling system, to set up a brand new RHRS outside the turbine building. This could be completed in a couple of months, Ninokata said.

Ninokata said it is true the Fukushima accident has proven that safety measures for tsunami are not enough, but he said the accident will not be a Chernobyl repeat.

The chances of another hydrogen explosion at the facility is low, as Tepco has instigated a number of measures, including injecting nitrogen into the troubled reactors in order to purge hydrogen from them. (<<< mistake--- too late to correct)

But even if another explosion occurs, the containment vessel will not blow up, although it might be damaged to some extent, he said.

What's more, unlike the Chernobyl accident, where the graphite moderator burned and released massive amounts of radioactive materials into the air, there are no flammable materials inside the Fukushima reactors.

``The leakage of radioactive material has been far less,'' Ninokata said.

Best regards,
Hisashi

****
Neil E. Todreas
KEPCO Professor of Nuclear Science and Engineering and Professor of Mechanical Engineering (Emeritus)
MIT, 24-205
Tel. 617/253-5296
Fax. 617/258-8863
todreas@mit.edu
****

Apostolakis, George NOT FOR PUBLIC DISCLOSURE

From: Apostolakis, George
Sent: Monday, April 18, 2011 11:46 AM
To: Blake, Kathleen
Cc: Sosa, Belkys
Subject: RE: Presentation by Prometheas

Yes, I did. The presentation is on May 19.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Blake, Kathleen
Sent: Monday, April 18, 2011 11:39 AM
To: Apostolakis, George
Cc: Sosa, Belkys
Subject: FW: Presentation by Prometheas

Cmr: Did you reply to Dr. Achilles? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: CMRAPOSTOLAKIS Resource
Sent: Thursday, April 07, 2011 11:35 AM
To: Blake, Kathleen
Subject: FW: Presentation by Prometheas

NOT FOR PUBLIC DISCLOSURE

From: Achilles Adamantiades [mailto:aadaman@icgaeolian.com]
Sent: Thursday, April 07, 2011 11:11 AM
To: CMRAPOSTOLAKIS Resource
Subject: Presentation by Prometheas

Dear George,

The Prometheas Society, a cultural organization in our area for many years, has decided to organize a panel discussion on the Japanese earthquake/tsunami and nuclear accident at Fukushima. Naturally, your name came up as a potential and most suitable panelist to which we would be pleased to invite you. We understand, of course, the sensitivity of the

matter and especially the delicate position of a Commissioner of the government and we would be prepared to accept you position if you decline the invitation. The event is being organized for the beginning of May.

u have a private e-mail address and wish to continue our communication this way, please, let me have it.

Best regards,

Achilleas

Achilles G. Adamantiades, Ph.D.
Consultant
Energy and the Environment

1600 K Str., NW, Ste. 650 | Washington, DC 20006
Tel: 202-783-4700 (x824) | Fax: 202-783-4701
Direct: 202-719-8824
Cell (b)(6)
aadaman@icgaeolian.com

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

From: Michael Corradini [corradini@engr.wisc.edu]
Sent: Sunday, April 17, 2011 8:38 PM
To: (b)(6)
Cc: Chapin, Doug; todreas
Subject: Re: Fwd: RE: UPDATE#2: OUR NEAC MEETING - APRIL 20th
Attachments: NRC Transparancy.docx

I am copying Doug and Neil too. I personally do not see violations be ignored.

I think NRDC sees a chance to push an agenda.

The NRC task force is taking their job VERY seriously - not due to violations!
--

Michael Corradini, Chair
Engineering Physics
University of Wisconsin
(608)263-1648 [Fax: 3-7451]
corradini@engr.wisc.edu
http://www.engr.wisc.edu/ep

Quoting (b)(6)

> What is causing Cochran and Markey to believe that the observed
> Fukushima plant
> accident progressions were due to components not being in compliance?
> Granted, the NRC may see some components that could be moved to 'less
> risky'
> locations or
> 'some' additional components required. In addition, efforts to pack
> the fuel in the SFPs will probably cease (and maybe someone should
> revisit Yucca), but he seems fixated on the key aspect of the
> accident being that they were in violation of some rules...
>
>
> Joy
>
> NRC Transparancy.docx (12.8 Kb) attached
>
> ----- Original Message -----
> From: 'Cochran, Tom' <tcochran@nrdc.org>
> To: 'Michael Corradini' <corradin@cae.wisc.edu>,
> 'Neil Todreas' <todreas@MIT.EDU>, 'Doug Chapin' <dchapin@mpr.com>,
> 'Harold.Ray' <Harold.Ray@sce.com>,
> 'JOY REMPE' (b)(6)
> 'Ashok Bhatnagar' <asbhatnagar@tva.gov>
> Sent: Sun Apr 17 9:20
> Subject: Fwd: RE: UPDATE#2: OUR NEAC MEETING - APRIL 20th
>
>

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

> Mike,Â Thanks for your thoughts. Â I have a little different view of some of these matters, particularly with respect to the Gen IIs.Â I have lost confidence in the NRC process. Â What I am hearing and reading (see attached) is that the majority of Commissioners were
> oppose to any transparency in the 90-day review, they have taken steps
> to minimize production of discoverable documents and Â they will hide
> behind national security exemptions (9/11) to avoid publicizing any
> discrepancies they find. Moreover, you cannot ask the NRC to be the
> primary group to investigate its own regulatory failings. Â Among
> other tasks, NRC staff should review every operational reactor to
> identify and list every departure from current safety regulations,
> regulatory guides, information bulletins, best practices, etc.R12;
> every wavier, every unresolved safety issue, every grandfathered
> practice that is no longer appropriate. Â NRC staff is the only group
> that could do this well.Â In the meantime we should be calling for a
> truly independent technical review by a group that can engender public
> confidence. The Administration has dropped the ball here. We should
> see whether NEAC can pick it up. Â I think there are a lot of folks
> who donR17;t fully appreciate the implications of what happened at
> Fukushima.Â BestR12;Â TomÂ From:
> Michael Corradini
> [mailto:corradin@cae.wisc.edu] Sent: Saturday, April 16, 2011 7:11
> PMTo: Neil Todreas; Doug Chapin; Harold.Ray; JOY REMPE; Ashok Bhatnagar; Cochran, TomCc:
> Chuck WadeSubject: UPDATE#2: OUR NEAC MEETING - APRIL 20thÂ Â Tom -Â Â
> I have been giving more thought to your comment. We can discuss it in
> person, but I think that the NRC and DOE as well as the international community is fully engaged in determining appropriate lessons from the 11 accident. Here is some of my thinking on this.Â Current reactors
> (so-called GenII): The NRC task force is taking the lead (with DOE et
> al) on determining what occurred, what are the radiological dose
> implications and what are the relevant issues for US reactors.Â Â
> Advanced LWRs (Gen III): The lessons-learned from the NRC task force
> will be applied here, since DOE will work with the vendors to scrub
> certified designs (or those to be certified). Also, the IAEA is taking
> a large role in working with the Japanese.Â Â Lastly, Gen IV reactors:
> These will be reviewed and that will likely be part of our job with
> NEAC. I expect that our own letter will be delayed somewhat for this,
> but I want to keep moving on what we have been discussingÂ MikeÂ Â Â
> Folks -- My concern is that the letter was drafted prior to
> Fukushima.Secretary Chu and the Congress may want to know what we
> believe are theimplications of Fukushima for this project. I do not
> have an immediateanswer/suggestion, but we should at least think about
> it and discuss howto address this issue.Tom-----Original
> Message-----From: Michael Corradini [mailto:corradin@cae.wisc.edu]
> Sent: Friday, April 15, 2011 12:46 PMTo: Neil Todreas; Doug Chapin; Harold.Ray; JOY REMPE;
Ashok Bhatnagar;Cochran, TomCc:
> Chuck WadeSubject: UPDATE#2: OUR NEAC MEETING - APRIL 20thFolks -Â Â
> Joy has been very helpful in revising the "living" letter fromNEAC to
> Sec. Chu on NGNP. Here is a version for you to look at forWednesday.
> It takes some pretty strong positions on Design andimplications for
> site and licensing. Clearly this is a strawman. Iexpect we will discuss this initially on Wednesday but will need moretime to chew on this and our R&D impressions for our final letter.Â Thanks, MIkeÂ

> ---- Msg sent via (b)(6)

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

From: Apostolakis, George
Sent: Saturday, April 23, 2011 1:06 PM
To: Snodderly, Michael
Subject: Re: Worthwhile Slide Presentation by Tepco

Thanks, Mike. I read the WSJ article. Very good. GA

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Snodderly, Michael
To: Apostolakis, George
Cc: Sosa, Belkys; Gilles, Nanette; Baggett, Steven; Monninger, John; Davis, Roger; Cubbage, Amy
Sent: Sat Apr 23 12:24:37 2011
Subject: Worthwhile Slide Presentation by Tepco

Commissioner,

Attached please find a very worthwhile slide presentation that Tepco released on April 18th. It is one of the best summaries of the Fukushima event that I have seen.

I know that you are not a big fan of the Wall Street Journal but there was an excellent article on today's front page concerning the venting of Fukushima Daiichi Unit 1 based on testimony by Tepco Executives to the Japanese Parliament last week. The article states that Tepco did not vent the containment until it had reached double the containment design pressure. Tepco said that this was done on purpose because of their fear of releasing radioactive material from the plant to the public and that they believed the containment was capable of handling twice the design pressure. This belief may have come from testing that the Japanese sponsored at Sandia National Laboratory where they pressurized a steel containment until failure and found that it failed at a pressure greater than twice design pressure. Please recall from our conversation last week that Mark I containments in the U S have design pressures ranging from 56 to 62 psig. For the sake of argument, let's assume that they vented at 120 psig. I don't think the hardened vent installed in most U S plants could handle that pressure which is why our severe accident management guidelines recommend venting at pressures closer to containment design pressure.

The article goes on to contend that the hardened vent leaked at this elevated pressure which allowed hydrogen gas and steam to build up in the Reactor Building. After the steam condensed, the resulting hydrogen burn failed the building and resulted in a more energetic release than would have occurred had it happened through an intact hardened vent and out the stack when winds were blowing off shore earlier in the accident. I am going to check with John Monninger and the staff but to me this seems like a very plausible scenario.

See you Monday,

Mike Snodderly
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-2241
E-mail: michael.snodderly@nrc.gov

Apostolakis, George

From: Apostolakis, George
Sent: Tuesday, April 26, 2011 8:48 AM
To: Stratos Tavoulareas
Subject: RE: Xronia Polla

Strato:

It's a bit early for me to know exactly what I will talk about. The events are still unfolding in Japan.

Here is a broad overview. I am cognizant of the fact that the audience knows nothing about nuclear power.

1. Brief introduction to nuclear power.
2. Safety philosophy (defense in depth)
3. Mark 1 BWRs
4. Description of the Fukushima accident.
5. Implications for US reactors.

If I think of anything else, I'll let you know.

George

Commissioner George Apostolakis
US Nuclear Regulatory Commission
e White Flint North, MS O16 G4
55 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Stratos Tavoulareas [mailto (b)(6)
Sent: Monday, April 25, 2011 5:58 PM
To: Apostolakis, George
Subject: Xronia Polla

George

Best wishes for your nameday and Easter.

When you get a chance (and if you time allows it) we would greatly appreciate it if you could send us an outline of your talk (the key topics you will discuss) so the panelist can prepare appropriately.

Best regards

Stratos Tavoulareas
ergy Technologies Enterprises Corp (EnTEC)
4 Perry William Dr.

McLean VA 22101

Tel: 703 506 3948

Mail Address: stavoulareas@enteconline.com

Apostolakis, George

From: Apostolakis, George
Sent: Wednesday, April 27, 2011 9:19 AM
To: Stratos Tavoulareas
Subject: RE: Xronia Polla
Attachments: George Apostolakis-27Apr11.pdf

Here it is.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Stratos Tavoulareas [mailto:(b)(6)
Sent: Tuesday, April 26, 2011 5:47 PM
To: Apostolakis, George
Subject: RE: Xronia Polla

Many thanks.

When you get a chance (no rush), I appreciate if you can send me your CV or a brief bio to introduce you.

Many thanks

Stratos Tavoulareas
Energy Technologies Enterprises Corp (EnTEC)
1204 Perry William Dr.

McLean VA 22101

Tel: 703 506 3948

Email Address: stavoulareas@enteconline.com

From: Apostolakis, George [mailto:George.Apostolakis@nrc.gov]
Sent: Tuesday, April 26, 2011 8:48 AM
To: Stratos Tavoulareas
Subject: RE: Xronia Polla

Strato:

It's a bit early for me to know exactly what I will talk about. The events are still unfolding in Japan.

It is a broad overview. I am cognizant of the fact that the audience knows nothing about nuclear power.

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5. Implications for US reactors.

If I think of anything else, I'll let you know.

George

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Stratos Tavoulareas [mailto (b)(6)
Sent: Monday, April 25, 2011 5:58
To: Apostolakis, George
Subject: Xronia Polla

George

Best wishes for your nameday and Easter.

When you get a chance (and if you time allows it) we would greatly appreciate it if you could send us an outline of your talk (the key topics you will discuss) so the panelist can prepare appropriately.

Best regards

Stratos Tavoulareas
Energy Technologies Enterprises Corp (EnTEC)
1204 Perry William Dr.

McLean VA 22101

Tel: 703 506 3948

Email Address: stavoulareas@enteconline.com

George Apostolakis

The Honorable George Apostolakis was sworn in on April 23, 2010 as a Commissioner of the U.S. Nuclear Regulatory Commission (NRC) after he was nominated by President Obama and confirmed by the US Senate. His term ends on June 30, 2014.

Dr. Apostolakis has had a distinguished career as an engineer, professor and risk analyst. Before joining the NRC, he was the Korea Electric Power Corporation professor of Nuclear Science and Engineering and a professor of Engineering Systems at the Massachusetts Institute of Technology.

In 2007, Dr. Apostolakis was elected to the US National Academy of Engineering for "innovations in the theory and practice of probabilistic risk assessment and risk management." He was elected as a corresponding member of the Academy of Athens in 2011.

He has served as the Editor-in-Chief of the International Journal *Reliability Engineering and System Safety* and is the founder of the International Conferences on Probabilistic Safety Assessment and Management. He received the Tommy Thompson Award for his contributions to improvement of reactor safety in 1999 and the Arthur Holly Compton Award in Education in 2005, both from the American Nuclear Society.

Dr. Apostolakis received his diploma in electrical engineering from the National Technical University in Athens, Greece in 1969. He earned a master's degree in engineering science in 1970 and a Ph.D. in engineering science and applied mathematics in 1973, both from the California Institute of Technology.

#909

Mike, Linda

From: (b)(6)
Sent: Wednesday, April 27, 2011 11:34 AM
To: NRCExecSec Resource
Subject: Lessons Learned From Chernobyl, Fukushima

Chairman Dale E. Klein
Via Annette L. Vietti-Cook
Secretary of the Commission
U.S. Nuclear Regulatory Commission
Mail Stop O-16G4
Washington, DC 20555-0001
(301) 415-1969, 1-800-368-5642, 301-415-7000
TTD: 301-415-5575
E-mail: NRCExecSec@nrc.gov

Re: Lessons Learned From Chernobyl, Fukushima

Dear Chairman:

There lessons to draw from the nuclear disaster last month in Japan and the one 25 years ago in Ukraine. Nuclear energy expert Matthew Bunn, of Harvard's Belfer Center for Science and International Affairs, makes some comments about things that need to be improved.

I draw your attention to:

Lessons Learned From Chernobyl, Fukushima
http://www.npr.org/2011/04/27/135760781/chernobyl-nuclear-disaster-has-lessons-for-japan

I hope you will take the time to review these remarks and give them the weight they deserve.

Thank you for the opportunity to bring this audio file to your attention.

Yours sincerely,
Robert E. Rutkowski

cc: The White House

(b)(6)
P/F (b)(6)
E-mail: (b)(6)

Cmr. Apostolakis
1 Belkys Sosa
2 Roger Davis
3 ~~Steve Baggett~~
4 ~~Mike Snodderly~~ NA
Kathleen Blake
6 Carmel Savoy
~~File~~
4 Japan Events
5. Chris Lui

4/27...Copy to: Chairman, Comrs, EDO, OGC
NOTE: The video mentioned in the attached e-mail can be accessed by the provided link (see attached).

om: Apostolakis, George
nt: Wednesday, May 04, 2011 3:45 AM
: Snodderly, Michael
Cc: Blake, Kathleen; Savoy, Carmel; Sosa, Belkys; Baggett, Steven; Davis, Roger; Gilles, Nanette
Subject: Re: Friendly Reminder (GBJ, GEA & WDM) - CORR-11-0057 & CORR-11-0058

The letters are fine.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Snodderly, Michael
To: Apostolakis, George
Cc: Blake, Kathleen; Savoy, Carmel; Sosa, Belkys; Baggett, Steven; Davis, Roger; Gilles, Nanette
Sent: Tue May 03 17:25:01 2011
Subject: RE: Friendly Reminder (GBJ, GEA & WDM) - CORR-11-0057 & CORR-11-0058

Commissioner,

Attached are my and Steve's comments on CORR 11-0057 and 11-0058 for your consideration.

ke

CORR-11-0057 – Letter to SEN Barbara Boxer, responds to letter urging NRC to ensure transparency and openness in NRC's review and evaluation of recent events in Japan; and

CORR-11-0058 – Letter to SEN Maria Cantwell, responds to letter posing a number of questions regarding the potential impacts of the events in Japan on the citizens of the State of Washington

Commissioner comments on the subject correspondence (2 CORRs) are due tomorrow, May 4, 2011.

Keep in mind that if required, up to an additional 2 business days for review will be granted to a Commissioner who is on short-term absence from the Office. If a Commissioner is unavailable for comment for an extended period of time, and has delegated authority for his or her staff to respond in his or her absence, Commissioner staff comments will be taken into consideration (Internal Commission Procedures, dated 08/04/2006, page V-7).

Linda Mike, SECY

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Gilles, Nanette

From: Gilles, Nanette
Sent: Tuesday, May 10, 2011 3:28 PM
To: Schmidt, Rebecca
Cc: Combs, Thomas; Powell, Amy; Davis, Roger; Baggett, Steven; Savoy, Carmel
Subject: Brian Sheron Draft Testimony for 5/13 House Hearing

Commissioner Apostolakis has the following comments on Brian Sheron's testimony for the Hearing on Friday, May 13, 2011 before the House Committee on Science, Space and Technology, Subcommittee on Energy and Environment and Subcommittee on Investigation and Oversight.:

(b)(5)

(b)(5)

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(b)(5)

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

NOT FOR PUBLIC DISCLOSURE

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Gilles, Nanette

From: Gilles, Nanette
Sent: Thursday, May 12, 2011 5:05 PM
To: Baggett, Steven
Subject: Commissioners Assistants Briefing Notification

Steve – Here is the number for the HOO Call on Tuesday.

From: Snodderly, Michael
Sent: Tuesday, May 03, 2011 12:53 PM
To: Gilles, Nanette
Subject: Fw: Time Change: 1330 EDT Commissioners Assistants Briefing Notification

See below for call in number

Sent from my NRC Blackberry
at (b)(6)

From: ANS.HOC@nrc.gov <ANS.HOC@nrc.gov>
Sent: Tue May 03 09:36:32 2011
Subject: Time Change: 1330 EDT Commissioners Assistants Briefing Notification

There will be a Commissioners Assistants Briefing given by the NRC HQ at 1330 EDT concerning the Reactor ents in Japan. Call (b)(6) approximately 5 minutes before the scheduled start time. When mpted, enter security code (b)(6) ou may call 301-816-5164 at this time and follow the voice prompts if you do not wish to receive this notification from our Automatic Notification System.

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From: Apostolakis, George
Sent: Friday, May 13, 2011 11:02 AM
To: Gilles, Nanette
Cc: Sosa, Belkys; Davis, Roger; Baggett, Steven
Subject: Re: Chairman's Office Interaction on 4/28 Commission Meeting SRM

(b)(5)

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Gilles, Nanette
To: Apostolakis, George
Cc: Sosa, Belkys; Davis, Roger; Baggett, Steven
Sent: Fri May 13 10:55:33 2011
Subject: Chairman's Office Interaction on 4/28 Commission Meeting SRM

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

Apostolakis, George

m: Apostolakis, George
t: Tuesday, May 17, 2011 10:58 AM
Blake, Kathleen
Subject: Re: Chuck Casto Periodic re Japan on May 19 at 2:30

Please do.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Blake, Kathleen
To: Apostolakis, George
Cc: Baggett, Steven; Sosa, Belkys
Sent: Tue May 17 09:31:59 2011
Subject: RE: Chuck Casto Periodic re Japan on May 19 at 2:30

Cmr – you can invite anyone you like to this meeting with Chuck. Shall I invite all staff? kb

Kathleen H. Blake
Administrative Assistant
to Commissioner Apostolakis
Nuclear Regulatory Commission
55 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Apostolakis, George
Sent: Monday, May 16, 2011 6:36 PM
To: Blake, Kathleen
Cc: Baggett, Steven; Sosa, Belkys
Subject: RE: Chuck Casto Periodic re Japan on May 19 at 2:30

Yes, if Chuck agrees.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Blake, Kathleen
nt: Monday, May 16, 2011 10:02 AM
postolakis, George
Baggett, Steven; Sosa, Belkys
Subject: Chuck Casto Periodic re Japan on May 19 at 2:30

Cmr: Chuck Casto will be in town on Thursday, May 19, and will be giving you a one-on-one meeting/periodic re the events in Japan. Did you want the staff to be included as well? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

Apostolakis, George

om: Apostolakis, George
nt: Saturday, May 21, 2011 11:33 AM
: 'Stratos Tavoulareas'; 'Achilles Adamantiades'; Traiforos, Spyros; (b)(6)
ikessides@worldbank.org
Cc: 'ELEFTHERIOS KARMIRIS'
Subject: RE: Fukushima

Strato:

Everything went well last Thursday; no need to accept responsibility for anything, except for the event's success.

I enjoyed the meeting and learned from my fellow panelists and the audience's questions.

George

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

---

om: Stratos Tavoulareas [mailto:stavoulareas@enteconline.com]
nt: Friday, May 20, 2011 5:19 PM
To: 'Achilles Adamantiades'; Traiforos, Spyros; Apostolakis, George; (b)(6) ikessides@worldbank.org
Cc: 'ELEFTHERIOS KARMIRIS'
Subject: Fukushima

Dear Friends

On behalf of Prometheas, I would like to thank you for your participation and important contribution in last night's event. The feedback we received was very positive; I am sure that the presentations and discussion helped the audience understand better what happened in Japan and why nuclear is an essential energy option. I accept responsibility if everything was not perfect, but it was the first time we used this facility and we have more complications that usual.

Best regards and a good weekend

Stratos Tavoulareas
Tel: (b)(6)

Apostolakis, George

om: Woody Epstein [sep@scandpower.com]
nt: Tuesday, May 31, 2011 5:56 PM
o: Apostolakis, George
Subject: RE: Fukushima: Earthquake and Tsunami Report

Importance: High

Dear George,

I am the guy ... just using the name I am known by in Japan and Europe.

Thanks for the note. I do know how busy you are.

The important finding is that the mean value of the probability of a tsunami >= 8m and an earthquake >= Shindo +6 was about 1.02e-3 ... much bigger than CDF and LERF limits. Moreover, the tsunami wall at Daiichi was built in 1966, yet miraculously was up to standards in the 2002 guideline.

Steve

~~Woody~~ Steve Epstein
Senior Principal Consultant
Manager of Risk Consulting, Japan

Japan +81 (0)80-4401-5417
USA: (b)(6)
Type

From: Apostolakis, George [George.Apostolakis@nrc.gov]
Sent: Wednesday, June 01, 2011 05:29
To: Woody Epstein
Subject: RE: Fukushima: Earthquake and Tsunami Report

Thanks. I knew you under a different first name. However, I trust you are the same fun guy that I knew.

I'll read your report as soon as time permits.

Commissioner George Apostolakis

US Nuclear Regulatory Commission

One White Flint North, MS O16 G4

11555 Rockville Pike

ckville, MD 20852

(301) 415-1810

NOT FOR PUBLIC DISCLOSURE

From: Woody Epstein [mailto:sep@scandpower.com]
Sent: Monday, May 30, 2011 8:54 PM
To: apostola@mit.edu
Subject: Fukushima: Earthquake and Tsunami Report
Importance: High

Dear Don Giorgio,

As you might I have heard, I am now working for Scandpower, managing our operations in Japan.

I have also been named Visiting Research Scientist at Tokyo Institute of Technology, and I have been working for Professor Ninokata in his lab, helping the students understand PRA.

In April, I wrote a white paper for the lab examining the earthquake and tsunami at Fukushima Daiichi from the PRA point of view. I am attaching it for you; you can also share this with any colleauges.

The white paper was expanded as a confidential report for EDF. I delivered it this week. It is quite a comprehensive study (25,000 words) from the PRA viewpoint of the accident at Daiichi by asking the three fundemental questions: What went wrong? How likely was it? What are the consequences?

If you are interested in the report, I will ask EDF.

Epstein

Woody Epstein

Senior Principal Consultant

Manager of Risk Consulting, Japan

NOT FOR PUBLIC DISCLOSURE

Japan +81 (0)80-4401-5417

USA: (b)(6)

Skype

DISCLOSURE

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~~NOT FOR PUBLIC DISCLOSURE~~

Apostolakis, George

From: Apostolakis, George
Sent: Tuesday, June 07, 2011 12:50 PM
To: Baggett, Steven
Cc: Sosa, Belkys; Gilles, Nanette
Subject: RE: ACTION — Draft SRM regarding June 6th ACRS meeting

(b)(5)

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Baggett, Steven
Sent: Tuesday, June 07, 2011 9:11 AM
To: Apostolakis, George
Cc: Sosa, Belkys; Gilles, Nanette
Subject: ACTION --- Draft SRM regarding June 6th ACRS meeting

Commissioner,

(b)(5)

Thanks

Steve

~~NOT FOR PUBLIC DISCLOSURE~~

Apostolakis, George ~~NOT FOR PUBLIC DISCLOSURE~~

From: Apostolakis, George
Sent: Tuesday, June 07, 2011 12:35 PM
To: Gilles, Nanette; Baggett, Steven; Davis, Roger; Sosa, Belkys; Blake, Kathleen; Savoy, Carmel; Lui, Christiana
Subject: RE: 6/7 EA Meeting Summary

Nan:

I will need a summary of where the Fukushima accident stands today. I will need it for MIT next week, but will not include it in the slides.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Gilles, Nanette
Sent: Tuesday, June 07, 2011 11:35 AM
To: Baggett, Steven; Davis, Roger; Sosa, Belkys; Apostolakis, George; Blake, Kathleen; Savoy, Carmel; Lui, Christiana
Subject: RE: 6/7 EA Meeting Summary

The report that Japan provided to IAEA, Reactor TAs should be receiving it today. It was discussed in the weekly HOO call this morning. It will also be shared with the Japan Task Force.

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Baggett, Steven
Sent: Tuesday, June 07, 2011 11:14 AM
To: Gilles, Nanette; Davis, Roger; Sosa, Belkys; Apostolakis, George; Blake, Kathleen; Savoy, Carmel; Lui, Christiana
Subject: 6/7 EA Meeting Summary

- **OUO Information** - OI investigation Outside of Scope
- Fort Calhoun has 4 weeks of onsite fuel and will switch to onsite power when water level reaches 1006 feet. With the temporary berm, the plant will have not issues until the water reaches 1012 feet, per weather service the river not likely to crest that high.
- Bechtel has provided its report to Progress on options to repair containment at Crystal River plant. Progress to decide on the approach sometime next week. Progress is working under 50.59 provisions.
- Japan has provided a report on the event to the IAEA. Staff does not have a copy as of this time and no indication of the content of the report.

(b)(5)

Outside of Scope

(b)(5)

Gilles, Nanette

From: Sosa, Belkys
Sent: Thursday, June 09, 2011 10:13 AM
To: Gilles, Nanette; Baggett, Steven; Davis, Roger; Lui, Christiana
Subject: FYI: U.S. Industry Leadership in Response to the Fukushima Daiichi Nuclear Accidents
Attachments: The Way Forward 060611 (public) FinalA2.pdf; FSC Charter 060811.docx

fyi

From: PIETRANGELO, Tony [mailto:arp@nei.org]
Sent: Thursday, June 09, 2011 10:10 AM
To: Jaczko, Gregory; CMRSVINICKI Resource; Apostolakis, George; CMRMAGWOOD Resource; CMROSTENDORFF Resource; Borchardt, Bill; Virgilio, Martin
Cc: Batkin, Joshua; Sharkey, Jeffry; Bubar, Patrice; Nieh, Ho; Pace, Patti; Lepre, Janet; Blake, Kathleen; Crawford, Carrie; Herr, Linda; Taylor, Renee; Sosa, Belkys
Subject: U.S. Industry Leadership in Response to the Fukushima Daiichi Nuclear Accidents

In the aftermath of the March nuclear accident in Japan, the leadership of the U.S. nuclear energy industry has developed a comprehensive plan to guide and coordinate industry efforts. Attached for your information is *The Way Forward: U.S. Industry Leadership in Response to the Fukushima Daiichi Nuclear Accidents.* This document provides a description of our strategic goals, guiding principles, key stakeholders, and the structure and governance for the effort, which includes the related activities of NEI, INPO, EPRI and the NSSS Owners Groups.

Also attached for your information is the charter of the industry's Fukushima Response Steering Committee, which developed *The Way Forward* document and will provide direction and oversight of industry implementation. The Steering Committee is chaired by Chip Pardee of Exelon and the membership includes senior executives and chief nuclear officers from the industry organizations and several utilities.

We look forward to interactions with the NRC as we apply the lessons learned from Fukushima to our plants. If you have any questions regarding the attached documents, please contact me.

Anthony R. Pietrangelo
Senior Vice President and Chief Nuclear Officer

Nuclear Energy Institute
1776 I Street NW, Suite 400
Washington, DC 20006
www.nei.org

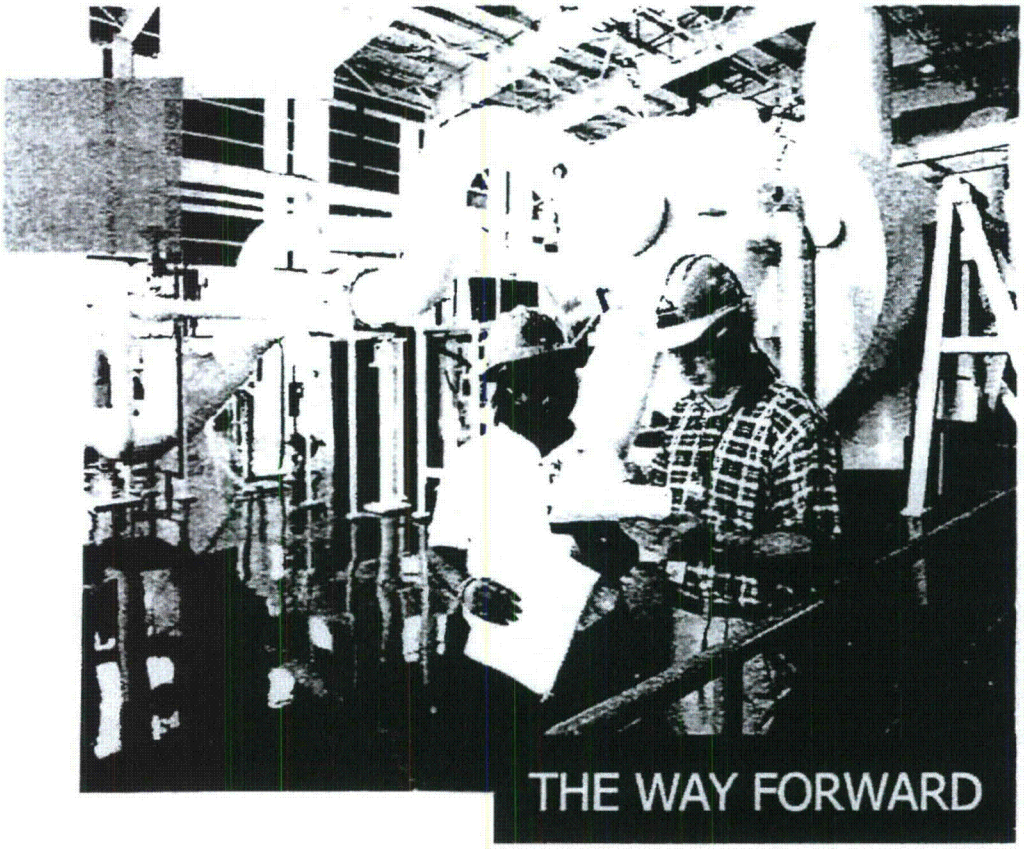
P: 202-739-8081
F: 202-533-0182
M (b)(6)
E: arp@nei.org

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U.S. Industry Leadership in Response to Events at the Fukushima Daiichi Nuclear Power Plant

NEI NUCLEAR ENERGY INSTITUTE

INPO®

EPRI ELECTRIC POWER RESEARCH INSTITUTE

June 8, 2011

1. EXECUTIVE SUMMARY

The earthquake and tsunami in Japan on March 11, 2011 and subsequent nuclear accident at Tokyo Electric Power Co.'s Fukushima Daiichi nuclear power plant have resulted in worldwide attention toward nuclear energy safety. The leadership of the U.S. commercial nuclear industry is dedicated to gaining a deep understanding of the events at Fukushima Daiichi and to taking the necessary actions to improve safety and emergency preparedness at America's nuclear energy facilities.

The Electric Power Research Institute (EPRI), Institute of Nuclear Power Operations (INPO), and Nuclear Energy Institute (NEI), in conjunction with senior utility executives, have created a joint leadership model to integrate and coordinate the U.S. nuclear industry's response to events at the Fukushima Daiichi nuclear energy facility. This will ensure that lessons learned are identified and well understood, and that response actions are effectively coordinated and implemented throughout the industry. This must be accomplished while electric companies continue to ensure that the safe and reliable operation of commercial reactors is our highest priority. This effort will not diminish the independent roles of the industry support groups, such as the role of INPO to promote the highest levels of safety in U.S. commercial reactors, as actions are taken to fulfill their missions.

An important and integral aspect of the industry's response is the awareness and involvement of the industry's many stakeholders, including industry vendors, architect-engineering companies, industry owners' groups and national consensus nuclear standards organizations. This will ensure that the interests of each stakeholder group are considered, understood and communicated to the public and policymakers.

A comprehensive investigation of the events at Fukushima Daiichi will take considerable time. Yet, there is also a need to act in a deliberate and decisive manner. Recognizing this, America's nuclear energy industry is taking action based on a preliminary understanding of the events. The industry's response is structured to ensure that emergency response strategies are updated based on new information and insights learned during subsequent event reviews.

Separately, the U.S. Nuclear Regulatory Commission (NRC) is conducting an independent assessment and will consider actions to ensure that its regulations reflect lessons learned from the Fukushima events. The industry's response will ensure that the NRC and industry remain informed of each other's respective activities so that any new regulatory requirements are implemented in the most efficient and effective manner.

This strategic overview describes how the industry will approach this challenge and is intended to serve as a reference point for the future. It articulates strategic goals and key stakeholders for the industry's integrated response. In addition, this overview describes the respective roles and coordination of industry organizations in managing the discrete elements of a comprehensive U.S. industry response plan.

2. STRATEGIC GOALS

The primary objective is to improve nuclear safety by learning and applying the lessons from the Fukushima Daiichi nuclear accident. In response, the U.S. nuclear industry has established the following strategic goals to maintain, and where necessary, provide added defense in depth for critical safety functions, such as reactor core cooling, spent fuel storage pool cooling and containment integrity:

1. The nuclear workforce remains focused on safety and operational excellence at all plants, particularly in light of the increased work that the response to the Fukushima event will represent.

2. Timelines for emergency response capability to ensure continued core cooling, containment integrity and spent fuel storage pool cooling are synchronized to preclude fuel damage following station blackout.

3. The U.S. nuclear industry is capable of responding effectively to any significant event in the U.S. with the response being scalable to support an international event, as appropriate.

4. Severe accident management guidelines, security response strategies (B.5.b), and external event response plans are effectively integrated to ensure nuclear energy facilities are capable of a symptom-based response to events that could impact multiple reactors at a single site.

5. Margins for protection from external events are sufficient based on the latest hazards analyses and historical data.

6. Spent fuel pool cooling and makeup functions are fully protective during periods of high heat load in the spent fuel pool and during extended station blackout conditions.

7. Primary containment protective strategies can effectively manage and mitigate post-accident conditions, including elevated pressure and hydrogen concentrations.

GUIDING PRINCIPLES

To achieve our strategic goals, the industry has established principles to guide the development of its response actions. These principles will be used to guide the resolution of issues and plant improvements and will ensure that a consistent expectation is established for incorporating lessons into the operations at each site. The strategic response actions will be designed to:

1. Ensure equipment and guidance, enhanced as appropriate, result in improvements in response effectiveness.

2. Address guidance, equipment and training to ensure long-term viability of safety improvements.

3. Develop response strategies that are performance-based, risk-informed and account for unique site characteristics.

4. Maintain a strong interface with federal regulators to ensure regulatory actions are consistent with safety significance and that compliance can be achieved in an efficient manner.

5. Coordinate with federal, state and local government and their emergency response organizations on industry actions to improve overall emergency response effectiveness.

6. Communicate aggressively the forthright approach the U.S. industry is taking to implement the lessons from the Fukushima Daiichi accident.

4. STAKEHOLDERS AND DESIRED OUTCOMES

The industry's strategic goals will be achieved by proactively engaging a variety of stakeholders.

The industry will ensure that the general public is well-informed of the collective approach in response to the Fukushima accidents. Special attention will be paid to engaging stakeholders (residents, elected officials and other stakeholders) immediately surrounding nuclear energy facilities to maintain confidence in their plant's continued safe operations and ability to protect public health and safety.

The industry will provide information to its employees to understand the operating experience from Fukushima as part of their training to execute their jobs with excellence and be advocates for nuclear safety.

The industry will continue to communicate and cooperate with federal, state and local emergency response organizations and government entities to ensure that emergency response plans reflect the lessons learned from the Fukushima Strategic Response Plan. These organizations include, but are not limited to, state and local police; fire officials; health officials/paramedics; federal, state and local governments; and transportation companies. Interactions will be focused on increasing confidence in the industry's and local government emergency preparedness programs.

Utilities, industry vendors and owners groups, architect-engineers, manufacturers and companies and organizations involved in the nuclear fuel cycle, working as a collective worldwide industry, will continue to strive for operational excellence. These actions and goals will continue the ongoing contribution to the legacy of safe, reliable, environmentally responsible production of electricity at nuclear energy facilities. The industry will work with all interested parties to ensure the benefits of nuclear energy for future generations.

The industry will maintain relationships with federal and state regulators to ensure the industry participates in the regulatory process and can effectively implement any regulatory changes.

The industry will continue to collaborate with technical associations and organizations to ensure information is disseminated and understood by all interested parties so that the benefits and positions of nuclear energy are appreciated and support the industry's long-term objectives.

The industry will proactively communicate lessons learned and industry actions such that policy and opinion leaders at the local, state and national level recognize the proactive, unwavering industry response to the Fukushima accident. The industry will continue to focus on improving confidence in the safety of U.S. nuclear energy facilities and assuring support for industry legislative proposals and programs that enhance safety.

The U.S. nuclear industry will interact with international nuclear energy companies and organizations to compile and assess recommendations and actions for applicability to U.S. facilities and to make the international industry aware of U.S. improvements.

5. LEADERSHIP MODEL OVERVIEW

The nuclear industry has successfully demonstrated the ability to identify and manage the response to various issues in a coordinated manner. Under normal circumstances, the structures are in place to successfully coordinate the response to significant issues among key industry groups. For the response to the Fukushima event, however, there is a need for a greater level of coordination with the number and complexity of potential issues that are identified by each of the key industry groups. As a result, we have developed a coordinating framework for the development and execution of actions in response to the lessons of the Fukushima event.

The leadership model is based on the following elements:

- **Organization** – clear division of responsibilities among the involved parties. An industry steering committee will provide strategic direction and oversight. Ownership for analysis and execution will be organized around the industry's seven building blocks based on the type of issue being addressed.

- **Event Response Process** – each industry organization (*see chart on page 9*) is responsible for identifying issues, plant and process improvements, and regulatory reviews of the Fukushima events. Issue descriptions, including action plans and recommendations, will be developed to implement improvements. The steering committee will approve the actions and designate an industry organization and building block to lead and implement the action to resolution.

- **Issue Action Plans** – action plans with schedules and resource management tools will be developed and executed for each issue within its assigned building block.

- **Strategic Response Plan** – all issues assigned to the seven building blocks constitute the nuclear industry's response. The action plans will be summarized by building block to form the strategic response plan.

- **Execution Oversight and Status Tracking** – each industry organization and its building block(s) will regularly report the status of all issues to the steering committee.

The leadership model is organized around seven areas called building blocks. Building blocks are temporary organizations created to develop and execute action plans for issues assigned to them by the steering committee. Building blocks led by an individual assigned by the industry organization will consist of assigned managers and designated personnel from the industry organizations, utilities, and suppliers. Building block oversight is provided by the steering committee, lead industry organization, and the assigned steering committee sponsor.

The seven building blocks along with the lead organization(s) and focus are identified below:

1. **Maintain Focus on Excellence in Existing Plant Performance (INPO):** focus on continued performance improvement of U.S. reactors.

2. **Develop and Issue Lessons Learned from the Fukushima Events (INPO):** focus on comprehensive analysis of the Fukushima event and that lessons learned are applied to the U.S. nuclear industry and shared with the World Association of Nuclear Operators (WANO).

3. **Improve the Effectiveness of U.S. Industry Response Capability to Global Nuclear Events (INPO/NEI):** focus on identified lessons learned from the U.S. industry response to the Fukushima event, allowing for more effective integrated response to future events.

4. **Develop and Implement a Strategic Communications Plan (NEI):** focus on managing the industry's strategic communications and outreach campaigns to recover policymaker and public support for nuclear energy.

5. **Develop and Implement the Industry's Regulatory Response (NEI):** focus on managing the industry's regulatory interactions and resolution of applicable industry regulatory issues from the incident.

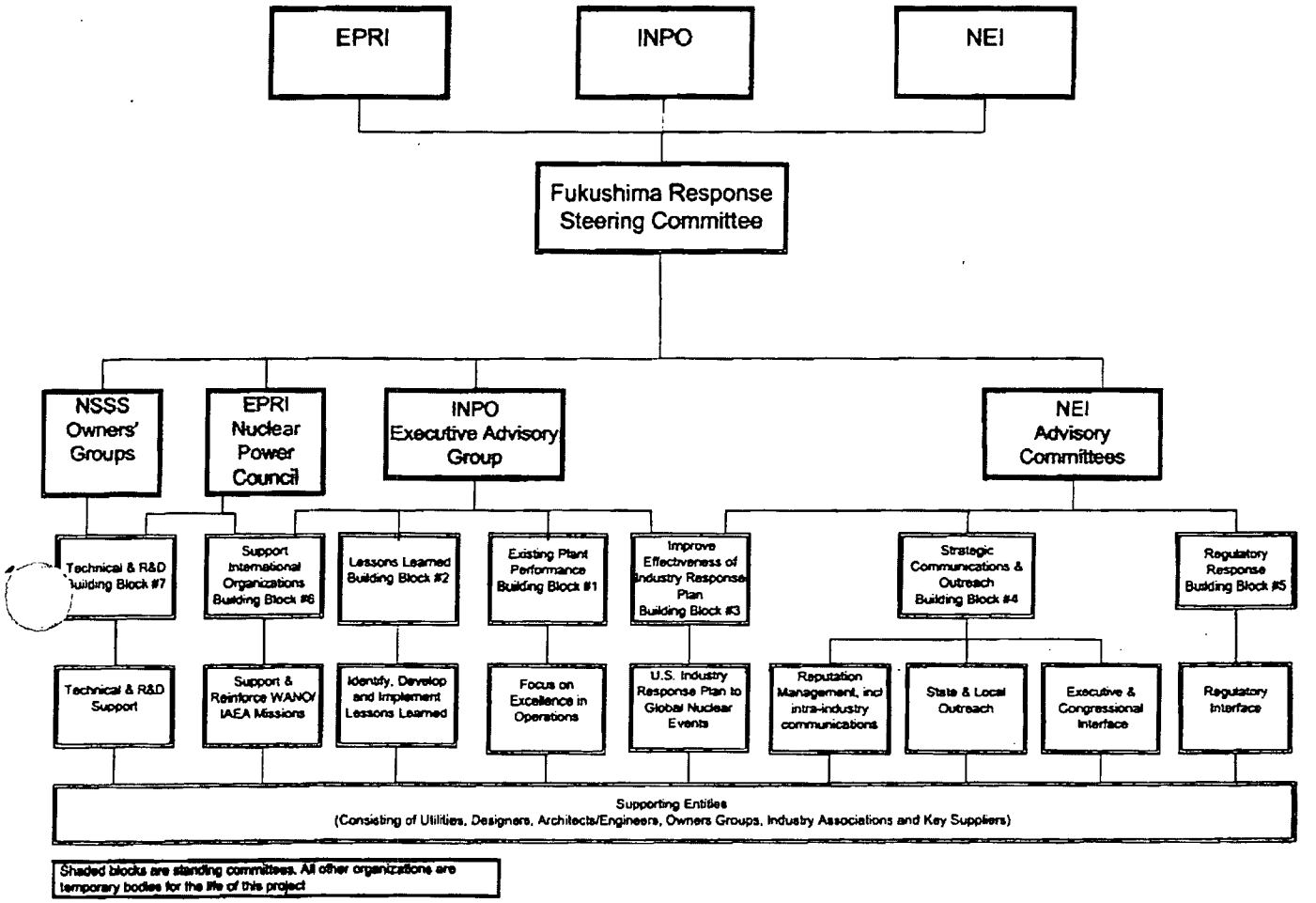
6. **Participate and Coordinate with International Organizations (INPO/EPRI):** focus on ensuring the results from international investigations are captured and effectively used to inform actions with the other building blocks.

7. **Provide Technical Support and R&D Coordination (EPRI/NSSS Owners' Groups):** focus on existing technical solutions and research and development activities and deliverables necessary to address recommended actions of this plan.

Each building block will be supported by nuclear and, in specific instances, non-nuclear industry organizations and companies, where specific technical, operational or other expertise is required.

6. LEADERSHIP RESPONSE ORGANIZATION AND BUILDING BLOCKS

The leadership model structure involves many industry participants and is outlined below:



Fukushima Response Steering Committee Charter

The U.S. nuclear industry has formed a Fukushima Response Steering Committee to coordinate the industry's overall response to the accident at Japan's Fukushima Daiichi nuclear plant. The steering committee is comprised of the chairpersons of the principal advisory groups to the industry associations (EPRI, INPO and NEI), a representative cross section of chief nuclear officers and executives from EPRI, INPO and NEI.

Members

- Chip Pardee, Chief Operating Officer, Exelon Generation Company, NEI NSIAC Chair, Fukushima Response Steering Committee Chairman
- Randy Edington, Executive Vice President and Chief Nuclear Officer, Arizona Public Service Company, INPO EAG Chair
- Maria Korsnick, Chief Nuclear Officer and Chief Operating Officer, Constellation Energy Nuclear Group, EPRI NPC Chair
- John Herron, President, Chief Executive Officer and Chief Nuclear Officer, Entergy Nuclear
- Ed Halpin, President and Chief Executive Officer, STP Nuclear Operating Company
- Dave Heacock, President and Chief Nuclear Officer, Dominion Nuclear
- Dennis Koehl, Vice President and Chief Nuclear Officer, Xcel Energy
- Mike Pacilio, Chief Nuclear Officer, Exelon Corporation
- Bill Webster, Senior Vice President, Industry Evaluations, INPO
- Rick Purcell, Senior Vice President, Industry Performance Improvement, INPO
- Neil Wilmshurst, Vice President and Chief Nuclear Officer, EPRI
- Tony Pietrangelo, Senior Vice President and Chief Nuclear Officer, NEI

The steering committee is chartered to:

1. Develop a strategic plan that articulates the strategic goals, structure and process for defining the industry's overall response to Fukushima;

2. Ensure that identified issues are appropriately coordinated between industry organizations and that lead and supporting roles are established; and

3. Monitor the status of action plans on key issues to ensure priorities and schedules are consistent with the strategic plan and that the overall impact on operating plants is balanced and appropriate to the industry's prime focus, excellence in safe operations.

Notes:

1. The development and management of actions plans for identified issues will be implemented under the purview and governance of the lead industry organization.

2. The formation of this steering committee shall in no way diminish the independent roles of the industry support groups as they take the actions necessary to fulfill their missions.

3. The steering committee chairman will assess the continued need for the steering committee at the conclusion of 2011, and every six months thereafter. A report will be made to the leadership of INPO, EPRI and NEI.

From: Blake, Kathleen
Sent: Monday, June 13, 2011 4:48 PM
To: Sosa, Belkys; Davis, Roger
Subject: Cmr GA's Edits to Chairman's Draft EPW Testimony for Senate Hearing
Attachments: [Untitled].pdf

-----Original Message-----
From: KATHLEEN.BLAKE@NRC.GOV [mailto:kathleen.blake@nrc.gov]
Sent: Monday, June 13, 2011 4:47 PM
To: Blake, Kathleen
Subject:

(b)(5)

(b)(5)

(b)(5)

(b)(5)

Commissioner,

A few questions for your consideration

(b)(5)

(b)(5)

Gilles, Nanette

From: Gilles, Nanette
Sent: Thursday, June 23, 2011 12:26 PM
To: Sosa, Belkys; Davis, Roger; Baggett, Steven
Cc: Blake, Kathleen; Apostolakis, George
Subject: RE: Danger of long-term Station Blackout.

How about something like:

Thank you for your comments on the activities of the Nuclear Regulatory Commission (NRC). As you mentioned, the NRC's station blackout requirements have been the subject of much discussion following the events at Japan's Fukushima nuclear power plants. At the direction of the Commission, the NRC staff formed a task force to consider the lessons learned from those events through both a short-term and longer-term review. The short-term task force recently briefed the Commission on their activities and they have identified the mitigation of a long-term station blackout as one of their areas of focus. The task force will provide the conclusions of its short-term review in a report to the Commission in mid July and they will brief the Commission on their findings at a July 19 public Commission briefing. The recommendations from the short-term review will help the Commission to determine what issues should be pursued in the longer-term, and I expect that issues associated with long-term station blackout will continue to be examined. I appreciate your interest in the NRC.

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

one: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Sosa, Belkys
Sent: Thursday, June 23, 2011 11:37 AM
To: Davis, Roger; Gilles, Nanette; Baggett, Steven
Cc: Blake, Kathleen; Apostolakis, George
Subject: FW: Danger of long-term Station Blackout.

Here is an informed member of the public and very perceptive.... I recommend we write him back something short and sweet, your thoughts?

From: Trent Sikes [mailto:(b)(6)
Sent: Monday, June 20, 2011 9:02 AM
To: CMRAPOSTOLAKIS Resource
Subject: Danger of long-term Station Blackout.

Commissioner Apostolakis,

My name is Trent Sikes, I hope that it is not too presumptuous for me, an ordinary citizen to write you. I do not work ustry but I have studied a lot about it. I'm not sure that I am what the NRC calls a "stakeholder", but I live about 1 ection of the prevailing winds, from Plant Hatch(GE MK1) in Georgia, so I personally believe that I have a huge s othing goes wrong at the plants.

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Any technological fix coping for SBO that does not take into account a large blackout lasting months is totally inade documented that the potential for a situation like this exists, just as the risks to the Fukushima area were documented earthquake.

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In conclusion, I would like to add that you brought up a good point at the last NRC meeting on 6-6-2011 about the us "voluntary". From the way the question was answered it gave me the impression that the nuclear industry identifies p "volunteers" to fix them, but with no regulatory oversight on the fix. This could create a situation where a serious pr but the industry takes a half-hearted cost saving approach to fix it and then there is no verification that the problem ha

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NOT FOR PUBLIC DISCLOSURE

Thank you for your time.

Trent Sikes

P.S After I wrote you this letter I saw this scathing article about the NRC from the Associated Press. I suspect the NR fall back over this. Here is what the article says about the plant down the road from my house , I hope that you can d these issues.

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Many plants have found they could not adhere to the general standard allowing each of these parts — known as mai valves — to leak at a rate of no more than 11.5 cubic feet per hour. In 1999, the NRC decided to permit individual pl amendments of up to 200 cubic feet per hour for all four steam valves combined.

But plants keep violating even those higher limits. ***For example, in 2007, Hatch Unit 2, in Baxley, Ga., reported co 574 cubic feet per hour***

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

m: Apostolakis, George
: Monday, June 27, 2011 9:58 AM
Blake, Kathleen; Sosa, Belkys
Cc: Sexton, Kimberly; Gilles, Nanette; Baggett, Steven
Subject: RE: Danger of long-term Station Blackout.

Not yet.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Blake, Kathleen
Sent: Monday, June 27, 2011 9:57 AM
To: Sosa, Belkys; Apostolakis, George
Cc: Sexton, Kimberly; Gilles, Nanette; Baggett, Steven
Subject: RE: Danger of long-term Station Blackout.

Cmr: ok for me to send? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Sosa, Belkys
Sent: Thursday, June 23, 2011 3:59 PM
To: Apostolakis, George; Blake, Kathleen
Cc: Davis, Roger; Gilles, Nanette; Baggett, Steven
Subject: RE: Danger of long-term Station Blackout.

Commissioner if you are ok with the response below, we recommend a reply email from Kathleen on your behalf to the individual. Thanks, - Belkys

---

Mr. Sikes,

On behalf of Commissioner Apostolakis, I would like to thank you for your interest in NRC activities and your views on station blackout. As you mentioned, the NRC's station blackout requirements have been the subject much discussion following the events at Japan's Fukushima nuclear power plants. The Task Force for the review of NRC processes and regulations following the events in Japan identified the mitigation of a long-term station blackout as one of their areas of focus and issues associated with long-term station blackout will

continue to be examined. The task force will brief the Commission on their findings at a July 19 public Commission meeting. The recommendations from the Task Force review will help the Commission determine what issues should be pursued in the longer-term. Citizen views are very important to Commissioner ostolakis and he appreciates your interest in the NRC.

Please note NRC's response to the AP article can be found at http://www.nrc.gov/reading-rm/doc-collections/news/2011/FTR_06-21-2011_oped.pdf

Thank you,

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574 cubic feet per hour

~~NOT FOR PUBLIC DISCLOSURE~~

OFFICE OF COMMISSIONER APOSTOLAKIS

ROUTING SLIP

ROUTINE

SUBJECT: Commissioners' Assistants Note - Draft Charter and Timeline for Transition to the NRC's Longer-Term Review of the Events in Japan

1	Belkys Sosa, EA	DATE: 6/29/11
2	Roger Davis, LA	DATE: 6/30/2011 45ans
~~3~~	Steve Baggett, MA	DATE: 7/1
~~4~~	Nan Gilles (has copy)	DATE: 6/29/11
5	Christiana Lui	DATE: 7/5
	Cmr Apostolakis	DATE:
	Kathleen Blake, AA	DATE:
6	Carmel Savoy, AA	DATE:
	NOTES: ~~Nan, please highlight for OA~~ Done	
	~~FILE/Recycle.~~	

~~NOT FOR PUBLIC DISCLOSURE~~

~~NOT FOR PUBLIC DISCLOSURE~~

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 28, 2011

NOTE TO COMMISSIONERS' ASSISTANTS

OCM/GBJ	OCM/KLS	OCM/GEA
cc Josh Batkin	X Jeffry Sharkey	X Belkys Sosa
cc John Monninger	Darani Reddick	Roger Davis
X Angela Coggins	X Patrick Castleman	X Michael Snodderly
Lisa Clark	John Thoma	Steve Baggett
X Tom Hipschman	Janet Lepre	Kathleen Blake
Michael Marshall	Carolyn Harves	Carmel Savoy
Anna Bradford		
Nehi Dhir	OCM/WDM	OCM/WCO
Roberta Warren		
Melody Fopma	X Patrice Bubar	X Ho Nieh
Susan Loyd	X Bill Orders	X Michael Franovich
David Montes	Rebecca Tadesse	Andrea Kock
Patti Pace	Margaret Bupp	Jason Zorn
Herald Speiser	Carrie Crawford	Linda Herr
Catina Gibbs		Sunny Bozin

FROM: Nader L. Mamish
Assistant for Operations, OEDO

SUBJECT: DRAFT CHARTER AND TIMELINE FOR TRANSITION TO THE NRC'S LONGER-TERM REVIEW OF THE EVENTS IN JAPAN

(b)(5)

Enclosures:
As stated

~~NOT FOR PUBLIC DISCLOSURE~~

P=> ML11179A066

~~OFFICIAL USE ONLY - PRE-DECISIONAL INFORMATION~~

cc: R. W. Borchardt, EDO
M. Virgilio, DEDR
M. Weber, DEDMRT
D. Ash, DEDCM
N. Mamish, AO
K. Brock, OEDO
G. Bowman, OEDO

SECY
OCA
OGC
OPA
OIP
OIS
CFO

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

CHARTER FOR THE NUCLEAR REGULATORY COMMISSION (NRC) STEERING COMMITTEE TO CONDUCT A LONGER-TERM REVIEW OF THE EVENTS IN JAPAN

(b)(5)

ENCLOSURE 1

(b)(5)

(b)(5)

(b)(5)

Japan Near-Term Task Force Report Timeline

Date[1]	Action
(b)(5)	

(b)(5)

ENCLOSURE 2

COMMISSIONER REC
2011 JUN 29 AM 8:27

~~NOT FOR PUBLIC DISCLOSURE~~

~~NOT FOR PUBLIC DISCLOSURE~~

Gilles, Nanette

From: Gilles, Nanette
Sent: Tuesday, July 12, 2011 3:11 PM
To: (b)(6)
Subject: RE: Danger of long-term Station Blackout.

Mr. Sikes,

On behalf of Commissioner Apostolakis, I would like to thank you for your interest in NRC activities and your views on station blackout. As you mentioned, the NRC's station blackout requirements have been the subject of much discussion following the events at Japan's Fukushima nuclear power plants. The Task Force for the review of NRC processes and regulations following the events in Japan identified the mitigation of a long-term station blackout as one of their areas of focus and issues associated with long-term station blackout will continue to be examined. The task force will brief the Commission on their findings at a July 19 public Commission meeting. The recommendations from the Task Force review will help the Commission determine what issues should be pursued in the longer-term. Citizen views are very important to Commissioner Apostolakis and he appreciates your interest in the NRC.

Please note NRC's response to the AP article can be found at
http://pbadupws.nrc.gov/docs/ML1117/ML11174A232.pdf

Thank you,

Nanette V. Gilles
Technical Assistant for Reactors
Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

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Sent: Monday, June 20, 2011 9:02 AM
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But plants keep violating even those higher limits. ***For example, in 2007, Hatch Unit 2, in Baxley, Ga., reported cor 574 cubic feet per hour***

Sosa, Belkys

n: Baggett, Steven
Tuesday, July 12, 2011 4:42 AM
Apostolakis, George; Sosa, Belkys; Gilles, Nanette; Davis, Roger
Subject: RE: Orders

Commissioner,

(b)(5)

Steve

-----Original Message-----
From: Apostolakis, George
Sent: Monday, July 11, 2011 11:00 PM
To: Sosa, Belkys; Gilles, Nanette; Baggett, Steven; Davis, Roger
Subject: Orders

(b)(5)

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

Apostolakis, George

From: Apostolakis, George
Sent: Tuesday, July 12, 2011 2:02 PM
To: Gilles, Nanette; Blake, Kathleen; Sosa, Belkys
Cc: Baggett, Steven; Davis, Roger
Subject: RE: Danger of long-term Station Blackout.

Nan: Please go ahead and respond along the lines of Belkys's recommendation. GA

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Gilles, Nanette
Sent: Tuesday, July 12, 2011 1:31 PM
To: Apostolakis, George; Blake, Kathleen; Sosa, Belkys
Cc: Baggett, Steven; Davis, Roger
Subject: RE: Danger of long-term Station Blackout.

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Apostolakis, George
Sent: Monday, June 27, 2011 9:58 AM
To: Blake, Kathleen; Sosa, Belkys
Cc: Sexton, Kimberly; Gilles, Nanette; Baggett, Steven
Subject: RE: Danger of long-term Station Blackout.

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11555 Rockville Pike
Rockville, MD 20852

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Subject: RE: Danger of long-term Station Blackout.

Cmr: ok for me to send? kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Sosa, Belkys
Sent: Thursday, June 23, 2011 3:59 PM
To: Apostolakis, George; Blake, Kathleen
Cc: Davis, Roger; Gilles, Nanette; Baggett, Steven
Subject: RE: Danger of long-term Station Blackout.

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My name is Trent Sikes, I hope that it is not too presumptuous for me, an ordinary citizen to write you. I do not wor industry but I have studied a lot about it. I'm not sure that I am what the NRC calls a "stakeholder", but I live about direction of the prevailing winds, from Plant Hatch(GE MK1) in Georgia, so I personally believe that I have a huge nothing goes wrong at the plants.

For some time now, well before Fukushima, I have been concerned about the NRC's approach to station black out e write to you because I have been reading the transcripts of the NRC meetings lately, and you, out of all the commiss have the greatest level of understanding about what a problem we are facing. Chairman Jaczko seems to grasp the pr he does not ask the same too the point questions of the industry regulators that you do.

e crux of the matter is this; the coping time for these plants in a SBO event is much too short. There are several ev flare, EMP attack, or cyber-attack that can disrupt commercial grid power for months or even years. The NRC cannc power infrastructure being able to handle one of these events, every plant must have technologies on-site to deal with Grid destroying solar flares happen on average once per century, there were major ones in 1921 and 1859. These hap when electric power was in it's infancy, and there were no nuclear power plants, so the effects on daily life were mir not be the case today. EMP and Cyber attack have been discussed in Congress and their grid destroying capability ha and attested too by government and industry scientists. Several nations possess these capabilities now and more are them by the time the latest license extensions on our older nuclear plants expire. These weapons have the potential to anonymously, greatly increasing their appeal to potential adversaries.

Any technological fix coping for SBO that does not take into account a large blackout lasting months is totally inade documented that the potential for a situation like this exists, just as the risks to the Fukushima area were documented earthquake.

The use of the term "defense-in-depth" is a bit of a misnomer. All of your defenses, with the exception of the four ho on the petroleum industry for diesel fuel, which in turn relies on the electric grid to run refineries. If the grid is down resupply of fuel and cooling will cease once on-site supplies of fuel are exhausted, the current 7 day supply is totally of your defenses must be independent of the petroleum industry and electric grid. From what I understand there is cu (PRM-50-96) on file and open for public comment until 7-20-11, that addresses this issue, it was written and filed be e it is adopted. But even if it is, it is like a Band-Aid on a gushing wound, in the sense that it only concentrates o n cooling for the spent fuel pools and not the reactor core.

In conclusion, I would like to add that you brought up a good point at the last NRC meeting on 6-6-2011 about the u
)luntary". From the way the question was answered it gave me the impression that the nuclear industry identifies
olunteers" to fix them, but with no regulatory oversight on the fix. This could create a situation where a serious pr
but the industry takes a half-hearted cost saving approach to fix it and then there is no verification that the problem h

I'm sorry to have taken so much of your time. I just wanted to point out the potential for long term SBO that has bee
leading researchers, in case you were not aware of it. Granted the risk of these events is rare, but well within the real
Please keep up the line and manner of questioning that you have been displaying at past meetings. I hope you unders
long term black out will be catastrophic, but the country will come back. If you add the possibility of multiple meltd
fires at multiple locations then you have a situation that can render North America uninhabitable for centuries. The U
the resources to deal with a situation like this, prevention is the only cure. You have the power to do something abou
hope you will use it.

Thank you for your time.

Trent Sikes

After I wrote you this letter I saw this scathing article about the NRC from the Associated Press. I suspect the NI
back over this. Here is what the article says about the plant down the road from my house , I hope that you can d
these issues.

http://hosted.ap.org/dynamic/stories/U/US_AGING_NUKES_PART_1?SITE=TXMID&SECTION=HOME&TEMI

*Operators have repeatedly violated leakage standards for valves designed to bottle up radioactive steam in the even
and other accidents at boiling water reactors.*

*Many plants have found they could not adhere to the general standard allowing each of these parts — known as mai
valves — to leak at a rate of no more than 11.5 cubic feet per hour. In 1999, the NRC decided to permit individual p
amendments of up to 200 cubic feet per hour for all four steam valves combined.*

But plants keep violating even those higher limits. ***For example, in 2007, Hatch Unit 2, in Baxley, Ga., reported co
574 cubic feet per hour***

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

From: Apostolakis, George
Sent: Wednesday, July 13, 2011 7:29 PM
To: Sosa, Belkys; Gilles, Nanette; Baggett, Steven; Davis, Roger
Subject: Fw: NEI SPEAKS

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Michael Corradini <corradin@cae.wisc.edu>

(b)(6)

Sent: Wed Jul 13 18:15:40 2011
Subject: NEI SPEAKS

NOT FOR PUBLIC DISCLOSURE

AS REQUESTED - READ ALL OF IT

Nuclear Energy Industry Comments on 90-Day Report From NRC's Fukushima Task Force

WASHINGTON, D.C., July 13, 2011—The U.S. Nuclear Regulatory Commission's Fukushima Daiichi task force has provided a report on the first 90 days of its nuclear power plant review to congressional oversight committees. The task force report confirms the safety of U.S. nuclear energy facilities and recommends actions to enhance U.S. nuclear plant readiness to safely manage severe events. Following is a statement from the Nuclear Energy Institute's senior vice president and chief nuclear officer, Tony Pietrangelo.

"The Nuclear Regulatory Commission task force report is the first step in the agency's process to review safety and preparedness at America's nuclear energy facilities and proposed changes to the agency's regulations. Implementation of the full scope of recommendations in the report, if approved by the NRC commissioners, would require clear policy direction from the commission on reshaping the agency's regulatory framework.

"The nuclear energy industry has taken seriously the accident at Fukushima Daiichi and continues to both support recovery efforts in Japan and compile lessons learned that can be applied to U.S. reactors. We have undertaken significant work in the past 90 days to examine our facilities and take the steps necessary to enhance safety. We will continue to work with the Nuclear Regulatory Commission to identify potential enhancements in safety that should be made.

e task force report does not cite significant data from the Fukushima accident to support many of its recommendations. Given the mammoth challenge it faced in gathering and evaluating the still-incomplete

information from Japan, the agency should seek broader engagement with stakeholders on the task force report to ensure that its decisions are informed by the best information possible.

Even though there are clear differences between the Japanese and U.S. approaches to the operation of nuclear energy facilities, every company operating a U.S. nuclear plant has verified its ability to safely manage a severe event, regardless of its cause, and the industry is coordinating our ongoing response to the Fukushima accident.

"Consistent with the NRC's principles of good regulation and consistent with President Obama's announcement this week that wise regulatory decisions depend on public participation and careful analysis of the likely consequences of regulation, we look forward to participating in a broad stakeholder dialogue on the task force report. The NRC has always supplemented regulatory requirements based on operating experience and significant events. The industry expects that this NRC practice will continue with a focus on those aspects that are most important to plant safety.

"The industry reiterates our commitment to make nuclear plant safety our top priority. Even as the NRC and industry separately have taken steps to identify additional layers of protection to enhance nuclear plant safety, the NRC and many of our nation's leaders have recognized that U.S. reactors are safe. We certainly agree."

###

The Nuclear Energy Institute is the nuclear energy industry's policy organization. This news release and additional information about nuclear energy are available at www.nei.org.

NEI Comments on NRC Post-Fukushima Report

July 13, 2011

• Tony Pietrangelo, NEI's senior vice president and chief nuclear officer, conducted a teleconference with the media today on the U.S. Nuclear Regulatory Commission staff report recommending steps the agency should take in light of the accident at Fukushima Daiichi. Earlier in the day, Pietrangelo appeared in an interview on Reuters television. NEI also issued a statement on the report. The NRC task force that wrote the report has issued a press release on the report, and will brief the commissioners on its recommendations in a webcast meeting July 19.

Plant Status

• Tokyo Electric Power Co. has measured high levels of radioactivity inside reactor building 2 at the Fukushima Dalichi nuclear energy facility. The company believes the source of the radioactivity is steam from the reactor. TEPCO has been using robotic measuring devices to conduct radiation surveys inside three reactor buildings and in areas surrounding the buildings since early this month.

• New water cooling systems are planned for the spent fuel storage pools at reactors 1 and 4 at Fukushima Daiichi. The fuel storage pools at reactors 2 and 3 already have new cooling systems and water temperatures are in the normal range.

• Structures supporting the used fuel storage pool of reactor 3 at Fukushima Daiichi are seismically sound, TEPCO reported. The analysis was ordered by Japan's Nuclear and Industrial Safety Agency.

Industry/Regulatory/Political Issues

Officials in Fukushima prefecture will inspect cattle after cesium was detected in cattle shipped from Minamisoma city. Livestock in the evacuation zone around the Fukushima Daiichi nuclear energy facility will be inspected, along with at least one head of cattle from other farms.

• Fukushima prefecture plans to test its population of 2 million people for internal radiation. Screening for residents from the evacuation zone is in progress.

dia Highlights

• NEI President and CEO Marvin Fertel has a comment on the National Journal Expert Blog on Energy and Environment, responding to the question "Should America follow Europe's lead on energy?" Fertel writes: "We should take a measured approach to global events based on what's right for America." He cites the nuclear energy industry's experience, referencing its response to events in Japan.

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Apostolakis, George

From: Apostolakis, George
Sent: Wednesday, July 13, 2011 12:13 PM
To: Sosa, Belkys
Cc: Davis, Roger; Gilles, Nanette; Baggett, Steven
Subject: RE: Chairman Jaczko's vote on COMWDM-11-0001/COMWCO-11-0001 (Engagement of Stakeholders Regarding the Events in Japan)

OK

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

From: Sosa, Belkys
Sent: Wednesday, July 13, 2011 12:02 PM
To: Apostolakis, George
Cc: Davis, Roger; Gilles, Nanette; Baggett, Steven
Subject: FYI: Chairman Jaczko's vote on COMWDM-11-0001/COMWCO-11-0001 (Engagement of Stakeholders Regarding the Events in Japan)

(b)(5)

Thanks,
Belkys

From: Speiser, Herald
Sent: Wednesday, July 13, 2011 11:13 AM
To: Baggett, Steven; Batkin, Joshua; Blake, Kathleen; Bozin, Sunny; Bradford, Anna; Bubar, Patrice; Bupp, Margaret; Chairman Temp; Clark, Lisa; Coggins, Angela; Cordes, John; Crawford, Carrie; Davis, Roger; Fopma, Melody; Franovich, Mike; Gibbs, Catina; Hart, Ken; Herr, Linda; Hipschman, Thomas; KLS Temp; Kock, Andrea; Lepre, Janet; Loyd, Susan; Mamish, Nader; Marshall, Michael; Monninger, John; Orders, William; Pace, Patti; Poole, Brooke; Reddick, Darani; Laufer, Richard; Bavol, Rochelle; Rothschild, Trip; Savoy, Carmel; Sharkey, Jeffry; Shea, Pamela; Sosa, Belkys; Speiser, Herald; Svinicki, Kristine; Temp, WCO; Temp, WDM; Warren, Roberta; Apostolakis, George; Temp, GEA; Tadesse, Rebecca; Castleman, Patrick; Montes, David; Dhir, Neha; Adler, James; Jimenez, Patricia; Nieh, Ho; Ostendorff, William; Lui, Christiana; Lisann, Elizabeth; Gilles, Nanette; Le, Hong; Sexton, Kimberly; Beasley, Benjamin; Riddick, Nicole
Cc: Mitchell-Funderburk, Natalie; Wright, Darlene
Subject: Chairman Jaczko's vote on COMWDM-11-0001/COMWCO-11-0001 (Engagement of Stakeholders Regarding the Events in Japan)

Attached please find Chairman Jaczko's vote.

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****

rald M. Speiser - (301) 415-1830
ministrative Assistant
fice of the Chairman
Nuclear Regulatory Commission
11555 Rockville Pike
Mailstop: O-16G4
Rockville, MD 20852

Davis, Roger

om: Gilles, Nanette
nt: Wednesday, July 13, 2011 4:32 PM
J: Sosa, Belkys
Cc: Davis, Roger; Baggett, Steven; Lui, Christiana
Subject: Rough Draft Vote on Near-Term Task Force Report
Attachments: Vote-SECY-11-0093.docx

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

(b)(5)

Sosa, Belkys

From: Blake, Kathleen
Sent: Thursday, July 14, 2011 5:28 PM
To: Sosa, Belkys
Subject: FW: Japan Nuclear Accident - NRC Actions

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: CMRAPOSTOLAKIS Resource
Sent: Thursday, July 14, 2011 5:01 PM
To: Blake, Kathleen
Subject: FW: Japan Nuclear Accident - NRC Actions

From: Rebecca Chin (b)(6)
Sent: Thursday, July 14, 2011 5:58 PM
To: CHAIRMAN Resource
Cc: CMRAPOSTOLAKIS Resource; CMRMAGWOOD Resource; CMROSTENDORFF Resource; CMRSVINICKI Resource
Subject: Japan Nuclear Accident - NRC Actions

Dear Chairman Jaczko,

On Tuesday, July 19, when the NRC Commissioners meet to discuss the 60 day report by your Task Force,

the Town of Duxbury Nuclear Advisory Committee urges the Commissioners to take definitive action now to better

protect the public. Duxbury is within the 10 miles EPZ for Pilgrim Nuclear Power Plant in Plymouth,

Massachusetts, that is the same design as Fukushima.

We agree with Congressman Markey who has emphasized that the NRC first take interim measures (such as issuing

orders), and then implement additional regulations, to ensure that there are:

- requirements to upgrade nuclear reactor protections for severe events (and combinations of events)

such as earthquakes, tsunamis, fires or floods;

- requirements to strengthen protections against the sort of catastrophic loss of electricity that caused the

meltdowns in Japan, including a requirement for reactor cores and spent nuclear fuel to be cooled for up to 72 hours

following such a blackout;

- requirements for technologies to prevent or mitigate against the sort of hydrogen explosion that occurred in Japan;

- requirements to strengthen the currently voluntary emergency mitigation procedures for nuclear crises; and

- increased NRC oversight and enforcement of these regulations.

Among the 34 recommendations, we support the Task Force urging tougher standards for back-up power supplies, back-up

water supplies for pools holding plant waste, and improvements in reactors that share the same design as Japan's

Fukushima Daiichi plant.

We expect you to adopt the recommendations of this report before the issuance of any relicensing application.

As the NRC will next embark on a six-month broader review, don't forget the public needs to participate.

Sincerely,

Rebecca J. Chin, Co-Chair, Duxbury Nuclear Advisory Committee
21 Deerpath Trail North
Duxbury, MA 02332
781-837-0009

CC:
Commissioner Apotolakis

Commissioner Magwood
Commissioner Ostendorff
Commissioner Sznicki

~~NOT FOR PUBLIC DISCLOSURE~~

Davis, Roger

From: Sosa, Belkys
Sent: Thursday, July 14, 2011 1:32 PM
To: Lui, Christiana; Gilles, Nanette; Baggett, Steven; Davis, Roger
Subject: RE: Vote-SECY-11-0093a.docx Rev

(b)(5)

From: Lui, Christiana
Sent: Thursday, July 14, 2011 12:32 PM
To: Gilles, Nanette; Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: Vote-SECY-11-0093a.docx Rev

(b)(5)

From: Gilles, Nanette
Sent: Thursday, July 14, 2011 12:19 PM
To: Sosa, Belkys; Baggett, Steven; Davis, Roger; Lui, Christiana
Subject: RE: Vote-SECY-11-0093a.docx Rev

(b)(5)

anette V. Gilles
echnical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Sosa, Belkys
Sent: Thursday, July 14, 2011 12:15 PM
To: Gilles, Nanette; Baggett, Steven; Davis, Roger; Lui, Christiana
Subject: Vote-SECY-11-0093a.docx Rev

(b)(5) Thanks, - Belkys

~~NOT FOR PUBLIC DISCLOSURE~~

NOT FOR PUBLIC DISCLOSURE

Gilles, Nanette

From: Gilles, Nanette
Sent: Thursday, July 14, 2011 1:54 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Davis, Roger; Baggett, Steven; Lui, Christiana
Subject: FW: Vote-SECY-11-0093a.docx Rev
Attachments: RE: Vote-SECY-11-0093a.docx Rev; Vote-SECY-11-0093a.docx

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Sosa, Belkys
Sent: Thursday, July 14, 2011 12:15 PM
To: Gilles, Nanette; Baggett, Steven; Davis, Roger; Lui, Christiana
Subject: Vote-SECY-11-0093a.docx Rev

Nan, this is a great start, please note my recommendations on the latest rev. Thanks, - Belkys

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Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

(b)(5)

(b)(5)

NOT FOR PUBLIC DISCLOSURE

Davis, Roger

NOT FOR PUBLIC DISCLOSURE

From: Davis, Roger
Sent: Friday, July 15, 2011 10:13 AM
To: Apostolakis, George; Sosa, Belkys; Baggett, Steven; Lui, Christiana
Subject: RE: Near-Term Task Force

(b)(5)

-----Original Message-----
From: Gilles, Nanette
Sent: Friday, July 15, 2011 9:22 AM
To: George Apostolakis; Sosa, Belkys; Baggett, Steven; Lui, Christiana; Davis, Roger
Cc: Apostolakis, George
Subject: RE: Near-Term Task Force

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

-----Original Message-----
From: George Apostolakis [mailto:apostola@MIT.EDU]
Sent: Friday, July 15, 2011 12:30 AM

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

To: Gilles, Nanette; Sosa, Belkys; Baggett, Steven; Lui, Christiana; Davis, Roger
Cc: Apostolakis, George
Subject: Near-Term Task Force

(b)(5)

GA

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Gilles, Nanette

From: Apostolakis, George
Sent: Friday, July 15, 2011 5:12 PM
To: Gilles, Nanette
Subject: FW: Correspondence about the design wave height at Fukushima Daiichi
Attachments: 2008PAGEOPHP_Standards.pdf; ATT00002.htm

I asked Prof. Synolakis for documents regarding the tsunami and here is what he sent.

Commissioner George Apostolakis
US Nuclear Regulatory Commission
One White Flint North, MS O16 G4
11555 Rockville Pike
Rockville, MD 20852

(301) 415-1810

NOT FOR PUBLIC DISCLOSURE

From: costas@usc.edu [mailto:costas@usc.edu]
Sent: Friday, July 15, 2011 5:06 PM
To: Apostolakis, George
Subject: Fwd: Correspondence about the design wave height at Fukushima Daiichi

Dear George,

Thanks for your message. i had penned a correspondence piece for Nature that was returned without going to review, but the conclusions stand and do answer your questions. I am prepping a more lengthy piece for elsewhere.

Yes, it is entirely true that the design basis had been underestimated given the historic record. Even assuming their design earthquake, it is equally true that their design wave was underestimated. Double whammy. This is why the NRC has adopted or is about to adopt standards for numerical models used for estimating tsunami design wave heights for NPPs.

I am in the US for a couple of weeks, my US cell is (b)(6). From mid-week next week I will be in Greece, (b)(6)

I remain at your service,

Costas

From: Corres <correspondence@nature.com>
Date: March 25, 2011 8:07:34 AM PDT
To: Costas Synolakis <costas@usc.edu>

Subject: RE: Correspondence about the design wave height at Fukushima Daiichi

Dear Dr Synolakis

Thank you for your submission to Correspondence. A decision regarding your submission will be made shortly

Kind Regards,

Roseann Campbell

Correspondence Assistant

nature

From: Costas Synolakis [mailto:costas@usc.edu]
Sent: 25 March 2011 14:06
To: Corres
Cc: Emile Okal; Νικος Καλλιγέρης
Subject: Correspondence about the design wave height at Fukushima Daiichi

Sir,

In the aftermath of the March 11, 2011 Japan tsunami, debate has raged about whether an earthquake and tsunami of this size might had been anticipated. While the NPP at Fukushima Daiichi withstood the magnitude 9.0 tremor, the tsunami knocked out the backup diesel generators (reportedly located at 6m elevation) resulting in the eventual shutdown of the cooling system.

According to reports, regulators had asked review panels in 2009 to focus on the earthquake hazard and not the tsunami. Power plant spokesmen have asserted that " there was little reason to predict a quake the size of March 11" and that the company made "a good faith effort last year to learn more" about the tsunami.

We examined a Tokyo Electric Power Company report presented on 26 November 2010 in the aftermath of the 2010 Chilean tsunami. It estimates 4.4m as the design tsunami height (presumably at the power plant) and concludes " we assessed and confirmed the safety of nuclear power plants". There is no specific reference to the design earthquake, but publicly available information suggest it was less than 8.4 versus the 9.0 that just materialized. It is unclear if the analysis included overland inundation computations, now standard worldwide. Threshold models of the kind we presume was used in the TEPCO report stop hydrodynamic computations at the shoreline and are known to substantially underestimate coastal impacts. An interesting question is whether anyway the 4.4m estimate was reasonable, given field observations of tsunamis. From 2001-2010, 12 tsunamis have been extensively

documented, 10 of which were triggered by events of magnitude less or equal to 8.4. Among them, six had maximum overland flow depths > 5m, and two > 10m.

Was it defensible to assume an 8.4 maximum probable earthquake? Difficult as is to predict future earthquakes before they happen, we note that it has been repeated claimed that any incomplete, under-sampled database of historical events could conceivably miss the maximum expectable event in any subduction zone. In the Nankai trough, Ando (1975) identified four possible blocks in the Nankai trough (A, B, C and D) supporting the rupture, and documented from Japanese archives that major earthquakes occurred in an essentially random way, with the rupture involving anywhere from a single block (e.g. ◆A◆) to two (e.g. ◆C◆D◆), and up to all four (◆AB- C-D◆), with a corresponding growth in the seismic moment and tsunami damage. To wit, the 1960 Great Chilean earthquake had a significantly longer rupture zone than several of its predecessors, and similar results have been inferred and repeatedly cited along the Southern Kuril arc and the Pacific northwest.

Earthquake rupture and tsunami inundation are complex processes. The "good faith effort" of regulators, consultants and plant engineers would had benefited from a higher dose of common sense, in this avoidable nuclear drama.

Costas Synolakis, University of Southern California, costas@usc.edu
Emile Okal, Northwestern University, emile@earth.northwestern.edu
Nikos Kalligeris, Technical University of Crete, Greece, (b)(6)

We understand that no references are encouraged, but we provide them for the benefit of the editors. We also have a table of tsunami overland flow depths and runup and citations for tsunamis in the past decade, if the editors require it for verification.

Ando, M., 1975. Source mechanism and tectonic significance of historical earthquakes along the Nankai trough, Japan, Tectonophysics, **27**, 119◆140.

Okal, E.A & Synolakis, C.E., 2008. Farfield tsunami hazard from mega-thrust earth- quakes in the Indian Ocean, Geophysical Journal International, **172**, 995-1015.

Takao M. , 2010. Tsumami assessment of nuclear powerplants in Japan , Tokyo Electric Power Company, First International Symposium on seismic safety of nuclear installations, 24-26 November 2010, Nigata Institute of Technology, Japan, http://www.jnes.go.jp/seismic-symposium10/

Synolakis et al, 2008. Validation and Verification of Tsunami Inundation Models, Pure and Applied Geophysics, **165**, 2197-2228.

http://www.washingtonpost.com/world/japanese-nuclear-plants-evaluators-cast-aside-threat-of-tsunami/2011/03/22/AB7Rf2KB_story.html

Costas Synolakis
Professor of Civil and Environmental Engineering,
Director, Tsunami Research Center
Viterbi School of Engineering, University of Southern California
Los Angeles, California 90089-2531
www.usc.edu/dept/tsunamis

Beauty is truth, truth beauty
this is all you know on earth,
and all you need to know.
John Keats.

Pure appl. geophys. 165 (2008) 2197–2228
0033–4553/08/112197–32
DOI 10.1007/s00024-004-0427-y

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Pure and Applied Geophysics

Validation and Verification of Tsunami Numerical Models

C. E. SYNOLAKIS,[1] E. N. BERNARD,[2] V. V. TITOV,[3] U. KÂNOĞLU,[4] and F. I. GONZÁLEZ[2]

Abstract—In the aftermath of the 26 December, 2004 tsunami, several quantitative predictions of inundation for historic events were presented at international meetings differing substantially from the corresponding well-established paleotsunami measurements. These significant differences attracted press attention, reducing the credibility of all inundation modeling efforts. Without exception, the predictions were made using models that had not been benchmarked. Since an increasing number of nations are now developing tsunami mitigation plans, it is essential that all numerical models used in emergency planning be subjected to validation—the process of ensuring that the model accurately solves the parent equations of motion—and verification—the process of ensuring that the model represents geophysical reality. Here, we discuss analytical, laboratory, and field benchmark tests with which tsunami numerical models can be validated and verified. This is a continuous process; even *proven* models must be subjected to additional testing as new knowledge and data are acquired. To date, only a few existing numerical models have met current standards, and these models remain the only choice for use for real-world forecasts, whether short-term or long-term. Short-term forecasts involve data assimilation to improve forecast system robustness and this requires additional benchmarks, also discussed here. This painstaking process may appear onerous, but it is the only defensible methodology when human lives are at stake. Model standards and procedures as described here have been adopted for implementation in the U.S. tsunami forecasting system under development by the National Oceanic and Atmospheric Administration, they are being adopted by the Nuclear Regulatory Commission of the U.S. and by the appropriate subcommittees of the Intergovernmental Oceanographic Commission of UNESCO.

Key words: Tsunami, benchmarked tsunami numerical models, validated and verified tsunami numerical models.

1. Introduction

Following the Indian Ocean tsunami of 26 December, 2004, there has been substantial interest in developing tsunami mitigation plans for tsunami prone regions worldwide (SYNOLAKIS and BERNARD, 2006). While UNESCO has been attempting to coordinate capacity building in tsunami hazards reduction around the world, several national agencies have been making exceptional progress towards being tsunami-ready.

[1] Viterbi School of Engineering, University of Southern California, Los Angeles, CA 90089, USA.
[2] NOAA/Pacific Marine Environmental Laboratory, Seattle, WA 98115, USA.
[3] NOAA/Pacific Marine Environmental Laboratory, Seattle, WA 98115, USA and Joint Institute for the Study of the Atmosphere and Ocean (JISAO), University of Washington, Seattle, WA 98195, USA.
[4] Department of Engineering Sciences, Middle East Technical University, 06531 Ankara, Turkey.

The National Oceanic and Atmospheric Administration (NOAA) is the federal agency charged with mitigating tsunami hazards in the United States. Tsunami models are prominent in two components of the NOAA strategy: Short-term forecast products in support of Tsunami Warning Centers (TWCs) operated by the National Weather Service and long-term forecast products such as inundation maps for hazard assessment and planning by Member States of the National Tsunami Hazard Mitigation Program (NTHMP). The NTHMP was formed through a directive of the U.S. Senate Appropriations Committee in 1994 to develop a plan for a tsunami warning system that reduces the risk to coastal residents. After the Indian Ocean tsunami, the U.S. expanded the role of NTHMP to serve as the organizational framework to implement the recommendations of the NATIONAL SCIENCE and TECHNOLOGY COUNCIL (2005).

One of the recommendations was to "Develop standardized and coordinated tsunami hazard and risk assessments for all coastal regions of the U.S. and its territories." Standards for modeling tools do not currently exist, yet an increased number of states either are developing or will need to develop tsunami mitigation plans. There is risk that forecast products may be produced with older or untested methodologies. This is a worldwide problem, as the Intergovernmental Oceanographic Commission (IOC) of UNESCO has found out in its efforts to help member nations develop tsunami hazard maps. Unrealistic estimates can be costly both in terms of lives lost, or in unnecessary evacuations that sometimes put lives at risk and reduce the credibility of the world system. Standards are urgently needed to ensure a minimum level of quality and reliability for real-time forecasting and inundation mapping products. Further, unrealistic estimates can lead to panic. Examples include the 30 m runup estimates for Cascadia tsunamis (THE SEATTLE TIMES, 2005; NEW SCIENTIST, 2005; ASSOCIATED PRESS, 2005) and large runup estimates for islands in the Eastern Mediterranean in 2007 (ETHNOS, 2007); in both instances, an inordinate effort took place to restore common sense.

In the past ten years, the process of model validation and verification has shown that coastal effects of tsunamis can be described by a set of depth-averaged hydrostatic equations of motion, also known as the shallow-water wave (SW) equations. Comparisons with both large-scale laboratory data and field data have demonstrated a compelling and not always expected capability to describe complex evolution phenomena, and to estimate the maximum runup and inundation, over wide ranges of tsunami waves. In the current state of knowledge, the main uncertainty arises from the ambiguities of the initial condition, assuming the solution methodology solves the equations of motion satisfactorily. The increasing deployment of Deep-ocean Assessment and Reporting of Tsunamis (DART) buoys—tsunameters or tsunamographs—that monitor tsunami evolution in the deep ocean, allows for real-time updates of the characteristics of the source and thus leads to better definition of the initial conditions, at least for tectonic tsunamis (SATAKE *et al.*, 2007). Realistic initial data as input in benchmarked computational tools lead to focused and reliable forecasts.

While equation solvers of higher-than-the-SW approximations of the parent Navier–Stokes equations now exist, they are presently too computationally intensive for

inundation mapping or operational forecasting, and are generally used for free-surface flows of very limited geographical extent. These models remain largely unvalidated over wide ranges of tsunami events and in fact many of them work only in one propagation direction. Yet, the rapid development of packaged numerical modeling tools facilitates their application by untrained users.

In the next section, we discuss model evaluation with state-of-the-art benchmark tests for validating and verifying computational tools for predicting the coastal effect of tsunamis. Then, we recommend standards and guidelines for operational codes used for inundation mapping and tsunami forecasting.

2. *Model Evaluation Standards*

Tsunami models have evolved in the last two decades through careful and explicit validation/verification by comparing their predictions with benchmark analytical solutions, laboratory experiments, and field measurements. While there is in principle no assurance that a numerical code that has performed well in all benchmark tests will always produce realistic inundation predictions, validated/verified codes largely reduce the level of uncertainty in their results to the uncertainty in the geophysical initial conditions. Furthermore, when coupled with real-time free-field tsunami measurements from tsunameters, validated/verified codes are the only choice for realistic forecasting of inundation.

Here we develop recommendations for national agencies approval of modeling tools, their further development, and their transfer to operations. These steps can be classified into four categories: basic hydrodynamic considerations, benchmarking, scientific evaluations, and operational evaluations.

2.1. *Basic Hydrodynamic Considerations*

Mass conservation: While the equation of conservation of mass is solved in all numerical computations of water-wave motions, cumulative numerical approximations can sometimes produce results that violate the principle. This is particularly true when the model employs friction factors or smoothing to stabilize inundation computations. For a closed domain within reflective boundaries, conservation of mass can be checked by calculating the water volume at the beginning and end of the computation, derived upon integration of the disturbed water surface $\eta(x, y, t)$ over the entire solution domain up to the maximum extend of inundation. The integral of the entire flow depth $h(x, y, t)$, where $h(x, y, t) = \eta(x, y, t) + d(x, y, t)$ and $d(x, y, t)$ is the undisturbed water depth, should not be used; typically, $\eta \ll d$ offshore, and integrating h will tend to mask errors. For a domain with open or absorbing boundaries, the net volume flux across each such boundary must be considered in the estimate of total displaced volume. Numerical errors in such computations can be highly additive, and mass invariably might not be conserved in long numerical

computations. Nonetheless, the initial total displaced volume should agree with the displaced volume at the end of the computation within a prespecified margin of error. If the difference is not acceptable, then the code numerics must be examined for errors or inadequacies, and/or the grid must be readjusted. Improvements can usually be achieved with a few changes in grid size(s) and time step. Obviously the process must be shown to converge to increasingly smaller mass losses.

Convergence: Extreme runup/rundown locations are optimally suited for checking convergence of the numerical code used to a certain asymptotic limit, presumably the actual solution of the equations solved. A graph needs to be prepared presenting the variation of the calculated runup/rundown (ordinate) with the step size (abscissa). As the step size is reduced, the numerical predictions should be seen to converge to a certain value, with further reductions in step size not appreciably changing the results. One excellent example is given in PEDERSEN (2008).

2.2. *Benchmark Solutions*

Benchmarking of numerical models can be classified into analytical, laboratory, and field benchmarking. Some of the benchmarks we will describe here have been used in the 1995 and 2004 Long-Wave Runup Models Workshops in Friday Harbor, Washington (YEH *et al.*, 1996) and Catalina, California (LIU *et al.*, 2008), respectively. More detailed descriptions of these benchmarks are given in SYNOLAKIS *et al.* (2007).

2.2.1 Analytical benchmarking. The real usefulness of analytical calculation is its identification of the dependence of desired results (such as runup) on the problem parameters (such as offshore wave height, beach slope, depth variation). Numerical solutions will invariably produce more accurate specific predictions, but will rarely provide useful information about the problem scaling, unless numerical computations are repeated *ad nauseam*. Comparisons with exact solutions can identify systematic errors and are thus useful in validating the complex numerical methods used in realistic applications.

Here, we present analytical solutions to certain common 1+1 (one directional and time) propagation problems. The results are derived for idealized initial waveforms often used in tsunami engineering to describe the leading wave of a tsunami. Generalization to more realistic spectral distributions of geophysical tsunamis is trivial, given that results are shown in closed-form integrals.

It is important to note that validation should always take place with non-periodic waves. During runup, individual monochromatic waves reflect with slope-dependent phase shifts (SYNOLAKIS, 1986). Whereas a particular code may model a periodic wave well, it may not model superposition equally well. This was a problem of earlier SW computations that did not account for reflection. While their predictions for the Carrier–Greenspan (CARRIER and GREENSPAN, 1958) sinusoids appeared satisfactory, they exhibited significant errors when modeling solitary waves or N-waves.

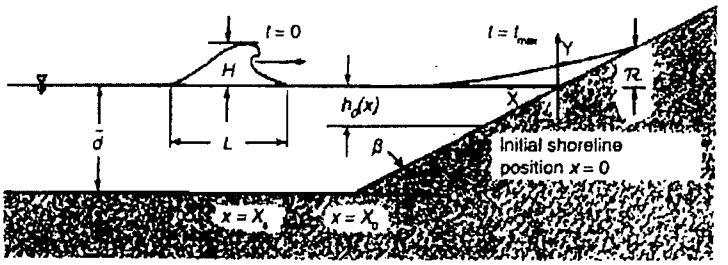


Figure 1
Definition sketch for a canonical consideration.

Linear solutions on a simple beach: We consider a solitary and N-wave propagation first over the constant-depth region then sloping beach—canonical problem (Fig. 1). The topography is described by $h_0(x) = x \tan\beta$ when $x \le X_0$ and $h_0(x) = 1$ when $x \ge X_0$ where $X_0 = \cot\beta$. The origin of the coordinate system is at the initial position of the shoreline and x increases seaward. Even though dimensionless variables are not preferred in numerical calculations and engineering practice, in analytical solutions they have distinct advantages as everything scales simply with an offshore characteristic depth or a characteristic length. Here dimensionless variables are introduced as: $x = \tilde{x}/\tilde{d}$, $(h, \eta, h_0, \mathcal{R}) = (\tilde{h}, \tilde{\eta}, \tilde{h}_0, \tilde{\mathcal{R}})/\tilde{d}$, $u = \tilde{u}/\sqrt{\tilde{g}\tilde{d}}$, and $t = \tilde{t}/\sqrt{\tilde{d}/\tilde{g}}$ provided the depth $\tilde{d}$ of the constant-depth region is chosen as the characteristic scale. Quantities with tilde are dimensional and η is the amplitude, u is the depth-averaged horizontal velocity, h_0 is the undisturbed water depth, and $\tilde{g}$ is the gravitational acceleration.

Consider a tsunami evolution problem described by the 1 + 1 nonlinear shallow-water wave (NSW) equations:

$$h_t + (u\,h)_x = 0, \quad u_t + uu_x + \eta_x = 0, \tag{1}$$

with $h(x, t) = \eta(x, t) + h_0(x)$. Neglecting nonlinear terms, through elementary manipulations, (1) reduces to an equation $\eta_{tt} - (\eta_x h_0)_x = 0$ known as the linear shallow-water wave (LSW) equation. Synolakis (1986, 1987) matched the linear theory solution at the constant-depth region with the linear solution over the sloping beach as derived by Keller and Keller (1964) to determine the solution for the wave height $\eta(x, t)$ over the sloping beach,

$$\eta(x,t) = 2\int_{-\infty}^{+\infty} \Phi(\omega)\frac{J_0(2\omega\sqrt{xX_0})e^{-i\omega(X_0+t)}}{J_0(2X_0\omega) - iJ_1(2X_0\omega)}\,d\omega. \tag{2}$$

Here, $\Phi(\omega)$ is the spectrum of the incoming wave offshore. This solution is only valid when $0 \le x \le X_0$; LSW equation does not reduce to Bessel's equation when $x < 0$. Notice that the integral (2) can be evaluated with standard numerical methods; however, the advantage of this form is that it allows calculation of the solution for many physically

realistic tsunami waveforms simply by using the $\Phi(\omega)$ of the incoming wave in (2), hopefully known at some offshore location.

Solitary wave evolution and runup: An initial solitary wave centered offshore at $x = X_s$ has the surface profile, $\eta(x, t = 0) = H \operatorname{sech}^2\gamma(x - X_s)$ where $\gamma = \sqrt{3H/4}$ and H is the dimensionless wave height, i.e., $H = \tilde{H}/\tilde{d}$. Upon substituting its spectrum in equation (2), SYNOLAKIS (1991) showed that the maximum local value of the wave amplitude η_{max} is given explicitly by $\eta_{max}/H = (X_0/x)^{1/4} = (1/h_0)^{1/4}$, an amplitude variation usually referred to as *Green's law*. The region over which this amplitude variation applies is the region of gradual shoaling; the region of rapid shoaling is often identified with the Boussinesq result, i.e., $\eta_{max} \sim h_0$. The fact that both evolution laws may coexist was first identified by SHUTO (1973). SYNOLAKIS and SKJELBREIA (1993) also present results which show that Green's law type evolution is valid over a wide range of slopes and for finite-amplitude waves at least in the region of gradual shoaling.

In the LSW theory, the shoreline does not move beyond $x = 0$. The maximum value of $R(t) = \eta(0, t)$ is the maximum runup $\mathcal{R}$, arguably the most important parameter in the long-wave runup problem, and it is the maximum vertical excursion of the shoreline. The result (2) can be readily applied to derive the maximum runup of a solitary wave climbing up a sloping beach. Per SYNOLAKIS (1986), the integral (2) with the solitary wave spectrum $\Phi(\omega)$ can be reduced into a Laurent series using contour integration. The series can be simplified further by using the asymptotic form for large arguments of the modified Bessel functions, making it possible to obtain its extremum, leading to the following expression for the maximum runup $\mathcal{R}$:

$$\mathcal{R} = 2.831\sqrt{\cot\beta}\, H^{5/4}. \tag{3}$$

This result is formally correct when $\sqrt{H} \gg 0.288 \tan\beta$, the assumption implied when using the asymptotic form of the Bessel functions. The asymptotic result (3) is valid for waves that do not break during runup. Equation (3) was derived by SYNOLAKIS (1986) and has since been referred to as *the runup law* and shown in Figure 2. As will be apparent in later sections, this methodology is quite powerful to find the maximum runup and it allows calculation of the runup of other waveforms such as N-waves, not to mention the runup of waves evolving over piecewise-linear bathymetries.

N-wave runup: Most tsunami eyewitness accounts suggest that tsunamis are N-wave like, i.e., they are dipolar, which means they appear as a combination of a depression and an elevation wave, and frequently as a series of N-waves, sometimes known as double N-waves. Until the late 1990s, the solitary wave model was used exclusively to evaluate the runup of tsunamis. Even though it was suspected that the leading tsunami wave might be a depression wave (MEI, 1983), before 1992, these waves were believed to be hydrodynamically unstable; the crest was assumed to quickly overtake the trough. The N-wave model was motivated by observations from a series of nearshore-triggered tsunamis starting in 1992 (TADEPALLI and SYNOLAKIS, 1994; SYNOLAKIS and OKAL, 2015), all of which produced tsunami waves which caused nearby shorelines to first recede before advancing. The most

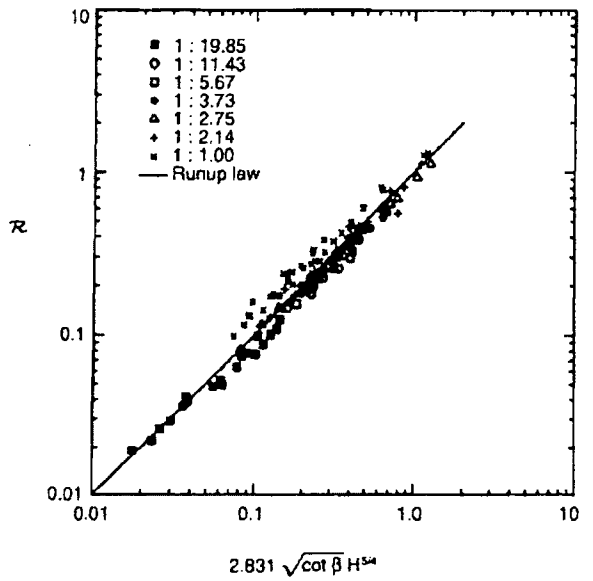


Figure 2
Laboratory data for maximum runup of nonbreaking waves climbing up different beach slopes: 1:19.85 (SYNOLAKIS, 1986); 1:11.43, 1:5.67, 1:3.73, 1:2.14, and 1:1.00 (HALL and WATTS, 1953); 1:2.75 (PEDERSEN and GJEVIK, 1983). The solid line represents the runup law (3).

spectacular account was during the 9 October, 1995 Manzanillo, Mexico earthquake. Minutes after the earthquake, one eyewitness saw the shoreline retreat beyond a rock outcrop which was normally submerged in over 4 m depth and at a distance of about 400 m from the shoreline (BORRERO *et al.*, 1997), suggesting a leading-depression N-wave (LDN). Before the megatsunami of 26 December, 2004, this had been the only photographic evidence of LDN. Recall that the megatsunami manifested itself first with a rapid withdrawal in most locales east of the rupture zone, and as a leading-elevation N-wave (LEN) west of it (SYNOLAKIS and KONG, 2006).

To reflect the fact that tsunamigenic faulting in subduction zones is associated with both vertical uplift and subsidence of the sea bottom, TADEPALLI and SYNOLAKIS (1994, 1996) conjectured that all tsunami waves at generation have an N-wave or dipole shape. TADEPALLI and SYNOLAKIS (1996) proposed a general function as a unified model for both nearshore and farfield tsunamis as generalized N-waves, i.e., a wave propagates with the trough first is referred to as an LDN and the crest arrives first is referred to as an LEN. For a special class of N-waves with elevation and depression waves of the same height H, referred to as isosceles N-waves, $\eta(x,0) = \mathcal{H}\,\mathrm{sech}^2[\gamma(x - X_N)]\tanh[\gamma(x - X_N)]$ with $\mathcal{H} = \frac{3\sqrt{3}H}{2}$ and $\gamma = \frac{3}{2}\sqrt{\sqrt{\frac{3}{4}}H}$, using contour integration and the same asymptotic approximation methodology as used in the solitary wave results, TADEPALLI and SYNOLAKIS (1994) showed that

$$\mathcal{R}_{\mathrm{LEN}} = 3.86\sqrt{\cot\beta}\, H^{5/4}. \tag{4}$$

Because of the symmetry of the profile, this is also the minimum rundown of an isosceles LDN. TADEPALLI and SYNOLAKIS (1994) also showed that the normalized maximum runup of nonbreaking isosceles LEN is smaller than the runup of isosceles LDN, and that both are higher than the runup of a solitary wave with the same wave height. The latter became known as *the N-wave effect* (Fig. 3).

Nonlinear solutions on a simple beach: Calculation of the nonlinear evolution of a wave over a sloping beach is theoretically and numerically challenging due to the moving boundary singularity. Yet, it is important to have a good estimate of the shoreline velocity and associated runup/rundown motion, since they are crucial for the planning of coastal flooding and of coastal structures. To solve the nonlinear set (1) for the single sloping beach case, $h_0(x) = x$ (Fig. 4), CARRIER and GREENSPAN (1958) used the characteristic length $\tilde{l}$ as a scaling parameter and introduced the dimensionless variables as: $x = \tilde{x}/\tilde{l}$, $(h, \eta, h_0, \mathcal{R}) = (\tilde{h}, \tilde{\eta}, \tilde{h}_0, \tilde{\mathcal{R}})/(\tilde{l}\tan\beta)$, $u = \tilde{u}/\sqrt{\tilde{g}\tilde{l}\tan\beta}$, and $t = \tilde{t}/\sqrt{\tilde{l}/(\tilde{g}\tan\beta)}$. CARRIER and GREENSPAN (1958) defined a hodograph transformation known as Carrier–Greenspan transformation

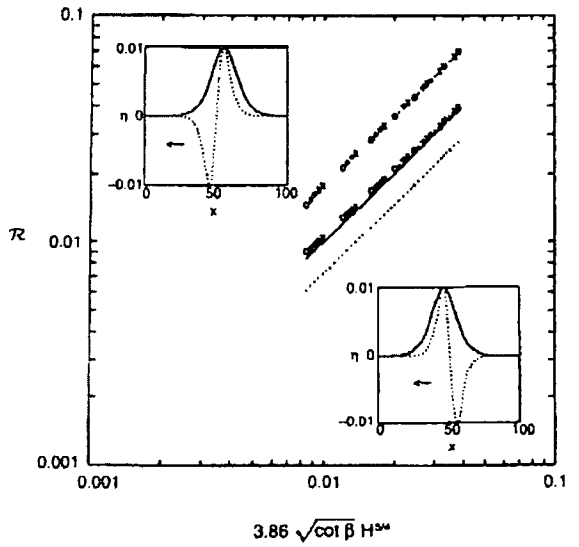


Figure 3
Maximum runup of isosceles N-waves and solitary wave. The top and lower set of points are results for the maximum runup of leading-depression and -elevation isosceles N-waves, respectively. The dotted line represents the runup of solitary wave (3). The upper and lower insets compare a solitary wave profile to a leading-depression and -elevation isosceles N-waves, respectively. After TADEPALLI and SYNOLAKIS (1994).

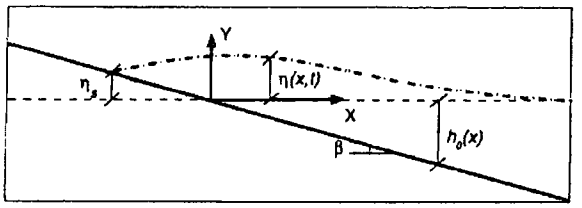


Figure 4
Definition sketch for an initial value problem.

$$x = \frac{\sigma^2}{16} - \eta, \quad t = u - \frac{\lambda}{2}, \quad \eta = \frac{\psi_\lambda}{4} - \frac{u^2}{2}, \quad u = \frac{\psi_\sigma}{\sigma}, \tag{5}$$

thus reducing the NSW equations to a single second-order linear equation:

$$(\sigma\psi_\sigma)_\sigma - \sigma\psi_{\lambda\lambda} = 0. \tag{6}$$

Here $\psi(\sigma, \lambda)$ is a Carrier–Greenspan potential. Notice the conservation of difficulty. Instead of having to solve the coupled nonlinear set (1), one now has to solve a linear equation (6), however the transformation equations (5) which relate the transformed variables to the physical variables are nonlinear, coupled, and implicit. Yet, a redeeming feature is that in the hodograph plane, i.e., in the (σ, λ)-space, the instantaneous shoreline is always at $\sigma = 0$. This allows for direct analytical solutions without the complications of the moving shoreline boundary.

In general, it is quite difficult to specify boundary or initial data for the nonlinear problem in the physical (x, t)-space coordinates without making restrictive assumptions; a boundary condition requires specification of $(X_0, \forall t)$ while an initial condition requires specification at $(\forall x, t_0)$. Even when boundary or initial conditions are available in the (x, t)-space, the process of deriving the equivalent conditions in the (σ, λ)-space is not trivial. These difficulties have restricted the use of Carrier–Greenspan transformation, and this is why they are discussed here again, in an attempt to demystify them.

Boundary value problem (BVP) for the constant depth/beach topography: Using the solution (2) of the equivalent linear problem, at the seaward boundary of the beach, i.e., at $x = X_0 = \cot\beta$ corresponding to $\sigma = \sigma_0 = 4$ based on characteristic depth scale, Synolakis (1986, 1987) was able to show that the Carrier–Greenspan potential is given by

$$\psi_b(\sigma, \lambda) = -\frac{16i}{X_0}\int_{-\infty}^{+\infty} \frac{\Phi(\kappa)}{\kappa} \frac{J_0(\sigma\kappa X_0/2)e^{-i\kappa X_0(1-\frac{\lambda}{2})}}{J_0(2\kappa X_0) - iJ_1(2\kappa X_0)}\, d\kappa. \tag{7}$$

Note that the hodograph transformation includes $\cot\beta$ as coefficient because the scaling used in Synolakis (1986, 1987), i.e., $x = \cot\beta\left(\frac{\sigma^2}{16} - \eta\right)$ and $t = \cot\beta\left(u - \frac{\lambda}{2}\right)$. Then the amplitude $\eta(x, t)$ can be calculated directly from equation (5), so comparisons with numerical simulations for any given $\Phi(\kappa)$ is possible and straightforward. One example of the application of the BVP solution of Synolakis (1986, 1987) is given in Figure 5.

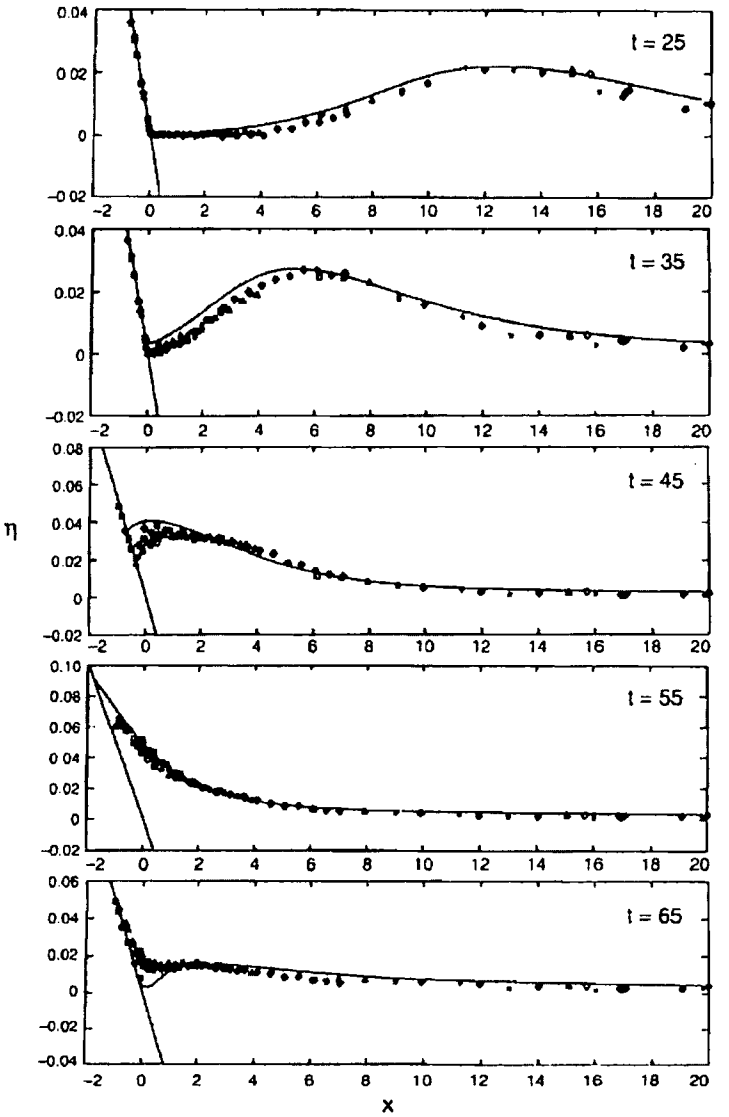


Figure 5
Time evolution of a $\bar{H}/\bar{d} = 0.0185$ solitary wave up a 1:19.85 beach (Fig. 1). While the markers show different realizations of the same experiment, the solid lines show boundary value problem solution of the nonlinear shallow-water wave equations. Refer to Synolakis (1986, 1987) for details.

Initial value problem (IVP) for a sloping beach: For the initial condition where $\Psi(\sigma) = u_\lambda(\sigma, 0) = 4\eta_\sigma(\sigma, 0)/\sigma$, Carrier and Greenspan (1958) presented the following potential in the transform space,

$$\psi_i(\sigma,\lambda) = -\int_0^\infty \int_0^\infty \frac{1}{\omega}\xi^2\Psi(\xi)J_0(\omega\sigma)J_1(\omega\xi)\sin(\omega\lambda)\,d\omega d\xi. \tag{8}$$

Note that a characteristic length scale is used to define dimensionless variables. KÂNOĞLU (2004) proposed that the difficulty of deriving an initial condition in the (σ, λ)-space is overcome by simply using the linearized form of the hodograph transformation for a spatial variable in the definition of initial condition. Once an IVP is specified in the (x, t)-space as $\eta(x, 0)$, the linearized hodograph transformation $x \cong \frac{\sigma^2}{16}$ is used directly to define the initial waveform in the (σ, λ)-space, $\eta\left(\frac{\sigma^2}{16}, 0\right)$. Thus $\Psi(\sigma) = 4\eta_\sigma\left(\frac{\sigma^2}{16}, 0\right)/\sigma$ is found, and $\psi_i(\sigma, \lambda)$ follows directly through a simple integration.

Once $\psi_i(\sigma, \lambda)$ is known, one can investigate any realistic initial waveform such as Gaussian and N-wave shapes as employed in CARRIER *et al.* (2003). While KÂNOĞLU (2004) does not consider waves with initial velocities, later, KÂNOĞLU and SYNOLAKIS (2006) solved a more general initial condition, i.e., initial wave with velocity.

Since it is important for coastal planning, simple expressions for shoreline runup/rundown motion and velocity are useful. Considering that the shoreline corresponds to $\sigma = 0$ in the (σ, λ)-space, the runup/rundown motion can be evaluated. Here, note that the mathematical singularity of the $u = \psi_\sigma/\sigma$, i.e., $J_1(\omega\sigma)/\sigma$, at the shoreline $(\sigma = 0)$ is removed with the consideration of the $\lim_{\sigma\to 0}[J_1(\omega\sigma)/\sigma] = \frac{\omega}{2}$ (SYNOLAKIS, 1986; KÂNOĞLU, 2004). An example is provided in Figure 6 for IVP (KÂNOĞLU, 2004).

Solitary wave on a composite beach: 1+1 models that perform well with the single beach analytical solutions must still be tested with the composite beach geometry, for which an analytical solution exists, with solitary waves as inputs. Most topographies of engineering interest can be approximated by piecewise-linear segments allowing the use of LSW equation to determine approximate analytical results for the wave runup in closed form. In principle, fairly complex bathymetries can be represented through a combination of positively/negatively sloping and constant-depth segments. Solutions of the LSW equation at each segment can be matched analytically at the transition points between the

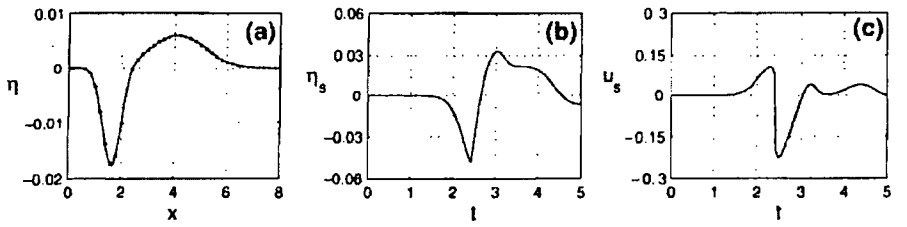


Figure 6

Initial value problem solution of the nonlinear shallow-water wave equations. (a) The leading-depression initial waveform presented by CARRIER *et al.* (2003), $\eta(x, 0) = H_1 \exp(-c_1(x - x_1)^2) - H_2 \exp(-c_2(x - x_2)^2)$ with $H_1 = 0.006$, $c_1 = 0.4444$, $x_1 = 4.1209$, $H_2 = 0.018$, $c_2 = 4.0$, and $x_2 = 1.6384$ (solid line) compared with the one resulting from approximation (dots), using the linearized form of the transformation for the spatial variable, (b) shoreline position, and (c) shoreline velocity. After KÂNOĞLU (2004).

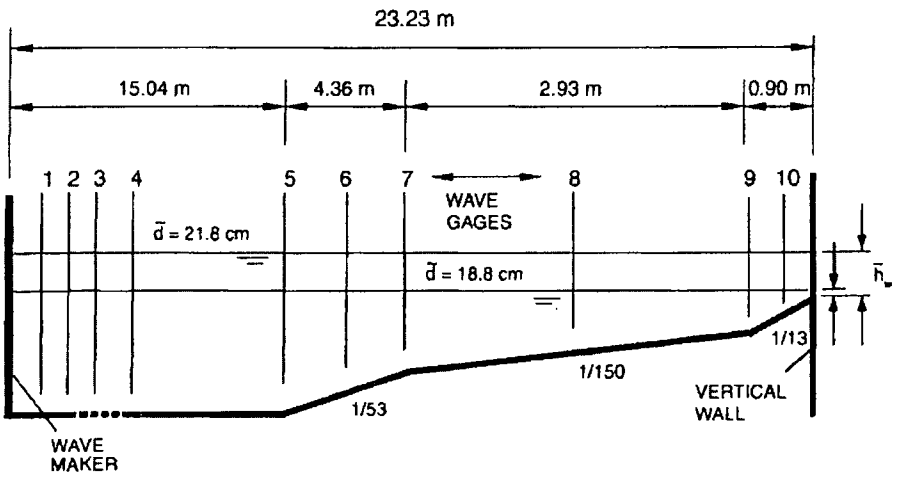


Figure 7
Definition sketch for the Revere Beach topography. $h_w = \tilde{h}_w/\tilde{d}$ is the water depth at the foot of the seawall, i.e., there were $\tilde{h}_w$ = 1.7 cm and 4.7 cm depths at the seawall when $\tilde{d}$ = 18.8 cm and 21.8 cm, respectively. Not to scale.

segments, and then the overall amplification factor and reflected waves can be determined, analytically. As an example, KÂNOĞLU and SYNOLAKIS (1998) considered three sloping segments and a vertical wall at the shoreline, as in Revere Beach in Massachusetts (Fig. 7). They were able to show that the maximum runup of solitary waves with maximum wave height H can be calculated analytically and is given by the runup law,

$$\mathcal{R} = 2h_w^{-1/4}H. \tag{9}$$

The runup law above suggests that the maximum runup only depends on the depth at the seawall h_w fronting the beach, and it does not depend on any of the three slopes in front of the seawall. Laboratory data exist for this topography and the runup law (9) predicts the nonbreaking data surprisingly well (Fig. 8). The laboratory data are discussed briefly in section 2.2.2 and in greater detail in YEH *et al.* (1996), KÂNOĞLU (1998), and KÂNOĞLU and SYNOLAKIS (1998).

Subaerial landslide on a simple beach: Inundation computations are exceedingly difficult when the beach is deforming during a subaerial landslide. LIU *et al.* (2003) considered tsunami generation by a moving slide on a uniformly sloping beach, using the forced LSW equation of TUCK and HWANG (1972), and were able to derive an exact solution. Let $\tilde{\delta}$ and $\tilde{L}$ be the maximum vertical thickness of the sliding mass and its horizontal length respectively, and $\mu = \tilde{\delta}/\tilde{L}$. Tilde representing dimensional quantities, LIU *et al.* (2003) normalized the forced LSW equation with $(\eta, h_0, \mathcal{R}) = (\tilde{\eta}, \tilde{h_0}, \tilde{\mathcal{R}})/\tilde{\delta}$, $x = \tilde{x}/\tilde{L}$, and $t = \tilde{t}/\left(\sqrt{\tilde{\delta}/\tilde{g}}/\mu\right)$, i.e., $\eta_{tt} - (\tan\beta/\mu)(\eta_x x)_x = h_{0,tt}$ where $h_0(x, t)$ is the time-dependent

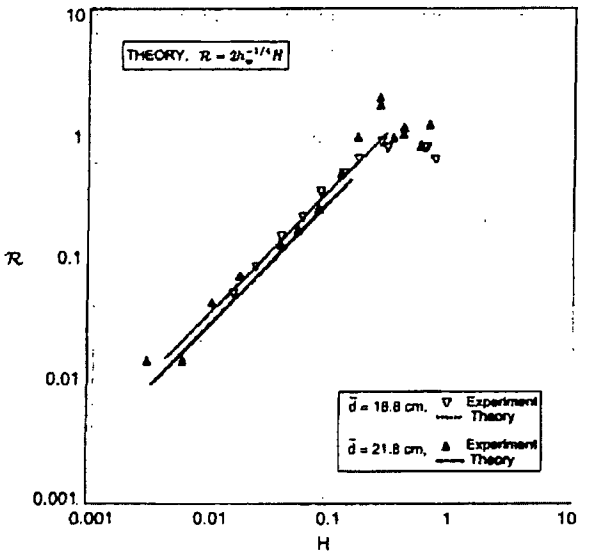


Figure 8
Comparison of the maximum runup values for the linear analytical solution (9) and the laboratory results for two different depths, i.e., $\tilde{d}$ = 18.8 cm and 21.8 cm. h_w is the nondimensional depth at the toe of the seawall, and it varies with $\tilde{d}$. After KÂNOĞLU and SYNOLAKIS (1998).

perturbation of the sea floor with respect to the uniformly sloping beach. The focus in their analysis is on thin slides where $\mu = \tilde{\delta}/\tilde{L} \ll 1$.

Consider a translating Gaussian-shaped mass, initially at the shoreline, given by $h_0(x, t) = \exp[-(\xi - t)^2]$ with $\xi = 2\sqrt{\mu x/\tan\beta}$. Once in motion, the mass moves at constant acceleration. The free surface wave height is given by

$$\eta(\xi, t) = \int_0^\infty J_0(\rho\xi)\rho\left[a(\rho)\cos(\rho t) + \frac{1}{\rho}b(\rho)\sin(\rho t)\right]d\rho + \frac{1}{3}(h_0 - \xi\, h_{0,\xi}), \qquad (10)$$

where $a(\rho)$ and $b(\rho)$ can be determined by the initial conditions, i.e., unperturbed water surface and zero velocity initially. Details can be found in LIU *et al.* (2003), nevertheless it is clear that once the seafloor motion is specified, the wave height can be calculated explicitly. Figure 9 shows one example of the solution. Comparisons of the maximum runup estimates of this solution with a nonlinear numerical computation are shown in Figure 10, as an example of the validation process.

2.2.2 Laboratory benchmarking. Long before the availability of numerical codes, physical models at small scale had been used to visualize wave phenomena in the laboratory and then predictions were scaled to the prototype. Even today, when designing harbors, laboratory experiments—scale model tests—are used to confirm different flow details and validate the numerical model used in the analysis.

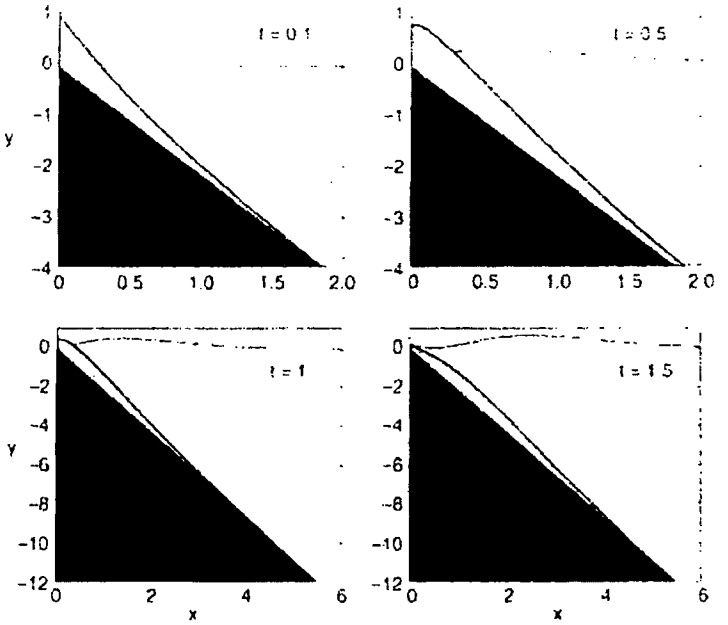


Figure 9
Spatial snapshots of the analytical solution at four different times for a beach slope, $\beta = 5°$, and landslide aspect ratio, $\mu = 0.05$ ($\tan\beta/\mu = 1.75$). The slide mass is indicated by the light shaded area, the solid beach slope by the black region, and η by the solid line (Liu *et al.*, 2003).

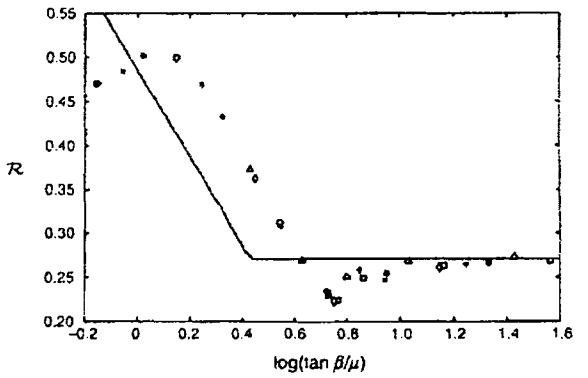


Figure 10
Maximum runup as a function of $\log(\tan\beta/\mu)$. The analytical solutions are shown by the solid line, and the various symbols are from nonlinear shallow-water wave simulations of Liu *et al.* (2003), corresponding to different slopes ranging from 2° to 20°.

Numerical codes developed in the last decade that consistently produce predictions in excellent agreement with measurements from small-scale laboratory experiments have been shown to also model geophysical-scale tsunamis well. For example, a numerical code that adequately models the inundation observed in a 1-m-deep laboratory model is also expected to compute the inundation in a 1-km-deep geophysical basin, as the grid sizes are adjusted accordingly and in relationship to the scale of the problem. While scale laboratory models, in general, do not have bottom friction characteristics similar to real ocean floors or sandy beaches, this has proven not to be a severe limitation for validation of numerical models. It is a problem when the laboratory results are used for designing prototype structures by themselves and without the benefit of numerical models. For example, sediment transport cannot be extrapolated from the laboratory to geophysical scales because the dynamics of sand grain motions do not scale proportionally to the geometric scales of the model, and it is otherwise impossible to achieve dynamic similarity.

The results from five laboratory experiments are described as laboratory benchmarking: Solitary wave experiments on a 1:19.85 sloping beach (SYNOLAKIS, 1986, 1987), on a composite beach (KÂNOĞLU, 1998; KÂNOĞLU and SYNOLAKIS, 1998), and on a conical island (BRIGGS *et al.*, 1995; LIU *et al.*, 1995; KÂNOĞLU, 1998; KÂNOĞLU and SYNOLAKIS, 1998); tsunami runup onto a complex three-dimensional beach (TAKAHASHI, 1996); and tsunami generation and runup due to a three-dimensional landslide (LIU *et al.*, 2005).

For the solitary wave experiments, the initial location, X_s in the analysis changes with different wave heights; solitary waves of different heights have different effective *wavelengths*. A measure of the *wavelength* of a solitary wave is the distance between the point x_f on the front and the point x_t on the tail where the local height is 1% of the maximum, i.e., $\eta(x_f, t = 0) = \eta(x_t, t = 0) = (\tilde{H}/\tilde{d})/100$. The distance X_s is at an offshore location where only 5% of the solitary wave is already over the beach, so that scaling can work. Therefore, in the laboratory experiments initial wave heights are identified at a point $X_s = X_0 + (1/\gamma)\,\mathrm{arccosh}\sqrt{20}$ with $\gamma = \sqrt{3(\tilde{H}/\tilde{d})/4}$. In the laboratory, even idealized solitary waveforms dissipate. If the wave height is measured far offshore and used as an initial condition for non-dissipative numerical models, the comparisons will be less meaningful, as the solitary wave will slightly change as it propagates towards the beach in the laboratory. By keeping the same relative offshore distance for defining the initial condition, meaningful comparisons are assured.

Solitary wave on a simple beach: Given that a small number of 2+1 wave basin laboratory measurements exists, 1+1 versions of the 2+1 numerical models should be first tested with 1+1 directional laboratory models. The solitary wave experiments on the canonical model should be used first (SYNOLAKIS, 1987). In this set of experiments, the 36.60-m-long, 0.38-m-wide, and 0.61-m-deep California Institute of Technology, Pasadena, California wave tank was used with water at varying depths. The tank is described by HAMMACK (1972), GORING (1978), and SYNOLAKIS (1986). A ramp with a slope of 1:19.85 was installed at one end of the tank to model the bathymetry of the

canonical problem of a constant-depth region adjoining a sloping beach. The toe of the ramp was 14.95 m distant from the rest position of the piston used to generate waves.

A total exceeding 40 experiments with solitary waves running up the sloping beach was performed, with depths ranging from 6.25–38.32 cm. Solitary waves are uniquely defined by their maximum height $\tilde{H}$ to depth $\tilde{d}$ ratio and the depth, i.e., $\tilde{H}/\tilde{d}$ and $\tilde{d}$ are sufficient to specify the wave. $\tilde{H}/\tilde{d}$ ranged from 0.021 to 0.626. Breaking occurs when $\tilde{H}/\tilde{d} > 0.045$, for this particular beach.

This set of laboratory data has been used extensively for code validation: Refer to SYNOLAKIS (1987), ZELT (1991), TITOV and SYNOLAKIS (1995; 1997; 1998), TITOV and GONZÁLEZ (1997), GRILLI *et al.* (1997), LI and RAICHLEN (2000; 2001; 2002). In particular, the data sets for the $\tilde{H}/\tilde{d} = 0.0185$ (Fig. 5) nonbreaking and $\tilde{H}/\tilde{d} = 0.3$ (Fig. 11) breaking solitary waves seem the most often used and most appropriate for code validation.

Solitary wave on a composite beach: 1+1 models that perform well with the solitary wave on simple beach experiments must still be tested with the Revere Beach composite beach geometry. Revere Beach is located approximately 6 miles northeast of Boston in the City of Revere, Massachusetts. To address beach erosion and severe flooding problems, a physical model was constructed at the Coastal Engineering Laboratory of the U.S. Army Corps of Engineers, Vicksburg, Mississippi facility, earlier known as Coastal Engineering Research Center. The model beach consists of three piecewise-linear slopes of 1:53, 1:150, and 1:13 from seaward to shoreward with a vertical wall at the shoreline (Fig. 7). In the laboratory, to evaluate the overtopping of the seawall, the wavemaker was located at 23.22 m and tests were done at two depths, 18.8 cm and 21.8 cm.

In the experiments, solitary waves of different heights $\tilde{H}/\tilde{d}$ were generated at the location X_s for the reason explained. In terms of specific measurements, time histories of the water surface elevations exist at the locations X_s, midway in each sloping segment, and at the transition points. One example of the time histories of water surface elevations is given in Figure 12 and compared with the analytical solution of KÂNOĞLU and SYNOLAKIS (1998). A comparison of numerical results with a laboratory case near the breaking limit offshore will ensure that the code remains stable, even for extreme waves. The runup variation for solitary waves striking the vertical wall was also determined. The maximum runup values on the vertical wall were measured visually and are presented in Figure 8 for the whole experimental parameter range.

Solitary wave on a conical island: 2+1 dimensional calculations should be tested with the conical island geometry. Motivated by the catastrophe in Babi Island, Indonesia (YEH *et al.*, 1994), during the 1992 Flores Island tsunami, large-scale laboratory experiments were performed at the Coastal Engineering Research Center, Vicksburg, Mississippi, in a 30-m-wide, 25-m-long, and 60-cm-deep wave basin (Fig. 13). An initial solitary wave-like profile was created in the basin by a Directional Spectral Wave Generator (DSWG) located at $\tilde{x} = 12.96$ m from the center of the island. The particular 27.42-m-long DSWG consisted of sixty 46 cm × 76 cm individual paddles, each driven independently. Allowing generation of waves with different crest lengths.

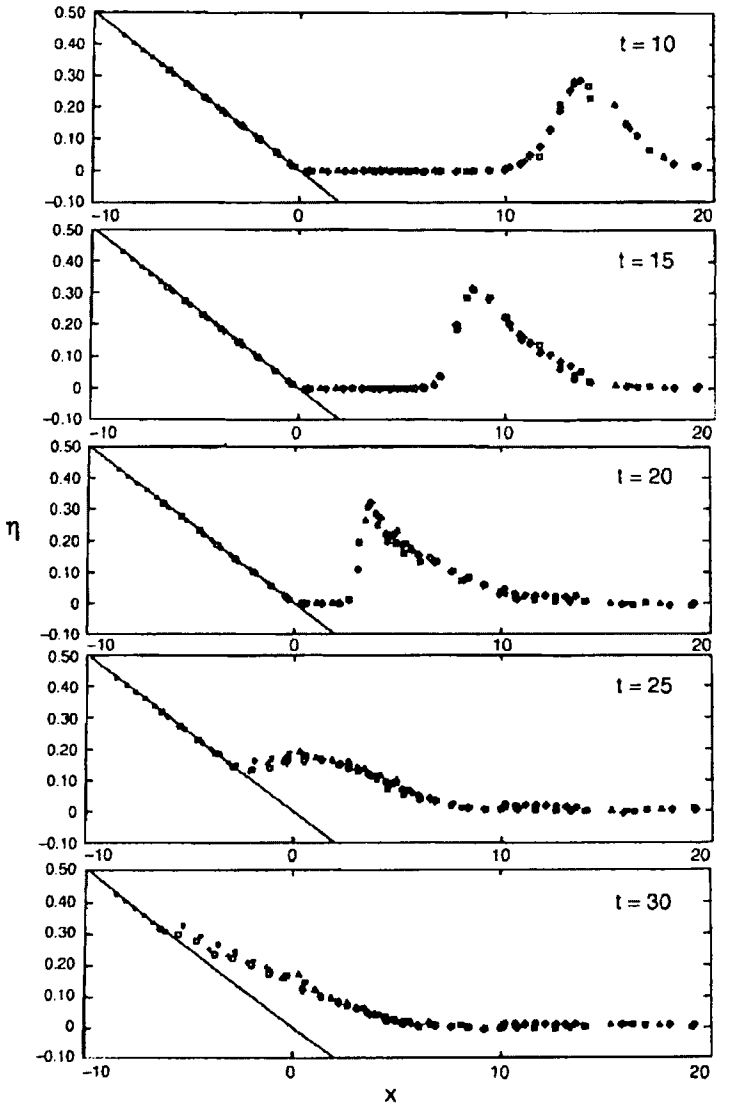


Figure 11
Time evolution of a $H/d = 0.30$ solitary wave up a 1:19.85 beach (Fig. 1). The markers show different realizations of the same experiment of SYNOLAKIS (1986). Refer to SYNOLAKIS (1985; 1987) for details.

In the physical model, a 62.5-cm-high, 7.2-m toe-diameter, and 2.2-m crest-diameter circular island with a 1:4 slope was located in the basin. Experiments were conducted at 32 cm and 42 cm water depths. Each experiment was repeated at least twice. The wavemaker trajectories were recorded to allow the assignment of the same boundary

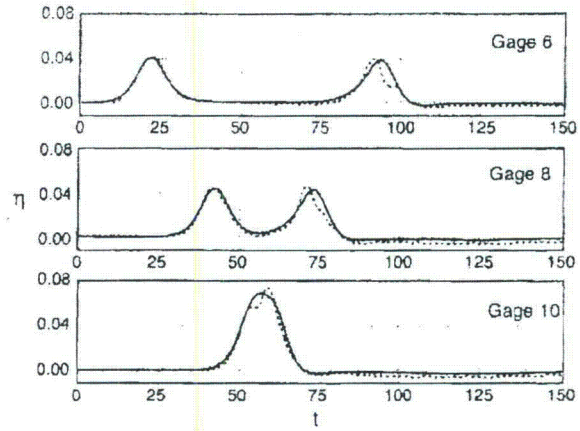


Figure 12
Comparison of the time histories of the free surface elevations midway in each sloping segment for the analytical solution (solid line) of KÂNOĞLU and SYNOLAKIS (1998) and the laboratory data (dotted line) for a $\tilde{H}/\tilde{d} = 0.038$, $\tilde{d} = 21.8$ cm, solitary wave. Refer to KÂNOĞLU and SYNOLAKIS (1998) for details.

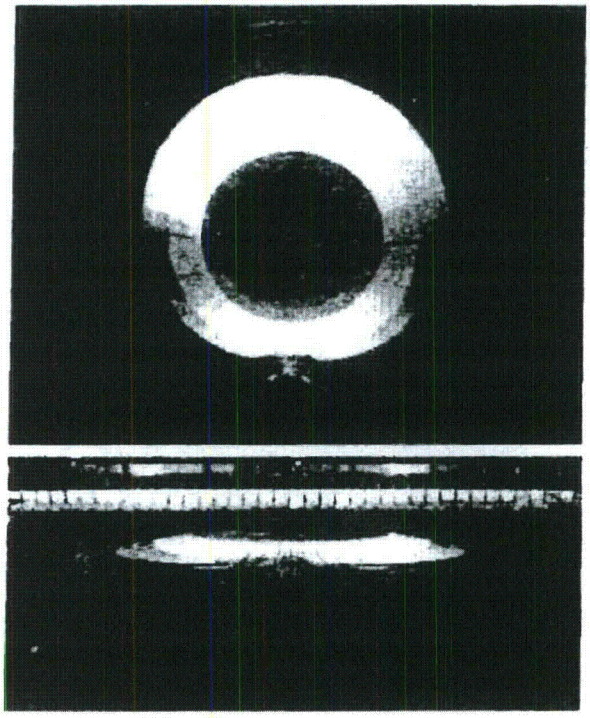


Figure 13
Views of the conical island (top) and the basin (bottom). After KÂNOĞLU and SYNOLAKIS (1998).

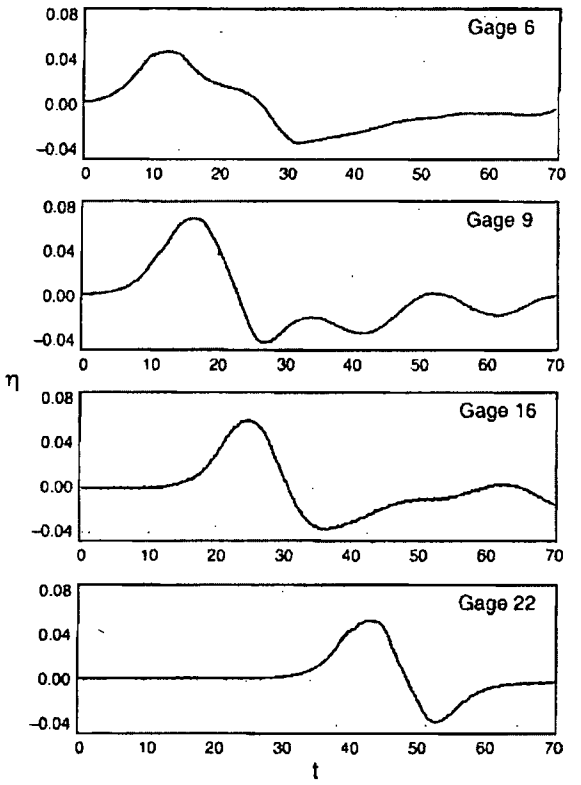


Figure 14
Laboratory data for the time histories of surface elevation for a $\tilde{H}/\tilde{d} = 0.045$, $\tilde{d} = 32$ cm, solitary wave at four gages. Gage 6 is located at the toe of the conical island on the 0° radial line, i.e., incoming wave direction. Gages 9, 16, and 22 are the gages closest to the shoreline on the 0°, 90°, and 180° radial lines respectively. Refer to Liu *et al.* (1995) and Kânoğlu and Synolakis (1998) for experimental details.

motion in numerical computations. Water-surface time histories were measured with 27 wave gages located around the perimeter of the island. One example is provided here and time histories of the surface elevation around the circular island are given at four locations (Fig. 14). Maximum runup heights around the perimeter of the island were measured at 24 locations (Fig. 15). Any numerical computation of two-dimensional runup should stably model two wave fronts that split in front of the island and collide behind it.

The conical island experiments provided runup observations for validating numerical models and supplemented comparisons with analytical results (Kânoğlu and Synolakis, 1998). The experiments are described in greater detail in Liu *et al.*, 1995; Briggs *et al.*, 1995; Kânoğlu, 1998; Kânoğlu and Synolakis, 1998.

Complex three-dimensional runup on a cove; Monai Valley: 2+1 numerical computations should also be benchmarked with the laboratory model of Monai Valley,

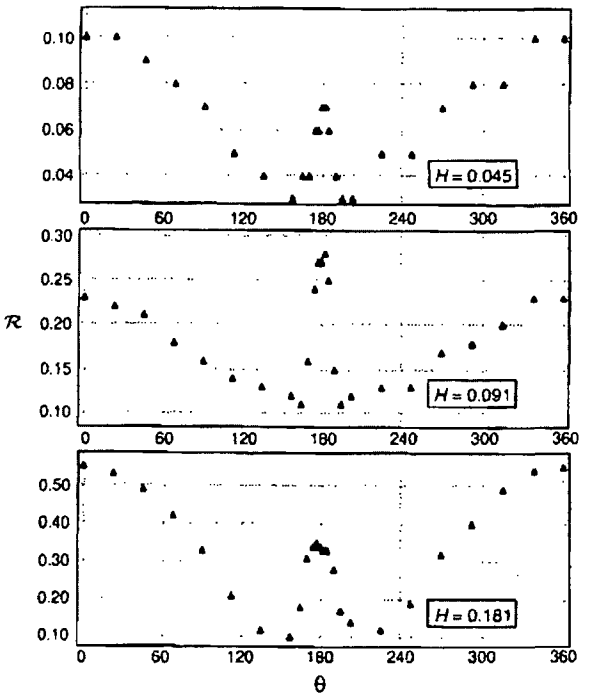


Figure 15
Maximum runup heights from the laboratory data for three solitary waves $\bar{H}/\bar{d} = 0.045$, 0.091, and 0.181, $\bar{d} = 32$ cm.

Okushiri Island, Japan. The Hokkaido–Nansei–Oki (HNO) tsunami of 1993 struck Okushiri resulting in 30 m extreme runup heights and currents of the order of 10–18 m/sec, (HOKKAIDO TSUNAMI SURVEY GROUP, 1993). The extreme tsunami runup mark was discovered at the tip of a very narrow gulley within a small cove at Monai. High resolution seafloor bathymetry existed before the event and, when coupled with bathymetric surveys following it, allowed meaningful characterization of the seafloor deformation that triggered the tsunami.

A 1/400 laboratory model closely resembles the actual bathymetry and topography of Monai Valley and was constructed in a 205-m-long, 6-m-deep, and 3.5-m-wide tank at the Central Research Institute for Electric Power Industry (CRIEPI) in Abiko, Japan (Fig. 16a). The incident wave from offshore was an LDN with a -2.5 cm leading-depression and a 1.6 cm crest following it (Fig. 16b). The vertical sidewalls were totally reflective. Waves were measured at 13 locations, as shown in Figure 16c for one location. Comparing model output for this benchmark with the laboratory data shows how well a given code performs in a rapid sequence of withdrawal and runup.

Three-dimensional landslide: Landslide wave generation remains the frontier of numerical modeling, particularly for subaerial slides. The latter not only involves the

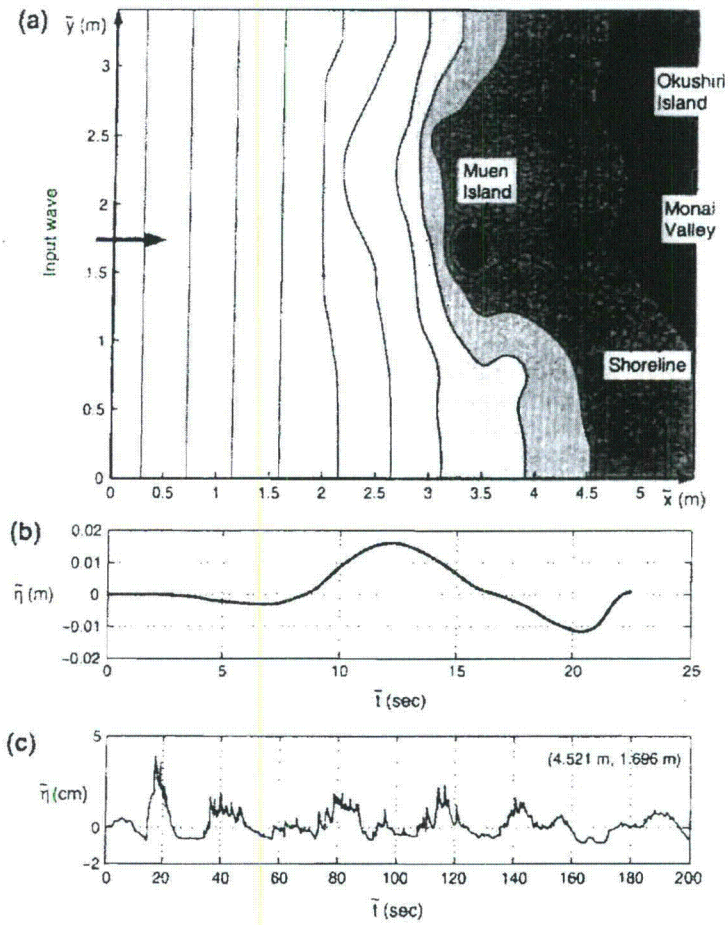


Figure 16
(a) Bathymetric and topographic profile for the Monai Valley experimental setup. Light to dark shading shows deep to shallow depth. Not to scale (b) Input wave profile, (c) Time series of surface elevation at (4.521 m, 1.696 m).

rapid change of the seafloor, but also the impact with the still water surface. Numerical codes that will be used to model subaerial-landslide triggered tsunamis need to be tested against three-dimensional landslide benchmarks.

Large-scale experiments have been conducted in a wave tank with a 104-m-long, 3.7-m-wide, and 4.6-m-deep wave channel with a plane slope (1:2) located at one end of the tank; part of the experimental setup is shown in Figure 17, after RAICHLEN and SYNOLAKIS (2003). A solid wedge was used to model the landslide. The triangular face had a horizontal length of 91 cm, a vertical face with a height of 45.5 cm, and a width of 61 cm (Fig. 17). The horizontal surface of the wedge was initially positioned either a short

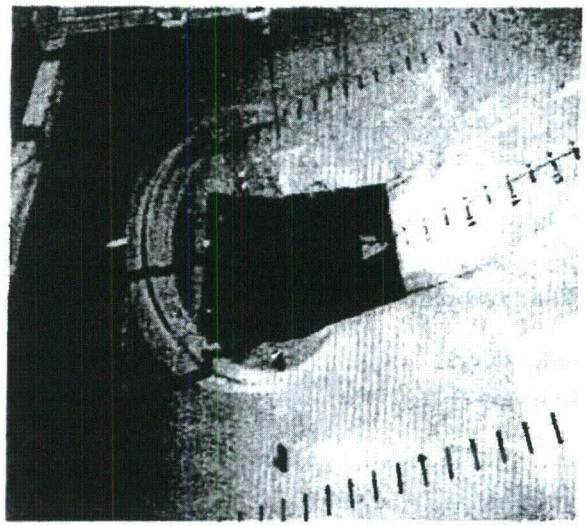


Figure 17
A picture of part of the experimental setup. After Raichlen and Synolakis (2003).

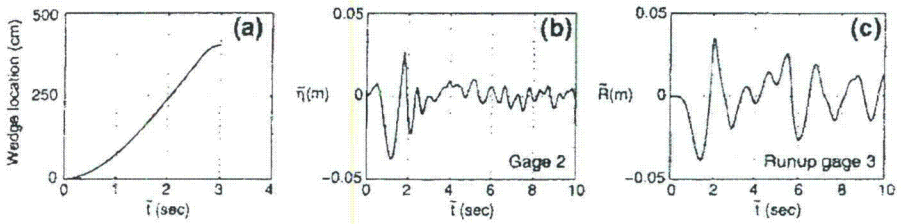


Figure 18
(a) Time histories of the block motion, (b) time histories of the surface elevation, and (c) runup measurements for the submerged case with $\Delta = -0.1$ m. Gage 2 and runup gage 3 are located approximately one wedge-width away from the center cross-section, i.e., 0.635 m and 0.61 m, respectively. While gage 2 is located 1.245 m away from the shoreline, the runup gage 3 is located at the shoreline. Refer to Liu *et al.* (2005) for details.

distance above or below the still water level to reproduce a subaerial or submarine landslide. The block was released from rest, abruptly moving downslope under gravity, rolling on specially designed wheels (with low friction bearings) riding on aluminum strips with shallow grooves inset into the slope. The wedge was instrumented with an accelerometer to measure the acceleration-time history and a position indicator to independently determine the velocity and position time histories which can be used for numerical modeling (Fig. 18).

A sufficient number of wave gages were used to determine the seaward propagating waves, the waves propagating to either side of the wedge, and for the submerged case, the

water surface-time history over the wedge. In addition, the time history of the runup on the slope was accurately measured. Time histories of the surface elevations and runup measurements for the case with submergence $\Delta = -0.1$ m are presented in Figure 18. A total of more than 50 experiments with moving wedges, hemispheres, and paralleliped bodies were conducted, and the wedge experiments were used as benchmark tests in the 2004 Catalina Island, Los Angeles, California workshop (Liu *et al.*, 2008). Details and more experimental results can be found in Raichlen and Synolakis (2003) and Liu *et al.* (2005).

2.2.3 Field data benchmarking. Verification of any model in a real-world setting is essential, after all computations are presumed to model geophysical reality, especially for operational models. Benchmark testing is a necessary but not a sufficient condition. The main challenge of testing a model against real-world geophysical data is to overcome the uncertainties inherent in the definition of the tsunami source. While the source of the wave is deterministic in the controlled setting of the laboratory experiment and can usually be reproduced with precision in computations, the initialization of the numerical computation of a prototype tsunami is not as well constrained. It has not been uncommon for modelers to introduce ad hoc amplification factors in standard source solutions a la Okada (1985) to obtain better agreement between their runup predictions and observations. Clearly such comparisons are circuitous, and fortunately with the further deployment of DART buoys—tsunamographs—they will be obsolete. For tsunamis, deep-ocean measurements (Bernard *et al.*, 2006) are the most unambiguous data quantifying the source of a tsunami. One example of tsunami source quantification through deep-ocean measurements is given in Wei *et al.* (2008).

No DART buoys—tsunameters—existed in the Indian Ocean at the time of the megatsunami, since DART buoys then had only been deployed in the Pacific Ocean. Satellite altimetry measurements of the Indian Ocean tsunami provide insufficient quality and coverage to constrain the tsunami source. Hydrodynamic inversion remains an ill-posed problem and criteria for its regularization are lacking. Hence, the 2004 event is not as yet one of the better operational benchmarks in terms of forecasting inundation, given the still raging debate as to the details of the seafloor deformation.

Deep-ocean measurements allow for more defensible inversions, since they are not affected by local coastal effects. Several events have been recorded by both deep-ocean and coastal gages in the Pacific and allow reasonably constrained comparison with models. The expanded DART system array will be providing more tsunami measurements for future events, expanding the library of well-constrained propagation scenarios for model verification. NOAA's National Geophysical Data Center (http://www.ngdc.noaa.gov/hazard/tsu.shtml), NOAA's Tsunami Warning Centers (http://www.prh.noaa.gov/ptwc/ and http://wcatwc.arh.noaa.gov/), and NOAA's Center for Tsunami Research (http://nctr.pmel.noaa.gov/) websites provide updated information on the latest tsunami data. Here, we first present field data for the 1993 HNO tsunami then

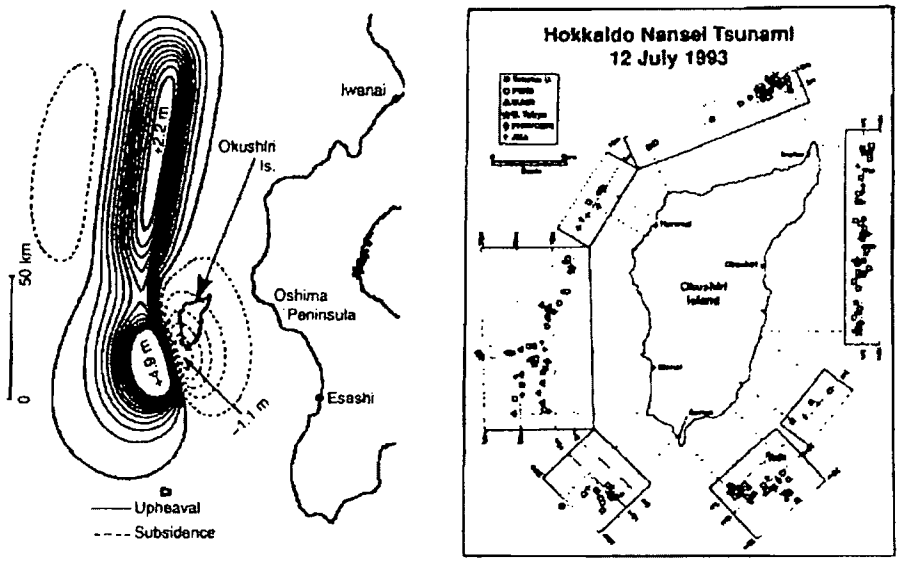


Figure 19
(Left inset) Fault plane constructed by the Disaster Control Research Center, Japan. (Right inset) Maximum runup measurements around Okushiri Island. Refer to TAKAHASHI (1996) for details.

present the data used for the first real-time model forecast test as an example of data which might be used for model verification.

Okushiri Island: 2+1 numerical computations should be tested with the field runup measurements from the HNO tsunami around Okushiri, Japan. The bathymetry data set and the initial condition formulated a benchmark problem for the 2nd International Long-Wave Runup Models Workshop and are thoroughly explained in TAKAHASHI (1996). The magnitude $M_s = 7.8$ HNO earthquake occurred on 12 July, 1993 with a depth of 37 km hypocenter located off the southwestern coast of Hokkaido. There are several field observations which need to be explained by numerical modeling. First, the computation should estimate the wave arrival at Aonae 5 min after the earthquake. The numerical model should generate two waves at Aonae approximately 10 min apart; with the first wave arriving from the west and the second from the east. In addition, the tide gage records as presented in TAKAHASHI (1996) need to be estimated. Maximum runup predictions should then be compared with the measurements (Fig. 19). The runup high at Hamatsumae, east of Aonae needs to be illustrated, as the locale is sheltered against the direct attack of the tsunami by Aonae point.

The Rat Islands tsunami: For operational codes, benchmark testing should invert the tsunameter signal of the 17 November, 2003 Rat Islands tsunami to improve the initial estimate of sea-surface displacement derived from a seismic deformation model. It should then use the results as input to a Hilo, Hawaii inundation model to hindcast the tide gage

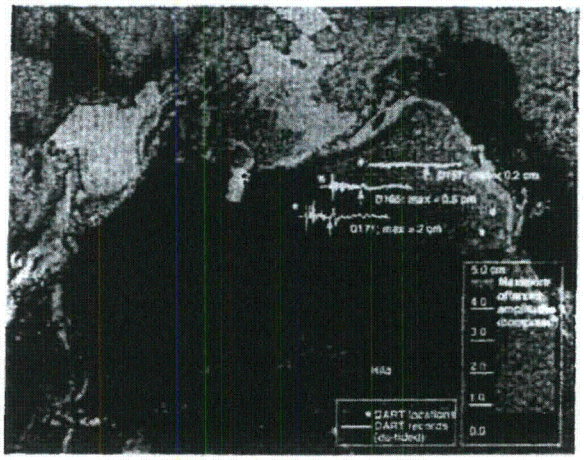


Figure 20
Propagation of the 17 November, 2003 Rat Islands tsunami. Star indicates epicenter location of the earthquake. Yellow dots are locations of DART buoys. White lines near the DART locations show recorded tsunami signal (detided) at corresponding tsunameter, arrows indicate tsunami arrival on the recordings. Filled colors show example of computed maximum tsunami amplitudes of a model propagation scenario.

record observed during the tsunami at Hilo. This is the most difficult but most realistic test for any operational model, for it involves a forecast (now hindcast) and needs to be done much faster than real time.

The magnitude $M_w = 7.8$ parent earthquake was located near Rat Islands, Alaska. This tsunami was detected by three tsunameters located along the Aleutian Trench and was also recorded at many coastal locations (TITOV *et al.*, 2005). The combined use of tsunami propagation and inundation models is required for simulation of tsunami dynamics from generation to inundation. The test requires matching the propagation model data with the DART recording to constrain the tsunami source model (Fig. 20). If a finite-difference method on a structured grid is used, several nested numerical grids would allow *telescoping* from a coarse-resolution propagation model into a high-resolution inundation model with a model grid of at least 50 m resolution. If an unstructured grid method is used, a single grid may include enough resolution near the coast. The data-constrained propagation model should drive a high-resolution inundation model of Hilo Harbor. The inundation model being tested should reproduce the tide gage record at Hilo (Fig. 21). Since this benchmarking is required for the forecasting models, it is essential to model four hours of Hilo Harbor tsunami dynamics in 10 min of computational time.

2.3. Scientific Evaluation

Peer-review documentation: Any model used for inundation mappings or operational forecasts must be published in peer-reviewed scientific journals. One or more of these

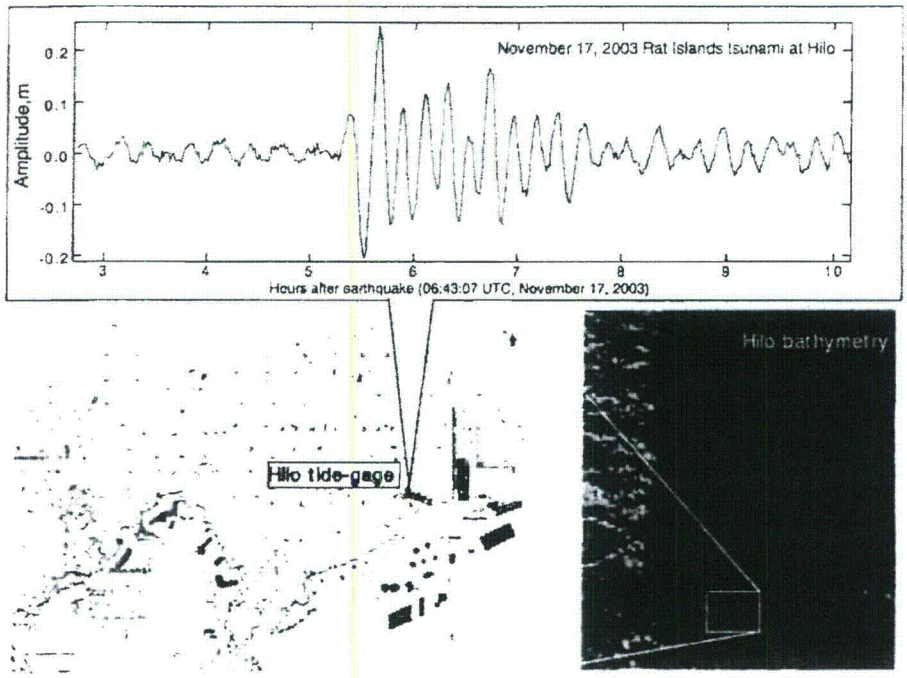


Figure 21
Location of Hilo tide gage and the recording of the 17 November, 2003 Rat Islands tsunami.

publications should include either the benchmark comparisons described here or their equivalents. However, it must be stressed that a single comparison is not sufficient.

Formal scientific evaluation: To identify best available practices and set standards based on these practices, a formal evaluation process of individual models needs to be established. This process may include solicitation of additional reviews of the model's veracity by experts.

2.4. *Operational Evaluation*

To ensure consistency in interpretation, the same model(s) should be used to produce inundation map and operational forecast products. If a tsunami inundation model is under consideration to generate operational forecast products, then an additional evaluation should be conducted to determine the suitability of the model for operational applications. This evaluation should be conducted in a test-bed environment consisting of research and operational parts, in order to assess a number of model features that bear on important operational factors, such as special implementation hardware/software issues, ease of use, computation time, etc. In particular, the operational evaluation of

candidate models for real-time forecasting and inundation mapping should include the following steps:

Step 1—*Meet operational forecasting and inundation mapping requirements and objectives*: Operational requirements include: Basic forecasting and inundation computation; analysis and visualization tools; integration with operations (vs. separate, stand-alone applications); basic data assimilation techniques; computational resources needed to meet milestones; etc. If a candidate model does not meet specified forecasting or inundation mapping requirements and objectives, it should be rejected at this point.

Step 2—*Meet modular development requirements*: Various pieces of the forecast model must be developed in parallel, based on the overall objectives defined in step 1.

Step 3—*Meet test bed and model standards*: In this step, the candidate model is tested against operational standards, with special attention given to its ability to simulate previous major tsunamis with the required speed and accuracy. Based on these test results, forecast model development may return to step 2, proceed, or the candidate model may be rejected for operational use.

Step 4—*Meet operational testing requirements*: The candidate model is integrated into the operational setting for testing. Potential sources are defined and the model is tested in a forecasting mode on an operational platform. Graphical interfaces are developed and forecast models are applied to a few cases to test operational integration and important individual factors such as speed, accuracy, and reliability (see section 3). Operational testing and feedback is provided by the TWCs at this point, and adjustments are made as necessary.

Step 5—*Implement operationally*: The model is fully integrated into the operational setting and procedures.

3. Criteria for Evaluating Operational Forecasting and Inundation Mapping Models

Given the accumulated experience in the tsunami community in the past 50 years, it is now possible to describe the requirements for an ideal tsunami model. Given an earthquake fault mechanism and tsunameter data, the ideal model should satisfactorily predict tsunami inundation at-risk coastlines in a sufficiently short time. Sufficiently short is defined as any time interval between the initiation of the tsunami and the calculation of the inundation forecast that allows for evacuation of the target communities. For example, the State of Hawaii needs about three hours for a complete and orderly evacuation. An ideal model would accurately forecast inundation at least three hours before the tsunami impact is expected anywhere in Hawaii.

3.1. Model Computational Time Constraints

Computational speed standards for inundation mapping and real-time forecasting are different. Inundation mapping can safely be conducted over months. An effective

short-term forecast must be produced faster than real-time. It should be available a few minutes before the tsunami strikes the nearest community, to allow sirens to trigger the evacuation of beach and coastal residents and give emergency personnel time to mobilize resources and prepare for search and rescue. Furthermore, a forecast must correctly predict the duration of the series of waves that comprise the tsunami event, to identify when it will be safe for search and rescue operations to begin without endangering the lives of responders. Tsunamis often became trapped in closed bays or on the continental shelf, resulting in sea-level oscillations that may persist for several hours. During the 1993 HNO tsunami, bay oscillation at Aonae trapped the tsunami for over 30 min, and a large portion of Aonae remained submerged for much of this time. The Crescent City, California harbor oscillated for several hours following the 15 November, 2006 tsunami (USLU *et al.*, 2007).

3.2. *Model Accuracy Constraints*

The accuracy of any given model depends on how well the computational procedure represents the correct solution of the parent equations of motion. When exact solutions exist (as, for example, for certain cases of the LSW and NSW equations), the determination of the accuracy of a solution algorithm is straightforward, i.e., through comparisons of the numerical results with the analytical predictions. Determining maximum runup numerically within 5% of the analytical solution is now possible with a handful of models.

For most bathymetries of geophysical interest, analytical solutions do not exist, and it is unlikely that they will ever be determined, due to the complexity of the physical terrain. However, a few laboratory models at smaller scale than the prototype exist. The Catalina Island, Los Angeles, 2004 model validation workshop of the National Science Foundation identified a handful of models that could predict the laboratory measurements within 10%. While greater compliance with measurements is hoped for in the next decade, 10% accuracy with respect to laboratory experiments is achievable now and should be considered a standard. In addition, for operational forecast models, propagation accuracy of 10% and an error in estimating arrival times for farfield events of 3 min, both are now possible (TITOV *et al.*, 2005).

An associated accuracy constraint is grid resolution. This depends on the complexity of the shoreline. On a fairly plane, wide, and very long beach such as those of Southern California, a 100-m-grid resolution may be sufficient. The smallest offshore and onshore features likely to affect tsunami impact on a coastal community should be reflected in the numerical grids. If a community is fronted by a sand spit of width 100 m, at least four grid points are needed to provide accurate resolution of the flow over the spit.

We emphasize again that laboratory and analytical benchmarks are necessary but not sufficient conditions for confidence for extrapolation of the methodology at geophysical scales. One example is wave-breaking. While a numerical model may realistically approximate the solution of the Navier–Stokes equations at laboratory scales, it may not do

so at large scales. Calculating the evolution of breaking waves involves calculating turbulent shear terms and invoking turbulence closure constraints which are scale-dependent. Therefore a reliability constraint needs to be applied, and this is discussed next.

3.3. Model Reliability and Reality Constraints

Model reliability refers to how well a given model predicts inundation consistently and realistically at geophysical scales. Linear theory may predict wave evolution consistently, but not always realistically. For example, linear theory predicts that the height of shoaling waves will grow continuously; in reality, however, waves will eventually break, if they exceed threshold height-to-depth and height-to-wavelength ratios.

Reliability is a crucial issue. Several widely-used numerical models include *ad hoc* friction factors. These factors were not developed to model the physical manifestation of frictional dissipation but to stabilize what is by its very nature a marginally stable computation. It is therefore not possible to know *a priori* how well a model that has been fairly successful in a small number of cases performs in general. For example, a model developed and calibrated to provide stable computations along steep coastlines for which inundation distances are less than 200 m may not perform equally well when forecasting inundation penetration of more than 3 km inland, as in the case of Banda Aceh during the 26 December, 2004 Boxing Day tsunami.

Clearly, any numerical model must be tested over a variety of scales from the laboratory to prototype to ensure both reliability and realism. Ideally, inundation models should be continuously tested with every new set of laboratory data or tsunami field data that becomes available. This will also allow for their further improvement.

4. Conclusions

State-of-the-art inundation codes in use today have evolved through a painstaking process of careful validation and verification. Operational forecast models based on these codes have been developed through extensive additional verification with measurements from real tsunamis. Mining this experience, procedures for approval and application of numerical models for operational uses are proposed as: establishment of standards for model validation and verification; scientific evaluation of individual models; operational evaluation of individual models; development of operational applications for forecasting; and procedures for transfer of technology to operations. Only through parallel testing of models under identical conditions, as when there is a tsunami emergency and an operational forecast is performed, can the community determine the relative merits of different computational formulations, an important step to further improvements in speed, accuracy, and reliability.

NOAA has adopted the standards and procedures discussed here for the development and evaluation of operational models for the Pacific and the West Coast/Alaska TWCs

(SYNOLAKIS *et al.*, 2007; http://nctr.pmel.noaa.gov/benchmark/). In addition to NOAA, UNESCO's Intergovernmental Coordination Group (ICG) for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS) adapted a similar document based on SYNOLAKIS *et al.* (2007) during its fourth session at Mombasa, Kenya on 28 February–2 March, 2007 with additional field benchmarking for Sumatra, 26 December, 2004; Nias, 28 March, 2005; Tonga, 3 May, 2006; and Java, 17 July, 2006 events. Also, again UNESCOs ICG for the Northeastern Atlantic, the Mediterranean and Connected Seas Tsunami Early Warning and Mitigation System (ICG/NEAMTWS) is considering adoption of a similar document as well.

It is again emphasized that model testing must be a continuous process. Operational products produced in real time during an actual event must be thoroughly reviewed, and the operational models must be systematically tested in hindcast mode after each tsunami strike. The results must be documented and reported to the community in order to develop and implement improvement through the identification and resolution of any serious problems or inadequacies of the models and/or products. While this process may appear onerous, it does reflect our current state of scientific knowledge. This process is thus the only defensible methodology when human lives are at stake.

Acknowledgements

We thank the National Science Foundation of the United States for supporting some of the early validation exercises through benchmark testing in three individual workshops, and for supporting the analytical studies and laboratory investigations that resulted in the benchmark data sets discussed in this paper. We are grateful to Baran Aydın and Ryan L. Whitney for their help with figures. This publication is partially funded by the Joint Institute for the Study of the Atmosphere and Ocean (JISAO) under NOAA Cooperative Agreement No. NA17RJ1232, Contribution number: 1590; PMEL Contribution number: 3235.

REFERENCES

ASSOCIATED PRESS (2005), *New analysis boosts potential tsunami threat*, December 7, 2005. http://www.kgw.com/shared/content/APStories/stories/D8EBN7NO7.html.

BERNARD, E.N., MOFJELD, H.O., TITOV, V., SYNOLAKIS, C.E., and GONZÁLEZ, F.I. (2006), *Tsunami: Scientific frontiers, mitigation, forecasting, and policy implications*, Philos. T. R. Soc. A *364*, 1989–2007.

BORERRO, J., ORTIZ, M., TITOV, V.V., and SYNOLAKIS, C.E. (1997), *Field survey of Mexican tsunami*, EOS Trans. Amer. Geophys. Un. *78*(8), 85, 87–88 (Cover article).

BRIGGS, M.J., SYNOLAKIS, C.E., HARKINS, G.S., and GREEN, D. (1995), *Laboratory experiments of tsunami runup on a circular island*, Pure Appl. Geophys. *144*, 569–593.

CARRIER, G.F. and GREENSPAN, H.P. (1958), *Water waves of finite amplitude on a sloping beach*, J. Fluid Mech. *17*, 97–110.

CARRIER, G.F., WU, T.T., and YEH, H. (2003), *Tsunami runup and drawdown on a sloping beach*, J. Fluid Mech. *475*, 79–99.

ETHNOS (2007), *Predictions for earthquakes and tsunamis*, http://www.ethnos.gr/article.asp?catid=11386&subid=2&pubid=139228.

GORING, D.G. (1978), *Tsunamis—the propagation of long waves onto a shelf*, W.M. Keck Laboratory of Hydraulics and Water Resources, California Institute of Technology, Pasadena, California, Report No. KH-R-38.

GRILLI, S.T., SVENDEN, I.A., and SUBRAYAMA, R. (1997), *Breaking criterion and characteristics of solitary waves on a slope*, J. Waterw. Port Coast. Ocean Eng. *123*(2), 102–112.

HALL, J.V. and WATTS, J.W. (1953), *Laboratory investigation of the vertical rise of solitary waves on impermeable slopes*, Tech. Memo. 33, Beach Erosion Board, U.S. Army Corps of Engineers, 14 pp.

HAMMACK, J.L. (1972), *Tsunamis—A model for their generation and propagation*, W.M. Keck Laboratory of Hydraulics and Water Resources, California Institute of Technology, Pasadena, California, Report No. KH-R-28.

HOKKAIDO TSUNAMI SURVEY GROUP (1993), *Tsunami devastates Japanese coastal region*, EOS Trans. Amer. Geophys. Un. *74*(37), 417 and 432.

KÂNOĞLU, U. (1998), *The runup of long waves around piecewise linear bathymetries*, Ph.D. Thesis, University of Southern California, Los Angeles, California, 90089–2531, 273 pp.

KÂNOĞLU, U. (2004), *Nonlinear evolution and runup–rundown of long waves over a sloping beach*, J. Fluid Mech. *513*, 363–372.

KÂNOĞLU, U. and SYNOLAKIS, C.E. (1998), *Long wave runup on piecewise linear topographies* J. Fluid Mech. *374*, 1–28.

KÂNOĞLU, U. and SYNOLAKIS, C. (2006), *Initial value problem solution of nonlinear shallow water-wave equations*, Phys. Rev. Lett. *97*, 148501.

KELLER, J.B. and KELLER, H.B. (1964), *Water wave runup on a beach*, ONR Research Report NONR-3828(00), Department of the Navy, Washington DC, 40 pp.

LI, Y. and RAICHLEN, F. (2000), *Energy balance model for breaking solitary wave runup*, J. Waterw. Port Coast. Ocean Eng. *129*(2), 47–49.

LI, Y. and RAICHLEN, F. (2001), *Solitary wave runup on plane slopes*, J. Waterw. Port Coast. Ocean Eng. *127*(1), 33–44.

LI, Y. and RAICHLEN, F. (2002), *Non-breaking and breaking solitary runup*, J. Fluid Mech. *456*, 295–318.

LIU, P.L.-F., CHO, Y.-S., BRIGGS, M.J., KÂNOĞLU, U., and SYNOLAKIS, C.E. (1995), *Runup of solitary waves on a circular island*, J. Fluid Mech. *320*, 259–285.

LIU, P.L.-F., LYNETT, P., and SYNOLAKIS, C.E. (2003), *Analytical solutions for forced long waves on a sloping beach*, J. Fluid Mech. *478*, 101–109.

LIU, P.L.-F., WU, T.-R., RAICHLEN, F., SYNOLAKIS, C.E., and BORRERO, J. (2005), *Runup and rundown generated by three-dimensional sliding masses*, J. Fluid Mech. *536*, 107–144.

LIU, P.L.-F., YEH, H., and SYNOLAKIS, C. (eds.), *Advanced Numerical Models for Simulating Tsunami Waves and Runup*, In *Advances in Coastal and Ocean Engineering 10* (World Scientific, Singapore 2008).

MEI, C. C., *The Applied Dynamics of Ocean Surface Waves* (Wiley, New York, NY 1983).

NATIONAL SCIENCE and TECHNOLOGY COUNCIL (2005), *Tsunami Risk Reduction for the United States: A Framework for Action*, A joint report of the subcommittee on Disaster Reduction and the United States Group on Earth Observations, 30 pp.

NEW SCIENTIST (2005), *Heaving seabed triggered Asian tsunami*, December 10, 2005. http://seattletimes.nwsource.com/html/localnews/2002668973_tsunami07m.html.

OKADA, Y. (1985), *Surface deformation due to shear and tensile faults in a half-space*, Bull. Seismol. Soc. Am. *75*, 1135–1154.

PEDERSEN, G., *A Lagrangian model applied to runup problems*. In *Advanced Numerical Models for Simulating Tsunami Waves and Runup* (eds. Liu, P.L.-F., Yeh, H., and SYNOLAKIS, C.), In *Advances in Coastal and Ocean Engineering 10* (World Scientific, Singapore 2008).

PEDERSEN, G. and GJEVIK, B. (1983), *Runup of solitary waves*, J. Fluid Mech. *135*, 283–299.

RAICHLEN, F. and SYNOLAKIS, C.E. (2003), *Runup from three- dimensional sliding masses*, Proc. *Long Waves Symposium*, Thessaloniki, Greece (eds. M. Briggs, and Ch. Koutitas), pp. 247–256.

SATAKE, K., OKAL, E.A. and BORRERO, J.C. (2007), *Tsunami and its hazard in the Indian and Pacific Oceans: Introduction*, Pure Appl. Geophys. *164*(2-3), 249-259.

SHUTO, N. (1973), *Shoaling and deformation of nonlinear waves*, Coastal Eng. Japan *16*, 1–12.

SYNOLAKIS, C.E. (1986), *The Runup of Long Waves*, Ph.D. Thesis, California Institute of Technology, Pasadena, California, 91125, 228 pp.

Synolakis, C.E. (1987), *The runup of solitary waves*, J. Fluid Mech. *185*, 523–545.

Synolakis, C.E. (1991), *Green law and the evolution of solitary waves*, Phys. Fluids A-Fluid Dynamics *3*, 490–491.

Synolakis, C.E. and Skjelbreia, J.E. (1993), *Evolution of maximum amplitude of solitary waves on plane beaches*, J. Waterw. Port Coast. Ocean Eng. *119*(3) 323–342.

Synolakis, C.E. and Okal, E.A. (2005), *1992–2002: Perspective on a decade of post-tsunami surveys*, Adv. Nat. Technol. Hazards *23*, 1-30.

Synolakis, C.E. and Bernard, E.N. (2006), *Tsunami science before and after Boxing Day 2004*, Phil. Trans. R. Soc. A *364*(1845), 2231–2265.

Synolakis, C.E. and Kong, L. (2006), *Runup measurements of the December 2004 Indian Ocean Tsunami*, Earthq. Spectra *22* (Suppl. 3), S67-S91.

Synolakis, C.E., Bernard, E.N., Titov, V.V., Kânoğlu, U., and González, F. (2007), Standards, criteria, and procedures for NOAA evaluation of tsunami numerical models. NOAA OAR Special Report, Contribution No 3053, NOAA/OAR/PMEL, Seattle, Washington, 55 pp.

Tadepalli, S. and Synolakis, C.E. (1994), *The runup of N-waves on sloping beaches*, Proc. R. Soc. Lond. A. *445*, 99–112.

Tadepalli, S. and Synolakis, C.E. (1996), *Model for the leading waves of tsunamis*, Phys. Rev. Lett. *77*(10), 2141–2144.

Takahashi, T., *Benchmark problem 4; the 1993 Okushiri tsunami—Data, conditions and phenomena*. In *Long-Wave Runup Models* (eds. Yeh, H., Liu, P.L.-F., and Synolakis, C.E.) (World Scientific Publishing, Singapore 1996) pp 384–403.

The Seattle Times (2005), *Tsunami expers forecast raises a flag*, December 7, 2005, http://seattletimes.nwsource.com/html/localnews/2002668973_tsunami07m.html.

Titov, V.V. and Synolakis, C.E. (1995), *Modeling of breaking and nonbreaking long-wave evolution and runup using VTCS-2*, J. Waterw. Port Ocean Coast. Eng. *121*(6), 308–316.

Titov, V.V. and González, F.I. (1997), *Implementation and testing of the method of splitting tsunami (MOST)*, NOAA Technical Memorandum ERL-PMEL-112, PB98-122773, Pacific Marine Environmental Laboratory, Seattle, Washington, 11 pp.

Titov, V.V. and Synolakis, C.E. (1997), *Extreme inundation flows during the Hokkaido–Nansei–Oki tsunami*, Geophys. Res. Lett. *24*(11), 1315–1318.

Titov, V.V. and Synolakis, C.E. (1998), *Numerical modeling of tidal wave runup*, J. Waterw. Port Ocean Coast. Eng. *124*(4), 157–171.

Titov, V.V., González, F.I., Bernard, E.N., Eble, M.C., Mofield, H.O., Newman, J.C., and Venturato, A.J. (2005), *Real-time tsunami forecasting: Challenges and solutions* Nature Hazard *35*(1), 41–58.

Tuck, E.O. and Hwang, L.S. (1972), *Long-wave generation on a sloping beach*, J. Fluid Mech. *51*, 449–461.

Uslu, B., Borrero, J.C., Dengler, L.A., and Synolakis, C.E. (2007), *Tsunami inundation at Crescent City, California generated by earthquakes along the Cascadia Subduction Zone*, Geophys. Res. Lett. *34*, L20601.

Wei, Y., Bernard, E.N., Tang, L., Weiss, R., Titov, V.V., Moore, C., Spillane, M., Hopkins, M., and Kânoğlu, U. (2008), *Real-time experimental forecast of the Peruvian tsunami of August 2007 for U.S. coastlines*, Geophys. Res. Lett *35*, L04609.

Yeh, H., Liu, P.L.-F., Briggs, M., and Synolakis, C.E. (1994), *Tsunami catastrophe in Babi Island*, Nature *372*, 6503–6508.

Yeh, H., Liu, P.L.-F., and Synolakis, C.E. (eds.), *Long-Wave Runup Models* (World Scientific Publishing, Singapore 1996).

Zelt, J.A. (1991), *The runup of breaking and nonbreaking solitary waves*, Coastal Eng. *125*, 205–246.

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www.birkhauser.ch/pageoph

Davis, Roger

From: Sosa, Belkys
Sent: Friday, July 15, 2011 8:05 PM
To: Apostolakis, George; Gilles, Nanette; Davis, Roger; Baggett, Steven
Subject: Fw: Letter from Rep Issa
Attachments: 2011-07-15 Letter from Chairman Issa.pdf

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Vietti-Cook, Annette
To: Sharkey, Jeffry; Sosa, Belkys; Bubar, Patrice; Nieh, Ho
Cc: Champ, Billie; Mike, Linda; Lewis, Antoinette
Sent: Fri Jul 15 19:04:50 2011
Subject: FW: Letter from Rep Issa

Attached is an advance copy of a letter from Congressman Issa regarding the SECY-11-0093 NEAR-TERM REPORT AND RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING THE EVENTS IN JAPAN.

Gilles, Nanette

From: Gilles, Nanette
Sent: Friday, July 15, 2011 9:29 AM
To: Apostolakis, George; 'apostola@mit.edu'; Sosa, Belkys; Baggett, Steven; Lui, Christiana; Davis, Roger
Subject: RE: Near-Term Task Force

I will see what information I can find on this

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

-----Original Message-----
From: Apostolakis, George
Sent: Friday, July 15, 2011 9:27 AM
To: Gilles, Nanette; 'apostola@mit.edu'; Sosa, Belkys; Baggett, Steven; Lui, Christiana; Davis, Roger
Subject: Re: Near-Term Task Force

(b)(5)

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

----- Original Message -----
From: Gilles, Nanette
To: George Apostolakis <apostola@MIT.EDU>; Sosa, Belkys; Baggett, Steven; Lui, Christiana; Davis, Roger
Cc: Apostolakis, George
Sent: Fri Jul 15 09:22:11 2011
Subject: RE: Near-Term Task Force

(b)(5)

an

NOT FOR PUBLIC DISCLOSURE

Nanette V. Gilles
Technical Assistant for Reactors
Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

-----Original Message-----
From: George Apostolakis [mailto:apostola@MIT.EDU]
Sent: Friday, July 15, 2011 12:30 AM
To: Gilles, Nanette; Sosa, Belkys; Baggett, Steven; Lui, Christiana; Davis, Roger
Cc: Apostolakis, George
Subject: Near-Term Task Force

(b)(5)

GA

NOT FOR PUBLIC DISCLOSURE

Gilles, Nanette

From: Gilles, Nanette
Sent: Friday, July 15, 2011 9:56 AM
To: Apostolakis, George
Cc: 'apostola@mit.edu'; Sosa, Belkys; Baggett, Steven; Lui, Christiana; Davis, Roger
Subject: RE: Near-Term Task Force

Commissioner - These two articles describe TEPCO's considerations for setting the Fukushima design basis in a fair amount of detail. The first one makes reference to the Jogan tsunami of 869 and indicates that TEPCO discounted information from events earlier than 1000 years ago as "unreliable." I have also asked the NRR Japan team what information we have and am waiting to hear back.

http://www.huffingtonpost.com/2011/03/27/fukushima-tsunami-plan-japan_n_841222.html

http://www.huffingtonpost.com/2011/05/27/fukushima-nuclear-plan-single-page_n_867897.html

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

-----Original Message-----
From: Apostolakis, George
Sent: Friday, July 15, 2011 9:27 AM
To: Gilles, Nanette; 'apostola@mit.edu'; Sosa, Belkys; Baggett, Steven; Lui, Christiana; Davis, Roger
Subject: Re: Near-Term Task Force

(b)(5)

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

----- Original Message -----
From: Gilles, Nanette
To: George Apostolakis <apostola@MIT.EDU>; Sosa, Belkys; Baggett, Steven; Lui, Christiana; Davis, Roger
Cc: Apostolakis, George
Sent: Fri Jul 15 09:22:11 2011
Subject: RE: Near-Term Task Force

(b)(5)

NOT FOR PUBLIC DISCLOSURE

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

-----Original Message-----
From: George Apostolakis [mailto:apostola@MIT.EDU]
Sent: Friday, July 15, 2011 12:30 AM
To: Gilles, Nanette; Sosa, Belkys; Baggett, Steven; Lui, Christiana; Davis, Roger
Cc: Apostolakis, George
Subject: Near-Term Task Force

(b)(5)

What do you think?

GA

NOT FOR PUBLIC DISCLOSURE

Davis, Roger

From: Apostolakis, George
Sent: Sunday, July 17, 2011 2:03 PM
To: Gilles, Nanette; Sosa, Belkys; Davis, Roger; Baggett, Steven
Subject: RE: Draft Speech

(b)(5)

From: Gilles, Nanette
Sent: Sunday, July 17, 2011 2:02 PM
To: Apostolakis, George; Sosa, Belkys; Davis, Roger; Baggett, Steven
Subject: Re: Draft Speech

(b)(5)

Sent from my NRC Blackberry

From: Apostolakis, George
To: Sosa, Belkys; Gilles, Nanette; Davis, Roger; Baggett, Steven
Sent: Sat Jul 16 16:40:17 2011
Subject: Re: Draft Speech

(b)(5)

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Sosa, Belkys
To: Gilles, Nanette; Apostolakis, George; Davis, Roger; Baggett, Steven
Sent: Sat Jul 16 15:24:48 2011
Subject: Re: Draft Speech

(b)(5)

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Gilles, Nanette
To: Sosa, Belkys; Apostolakis, George; Davis, Roger; Baggett, Steven
Sent: Sat Jul 16 12:54:08 2011
Subject: Re: Draft Speech

(b)(5)

NOT FOR PUBLIC DISCLOSURE

nt from my NRC Blackberry

From: Sosa, Belkys
To: Apostolakis, George; Gilles, Nanette; Davis, Roger; Baggett, Steven
Sent: Fri Jul 15 20:07:01 2011
Subject: Fw: Draft Speech

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Montes, David
To: Bubar, Patrice; Nieh, Ho; Sosa, Belkys; Sharkey, Jeffry
Cc: Batkin, Joshua; Coggins, Angela; Loyd, Susan; Monninger, John
Sent: Fri Jul 15 18:05:19 2011
Subject: Draft Speech

Attached is the draft speech for Monday.

David

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

Davis, Roger NOT FOR PUBLIC DISCLOSURE

From: Davis, Roger
Sent: Monday, July 18, 2011 3:11 PM
To: McMillan, Joseph; Raspa, Rossana
Subject: FW: Memorandum to Commission on Fukushima Task Force and KI
Attachments: 2011.July.NRCFukushimaTaskForceFinal.rtf

Joe and Rossana,

(b)(5)

Roger

NOT FOR PUBLIC DISCLOSURE

From: Peter Crane [mailto (b)(6)
Sent: Monday, July 18, 2011 11:44 AM
To: Vietti-Cook, Annette
Cc: Davis, Roger
Subject: Memorandum to Commission on Fukushima Task Force and KI

Hi Annette –

The attached memorandum is directly relevant to the briefing that the Commission will be getting tomorrow on the report, issued last week, of the Fukushima Task Force. It is time-critical. Could you please see that it is printed out and delivered to Commission offices as soon as possible? Thanks.

By the way, in it I mention that there is a March 27, 2006, letter from HHS Secretary Leavitt to Chairman Diaz that I was able to find on ADAMS, except as an attachment to a letter from Professor Frank von Hippel of Princeton and me to Senator Lieberman, with copies to the NRC. Maybe I missed it somehow with the search terms I used. In any event, if that letter is not on ADAMS, it should be, and it is puzzling that it isn't.

Thanks –
Peter

Peter Crane / (b)(6) / (b)(6) / (b)(6) / (b)(6) *(home)*, (b)(6) *(cell)*

July 18, 2011

MEMORANDUM FOR: Chairman Gregory B. Jaczko
Commissioner Kristine L. Svinicki
Commissioner George Apostolakis
Commissioner William D. Magwood, IV
Commissioner William C. Ostendorff

FROM: Peter Crane
Counsel for Special Projects, USNRC (retired)

On July 13, the NRC issued press announcements on two unrelated matters: the public release of the report of the NRC staff's Task Force on the Fukushima accident (news release No. 11-127), and the Commission's directive to the staff "to examine feasibility and need of study on radiation doses to public from nuclear medicine" (news release No. 11-128).

The Task Force report touches on, though only very minimally, the use of potassium iodide (KI) as a thyroid blocking agent; the directive on nuclear medicine relates directly to the issue of the release of patients with high doses of radioactive iodine-131 in their systems. Both as an NRC employee and as a retiree, I have been involved with these two subjects for many years – nearly 30 years, in the case of KI, and almost 20 years, with respect to radioactive patients – and I have considerable institutional knowledge in these areas.[1] I feel obligated to the current Commissioners, the agency, and the public, to share some of this history with them, and explain why the July 13 issuances are problematic. Since I see that the schedule calls for the Task Force to brief the Commission on July 19, I will in the interest of time deal with the first today and the second in a memorandum to be submitted in the near future.

The charter of the NRC staff Task Force on Fukushima was set forth in a March 23, 2011, tasking memorandum from Chairman Jaczko to R. W. Borchardt, the Executive Director for Operations (Appendix B to the report, p. 77), and the March 30, 2011, memorandum from Mr. Borchardt to Martin Virgilio and Charles Miller (Appendix C to the report, p. 79). The Task Force was given the specific task of considering, among other things, "Emergency preparedness (e.g. emergency communications, **radiological protection, emergency planning zones, dose projections and modeling, protective actions**)." [Emphasis added.]

[1] In an appendix, I will describe my 27-year service at NRC.

Protective actions include, as the report acknowledges, potassium iodide. The following seem like obvious questions: How widely was potassium iodide distributed in Japan? How far away from Fukushima did radioactive iodine show up in foodstuffs, water, and air? What kind of radiation doses to the thyroid were received by Japanese citizens, especially children, and at what distances from the reactors? What does this suggest about the need for KI beyond the 10 mile radius in which the NRC now offers it?

These are all questions that can be answered, to a greater or lesser extent, by any informed citizen who reads the newspapers and has access to a computer, but anyone whose only source of information is the NRC Task Force, which was in theory addressing such issues, would be out of luck. Indeed, such a person would not even realize that these issues existed, for the Task Force has tiptoed around them.

The Task Force must surely be aware that the NRC has come under sharp criticism for its role in preventing the implementation of a law, Section 127 of the Public Health Security and Bioterrorism Preparedness and Response Act of 2002, which would have extended the availability of KI out to a 20-mile radius. A January 2008 decision by the President's Science Advisor, Dr. John H. Marburger III, declined to implement that portion of the Act. The Task Force must also know that a bipartisan group of some 30 Members of Congress, including Rep. Ed Markey, the law's sponsor, has called on the President to revisit that decision and authorize the broader stockpiling and distribution of the drug, and that this issue is under reconsideration by the Administration.

But no reader of this report would realize any of that, or find a scintilla of information that might shed light on the question of whether current policy needs revision. What is more, an Associated Press story on March 31, 2011, quoted Patricia Milligan, the NRC's senior expert on KI matters, as saying that the NRC was "absolutely confident" that the 10 mile radius for stockpiling of KI was sufficient. Considering that the accident was still unfolding rapidly at that time, this was highly premature. It was only on March 23, after all, that Chairman Jaczko had directed the staff to examine, among other things, "emergency planning zones" and "protective actions." If the staff had completed its review of the KI issue in the intervening eight days, this was quick work indeed.[2]

[2] Normally the NRC's consideration of KI policy is measured in years. When the NRC Commissioners, over the fierce opposition of the NRC staff, granted my petition for rulemaking on KI in early 2001, changing the NRC's regulations and also offering supplies of KI to states, it was the culmination of a process that had begun with a Differing Professional Opinion that I had filed 12 years earlier.

The Marburger decision and the NRC's role in it deserve further discussion here. As the Commission is probably aware, the legislation authorizing the expansion of KI distribution from 10 to 20 miles from nuclear power plants was passed by an overwhelming margin in 2002 and signed into law by President Bush. The White House, in a 2002 statement, hailed the result, saying that henceforth, KI, which it called "crucial" and "critical," would be available wherever needed, not just within what it termed the "artificial ten-mile barrier." The Department of Health and Human Services was given the task of implementing the law, which NRC had opposed.

But to begin distribution of KI, which HHS was eager to do, for it saw a plain need to improve protection for America's children, it was required to publish guidelines. Opponents of the law prevailed on the Office of Management and Budget to withhold its approval of those guidelines, and thereby delay implementation of the law, to the great frustration of HHS.

The same law directed the National Academies of Science to perform a study of KI. Published in 2004 under the title *Distribution and Administration of Potassium Iodide in the Event of a Nuclear Incident*, it made clear, inter alia, that "children are most likely to benefit from KI prophylaxis" (p. 4); that thyroids are at risk in a nuclear incident from "inhalation of contaminated air or ingestion of contaminated food or milk" (p. 3); that "KI should be available to infants, children, and pregnant and lactating women" (p. 5); that though KI distribution to date focused only on the 10-mile Emergency Planning Zone utilized by the NRC, the variation from site to site meant that "no single best solution exists," and that a specific incident might require KI "beyond the EPZ as well" (p. 161); and that as a result, "**KI distribution programs should consider predistribution, local stockpiling outside the emergency planning zone (EPZ), and national stockpiles and distribution capacity.**" (p. 160, emphasis in the original)

In a November 1, 2005, letter to HHS, the NRC brazenly misrepresented the findings of the NAS report. Writing to Dr. Robert Claypool of HHS, William F. Kane, NRC Deputy Executive Director for Reactor and Preparedness Programs, asserted – purportedly on the basis of the NAS report – that the only pathway of concern beyond the 10-mile radius would be ingestion, which could be controlled by interdiction of foodstuffs, and, in a particularly egregious distortion, declared that "the Academy raised questions about the usefulness of expanded distribution of KI."[3]

HHS Secretary Michael Leavitt responded with a letter to NRC Chairman Nils Diaz[4], dated

[3] This letter may be found on the NRC's ADAMS system, using accession no. ML052790498.

[4] I have so far been unable to find this letter on ADAMS, except as an attachment to a letter that Professor Frank von Hippel of Princeton University and I sent to Senator Joseph Lieberman on September 26, 2007, with a copy to the

March 27, 2006, which though couched in superficially civil terms was an acid rebuke that made clear that NRC had quoted snippets of the NAS report out of context to produce a misleading impression. He quoted the actual words of the NAS report back to Diaz: "A specific incident might call for protective actions to be restricted to a small part of the EPZ **or require that they be implemented beyond the EPZ as well,"** boldfacing the last 11 words for emphasis.[5]

NRC, which may be found as LTR-07-0685 on the ADAMS system. If Secretary Leavitt's letter is not on the system in its own right (and if not, one may ask why not), it should be added.

[5]Secretary Leavitt also wrote:

> Section 127 of the Bioterrorism Preparedness and Response Act of 2002 requires the President to make KI available to State and local governments for stockpiling and distribution, and to establish guidelines for the stockpiling of KI and for its distribution and utilization in the event of a nuclear incident. Additionally, subsection 127(f) states that these requirements *"cease to apply as requirements if the President determines that there is an alternative and more effective prophylaxis or preventive measures for adverse thyroid conditions..."* The President has not made the necessary determination here. Rather, as the President stated in 2002 when forming the Department of Homeland Security, *"...one Department would be responsible for distributing Potassium Iodide to citizens exposed - no matter where they lived. There would no longer be an artificial ten-mile barrier to treatment."* Currently, we do not believe there are "alternative and more effective... measures" than to make KI available up to 20 miles from a nuclear facility, in conjunction with the protective measures established by the NRC. [Emphasis in the original.]

Unaware at the time of HHS Secretary Leavitt's letter to NRC, I drew the Kane letter's mischaracterization of the NAS report to the attention both of the Commission, by email, and the NRC's Office of Inspector General. This was, as usual, fruitless. The EDO, Luis Reyes, replied a few weeks later with a short note that neither mentioned the NAS report nor gave a direct answer to the charge that the Kane letter had mischaracterized its findings. Instead, he wrote that "the Commission believes that Mr. Kane's letter reflected the NRC's well-considered, scientifically-based position on expanded distribution of KI." Apparently, it was a matter of indifference whether the Kane letter was factual, so long as it supported the Commission's position.

OIG declined to investigate. Its Allegations Coordinator, George Mulley, explained to me on the telephone that the first thing that OIG did, when examining an allegation, was to ask what federal law had been broken, and that there was nothing in the U.S. Code that made it illegal to deceive another federal agency. This was, I submit, an unduly pinched view of OIG's mandate.

But it was hardly surprising. OIG's record of mishandling allegations concerning the staff's treatment of KI matters goes back many years, and includes one occasion on which, contrary to OIG procedures, Inspector General David Williams disposed of an allegation with no written record, and without even informing his head of investigations, Leo Norton, that the allegation had been received. Norton, an honorable and candid person, agreed with me that this was an "off the books" handling of an allegation, and said that I could quote him to that effect. It was unique in his experience, he said, and "no way to do business." For more on OIG and KI, see also the joint letter from Professor Frank von Hippel and me to Senator Joseph Lieberman, dated 9/26/2006, with copies to the NRC, cited above, and accessible through ADAMS as LTR-07-0685.

I might add that though the concurrence page on the Kane letter, as it appears on the NRC website, indicates that the originator of the document was Patricia Milligan, the responsibility for it extends to all who reviewed and signed off on it. The same applies to those who, after seeing Secretary Leavitt's letter, nevertheless approved the response to Senator Isakson's question, which will be discussed shortly.

Secretary Leavitt's letter plainly did not faze the NRC, however, which in an April 10, 2006, letter to Senator George Voinovich, responding to questions arising from a recent oversight hearing, repeated the assertion that the NAS supported the NRC position on the undesirability of stockpiling KI beyond ten miles, and attached the Kane letter.[6] (The answer came in response to a question from Sen. Isakson.) By now, there was no excuse for inaccuracy. If the staff had somehow contrived to misread the NAS report at the time it wrote to Dr. Claypool in November 2005, any such misunderstanding had been cleared up by Secretary Leavitt, in his letter of March 27, 2006.

With his declared intention of implementing the law and providing KI in the 10 to 20- mile radius, Secretary Leavitt was on a collision course with the NRC and the nuclear industry. The White House was persuaded to forget or ignore what it had said in 2002 about eliminating the "artificial 10 mile barrier" to the distribution of this "crucial" and "critical" drug. On July 2, 2007, President Bush signed an order that stripped Leavitt of his authority over the law and transferred it to the NRC and to his own Science Advisor, Dr. Marburger, who would have the

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[6] The relevant section of the letter, at pp. 29-30, reads as follows, and may be found on the NRC website using accession no. ML060930353:

QUESTIONS FROM SENATOR ISAKSON:

During the hearing, I brought up the issue of potassium iodide, but didn't get a chance to pursue my question with the Commission. It is my understanding that the Department of Health and Human Services (HHS) has made a recommendation to expand the stockpiling of potassium iodide beyond the 10-mile radius around a nuclear facility which is the current requirement. Please provide the Commission's position on the HHS's recommendation for the record.

ANSWER:

Based on the NRC's decades of experience with nuclear power plant emergency preparedness and radiological protection of the public, it is the NRC's conclusion that expanded distribution of potassium iodide (KI) is unnecessary. Expanded distribution of KI is unnecessary because of the current, well-established, and scientifically sound framework of the NRC's emergency preparedness regulations. This framework includes predetermined protective actions for populations within the 10- and 50-mile ingestion exposure pathway Emergency Planning Zones (EPZs) to provide the necessary protection of public health and safety. These predetermined protective actions include interdiction of contaminated milk, food, and water, as well as protective measures for livestock. **NRC's conclusion is supported by a January 2004 study by the National Academy of Sciences**, which found that food testing and interdiction programs in place throughout the United States are more effective preventive strategies than expanded distribution of KI for ingestion pathways. Additionally, many States and other interested entities, including Federal agencies, have expressed opposition to the distribution of KI beyond the existing 10-mile EPZs. Additional detail on the Commission's position on HHS's draft guidelines for expanded KI distribution are [*sic*] provided in the November 1, 2005 letter from Mr. William Kane, NRC's Deputy Executive Director for Reactor and Preparedness Programs, to Dr. Claypool of HHS's Office of Mass Casualty Planning, which is attached (Attachment 7) for your convenience.

final say on whether to implement the law.

At Marburger's request, a technical evaluation paper on KI was prepared by the Potassium Iodide (KI) Subcommittee of the Federal Radiological Preparedness Coordinating Committee (FRPCC), an interagency group. On October 23, 2007, FRPCC Chair Vanessa Quinn, of FEMA, transmitted the paper to Marburger, with a cover letter that made plain the leading role of the NRC staff in the effort.[7]

Marburger's decision, issued on January 22, 2008, predictably found no need to implement the 2002 law. This is not the place to get into the legal question of whether his refusal to do so was consistent with Congressional intent and a proper reading of the statute, though I have strong views on that point; I would like instead to stay with the technical and policy bases for his decision.

Perhaps the most extraordinary thing about the Marburger decision was that the President's Science Advisor felt able to issue a 13-page decision on a drug for the prevention of cancer without ever using the word "cancer." Instead, he referred euphemistically to "adverse thyroid conditions." From the chief scientist in the United States Government, this defies comprehension. Is it conceivable that any Government official would issue a decision on the use of Sabin vaccine without ever employing the word "polio"? Of course not. But when the subject is KI and thyroid cancer, this happens again and again.[8]

Let us now look at the important question of what exactly Marburger was relying *on*. At p. 12 of

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[7] Quinn wrote: "I would be remiss if I did not specifically mention the hard work and effort put into this project by Trish Milligan, KI Subcommittee Co-Chair. Her technical knowledge and willingness to spearhead the overall coordination of this technical evaluation paper was invaluable." Just the day before, October 22, 2007, an article in *USA Today*, entitled "White House may stop plan for anti-radiation pills," included the following: "Patricia Milligan, the NRC's senior adviser for preparedness, says the commission opposes broad distribution of the pills because the best way to eliminate risk is to make sure people don't eat contaminated food. She also says the NRC is concerned about undermining the reputation of the nuclear industry. 'It's always a concern that if you expand the distribution (of the pills), you don't have confidence in the plants,' she says. 'We have studies that show the safety of our plants.'"

[8] This is certainly true at NRC as well. For example, at NRC headquarters, on July 1, 1997, anyone whose office windows faced west might have seen a television crew, with the familiar eye of the CBS Evening News on its videocamera, interviewing me in front of the building. Four hours later, the NRC, under Chairman Shirley Jackson, issued a press release stating that agency would buy KI for any state that wanted it. (At the time, the matter had been pending for seven years.) But the news release was careful not to use the word "cancer," and therefore was less helpful to readers than it might have been. It probably made little difference, however, for the NRC did nothing to implement this commitment, and two years later, still under Chairman Jackson, the Commission retracted its promise, saying that budget constraints did not allow expenditures on new initiatives of this kind.

his decision, he wrote:

> Some concerned citizens groups criticize meteorological analyses that assume a wind that blows constantly in a single direction, suggesting that variable trajectory models would better account for complex wind patterns, leading to accident consequences extending beyond current projections. In fact the opposite is true. The NRC and FEMA outline their strategies for emergency planning in the 2002 study *Assessment of the Use of Potassium Iodide (KI) as a Supplemental Public Protective Action during Severe Reactor Accidents* (NUREG 1633)[fn], which addresses the effect of meteorology on accident consequences, specifically its effect on where the offsite release goes....

The footnote included a citation to this document, which states on its cover page that it was "Prepared by P. A. Milligan/NRR."[9]

What Marburger evidently did not know was that officially, this document was in the dumpster. In November 2002, the Commission had decided, on a 4-1 vote, with Commissioner Dicus the lone dissenter, that it was unfit for publication, and that no more resources should be spent on bringing it up to standard. Commissioners' comments on it were not gentle. Commissioner McGaffigan noted that although it was the 9/11 attacks that had spurred states' interest in KI stockpiling, "the draft NUREG is silent on the subject." Commissioner Diaz wrote:

> The draft NUREG now before us is the third version we have been asked to review since mid1998. (The first version was withdrawn by the Commission and we disapproved the second one.) ... In my opinion, it's time to pull the plug.[10]

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[9] http://www.nrc.gov/reading-rm/doc-collections/commission/secys/2002/secy2002-0089/attachment1.pdf

[10] The story of the three rejected versions of NUREG-1633 is a curious one. The first version managed not to include, in its 37 pages, the fact that the Food and Drug Administration had found KI to be "safe and effective." (This was comparable to the FDA issuing a report casting doubt on the safety of a particular nuclear power plant without mentioning that there was an organization called the NRC that had found this plant to be safe.) The document strove to raise anxieties about the safety of the drug, and to warn of the lawsuits that would be faced by any state that gave it out in an emergency. It also asserted that American can authorities cautioned against giving the drug to children and pregnant women, whereas in reality, it is universally recognized, here and abroad, that the principal *benefit* of the drug is to children and pregnant women. (I should in fairness mention that NUREG-1633 was not wrong about everything, however. For example, it said of Chernobyl, at p. 14: "[I]nhalation most like was a major source of the dose received in some areas near the plant." This contradicts an assertion often made by opponents of KI: that virtually all the post-Chernobyl thyroid cancers resulted from drinking contaminated milk.)

The Commission soon received scathing comments from state health officials and others. Dr. Karim Rimawi, director of the Bureau of Environmental Radiation Protection in the New York State Health Department, wrote on September 29, 1998, that the Department "had looked forward to NRC's report in the

I do not know where Dr. Marburger got his copy of the draft NUREG – perhaps it was not from the NRC at all – but surely he could and should have been warned by his NRC advisor that the document had been rejected by the Commissioners and therefore had no place in his decision.

Relying as it did on an invalid document, Marburger's decision must therefore be considered at least partially tainted. Its pernicious effects, moreover, have extended far beyond the question of implementing the 2002 law. After its issuance, the interagency group that maintains the Strategic National Stockpile removed KI from the arsenal of protective drugs that comprise that stockpile, to which it had been added after 9/11.[11] I am told that the group felt that it had no choice, in light of the Marburger decision.

At a time at which in every other sphere of life, America is *increasing* its preparedness against terrorism, the NRC has thus been instrumental in *diminishing* our country's preparedness to deal with acts of nuclear terrorism or other nuclear catastrophes. It must be borne in mind what the consequences of insufficient preparedness will be, if such a disaster occurs: an increased incidence of thyroid cancer, especially in children who were very young, or still in the womb, at the time of exposure.[12]

I would be the last person to argue that KI is a panacea for protection against radiological

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hope that it would assist us," but found that it had been "prepared to justify a position advocating against the use of KI for public protection, rather than as an objective review of the relevant information." "This bias," he wrote, "raises doubt as to the value of the document." He also commented: "It selectively references sources that support that point of view and ignores others that tend to justify the use of KI."

Shortly afterwards, the Commission ordered NUREG-1633 withdrawn. Commissioner Ed McGaffigan, in a memorandum quoted in the October 12, 1998, issue of *Inside N.R.C.*, wrote: "As I admitted at the public meeting, I had not read enclosure 8 [draft NUREG-1633] in any detail when I agreed to put it out for public comment and peer review as the SRM was drafted. I made the mistake of thinking no harm could come from just putting a document out for public comment. I was wrong." (At p. 8.)

Revision of the NUREG was entrusted to a large Core Group, headed by Aby Mohseni. It was on his watch that the entire Core Group, during a particularly a cold February in Rockville, spent a week at NRC expense in Tempe, Arizona. This second version was also rejected, and the project then passed into the hands of Patricia Milligan, who produced the third and final version. By the time the Commission rejected it in 2002 and "pulled the plug," in Commissioner Diaz's words, the NRC had spent a small fortune on NUREG-1633, with nothing of value to show for it.

[11] http://www.washingtonpost.com/national/us-health-care-system-unprepared-for-major-nuclear-emergency-officials-say/2011/04/07/AF6ZSavC_story.html

[12] If the example of Chernobyl is an accurate guide, we will begin seeing the first post-Fukushima childhood thyroid cancers in about five years.

disasters. Indeed, in the early days of the Fukushima accident, I went on television in Seattle to say that it would "irresponsible scaremongering" to suggest that anyone in the U.S. should now be taking KI to protect against the releases from Japan. But it is likewise irresponsible in the extreme not to have adequate supplies on hand in this country, for accidents or acts of terrorism occurring here, and of all the possible reasons for failing to stockpile it, protecting the public image of the nuclear power industry is surely the rock-bottom worst.[13]

The real question is whether KI would be useful in the event of a major release, for if not, there is no point in having it, regardless of its low cost. The opponents of KI stockpiling have long maintained that KI is unnecessary, because the whole problem of thyroid protection can be solved by instructing people to refrain from drinking milk after a major nuclear release. For example, in the early days of the Fukushima accident, a March 13 article in the *New York Times* quoted a radiation expert at Columbia, Dr. David Brenner:

> Dr. Brenner said the iodine pills were protective, but were "a bit of a myth" because their use is based on the belief that the risk is from inhaling radioactive iodine. Actually, he said, 98 percent of people's exposure comes from milk and other dairy products.
>
> "The way radioactive iodine gets into human beings is an indirect route," he said. "It falls to the ground, cows eat it and make milk with radioactive iodine, and you get it from drinking the milk. You get very little from inhaling it. The way to prevent it is just to stop people from drinking the milk." He said that the epidemic of thyroid cancer around Chernobyl could have been prevented if the government had immediately stopped people from drinking milk.

I have no idea where Dr. Brenner got this 98% figure; most sources I have seen think that 70 or 80 percent of the Chernobyl exposures came from the milk pathway, not more. At any rate, once I-131 began showing up in Tokyo's tap water, I wrote a letter to the *New York Times*, published on March 26, that was implicitly a slap at Dr. Brenner and the reporter who had so uncritically relied on him.[14]

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[13] Even if we assume for purposes of argument that stockpiling KI would cause Americans to worry about the safety of nuclear power plants (and after Fukushima, it seems unlikely that KI would play any significant role in any such worries they may have), that is separate from the question of whether we should have the drug on hand as part of preparedness for acts of *terrorism*. The public relations needs of the nuclear power industry regarding power plant safety should have no bearing on whether we are ready to cope with a nuclear device exploded by terrorists.

[14] To the Editor:

The detection of radioactive iodine 131 in Tokyo's drinking water ("Anxiety Up as Tokyo Issues Warning on Its Tap Water," front page, March 24), in amounts considered unhealthy for children, makes clear that potassium

Whether for that reason or some other, Dr. Brenner's public position on KI changed almost instantaneously. On the afternoon of the same day, March 26, a glowing profile of him, "Countering Fears With Just the Facts," was posted on the *New York Times* website (it appeared in print on March 29), which included the following:

> Potassium iodide pills are widely recommended to protect the thyroid gland from radioactive iodine, but Dr. Brenner said it was better just to stop drinking milk until the threat had passed.
>
> His message changed, however, when radioactive iodine turned up in tap water in Tokyo. Though the public was advised that babies, children and pregnant women should not drink the water, Dr. Brenner conceded that some exposure might still be hard to avoid, and that using potassium iodide was a reasonable precaution.
>
> "I've been maybe a little overstrong in saying that potassium iodide doesn't have a role to play," he said. "But usually the problem is milk. To me, the levels in water came as a surprise."

But is it really a "myth," as Dr. Brenner suggested in the earlier article, that inhalation of I-131 after a radiological release is a danger?

Nearly 20 years ago, the Environmental Protection Agency issued a "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," EPA 400-R-92-001 (May 1992)[15], that included the following, at p. 5-20: "If a major release of radioiodine or respirable particulate

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iodide must be administered if children are to be adequately protected against thyroid cancer caused by ingested and inhaled iodine 131. Interdiction of milk supplies, though important, is plainly insufficient.

Japan's apparent preparedness with potassium iodide contrasts with the situation in the United States. In response to 9/11, Congress passed a law to create stockpiles of potassium iodide for populations within a 20-mile radius of nuclear reactors, rather than the 10-mile radius within which the Nuclear Regulatory Commission offers it to states that request it.

But the N.R.C., which had opposed the law, fought successfully to keep it from taking effect. In 2008 President George W. Bush's science adviser, John H. Marburger III, declared that potassium iodide was not needed beyond the 10-mile radius, and that the law therefore would not be implemented.

The events in Japan demand that the Obama administration act quickly to reverse this unjustified rejection of a sensible law.

Peter Crane
Seattle, March 24, 2011

[15] http://www.epa.gov/radiation/docs/er/400-r-92-001.pdf

materials occurs, **inhalation dose will be the controlling pathway**." [Emphasis added.] It recommended, among other things, consideration of the use of KI. It made the point that though evacuation in an emergency is the ideal option, you can get a radiation dose while evacuating, and that automobiles offer only about 10% shielding.

The Food and Drug Administration issued guidance on KI in 2001.[16] At p. 8, after noting that the post-Chernobyl exposures to radioiodines came "largely" from the milk pathway, it said:

> In this or similar accidents, for those residing in the immediate area of the accident or otherwise directly exposed to the radioactive plume, **inhalation of radioiodines may be a significant contributor to individual and population exposures.** ... The risk depends on factors such as the magnitude and rate of the radioiodine release, wind direction and other atmospheric conditions, and thus may affect people both near and far from the accident site. [Emphasis added.]

There was also a useful report from the International Atomic Energy Agency in 2002.[17] At p. 52, the joint IAEA/WHO committee that prepared it makes the point that "iodine prophylaxis is intended **primarily as a protective action against inhalation**," in the short term, and suggests amending the International Basic Safety Standards to reflect this. [Emphasis added.]

In 2003, the Medical Preparedness and Response Sub-Group of the Department of Homeland Security Working Group on Radiological Dispersal Device Preparedness prepared a report saying that if terrorists detonated a radiological dispersal device containing radioiodine or a 10-kiloton improvised nuclear weapon, millions of doses of KI might be needed to deal with the fallout. It said, at p. 62: "Urgent consideration for giving KI to pregnant women (especially 2nd and 3rd trimesters) and children is appropriate."[18]

On June 30, 2011, in response to a Freedom of Information Act request, the NRC placed a large number of documents relating to the Fukushima accident onto the ADAMS system.[19] They

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[16] http://www.fda.gov/downloads/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/ucm080542.pdf

[17] http://www-pub.iaea.org/MTCD/publications/PDF/Pub1133_scr.pdf

[18] http://www.orau.gov/hsc/RadMassCasualties/content/resources/Radiologic_Medical_Countermeasures_051403.pdf

[19] For this information, I am indebted to David Lochbaum, an NRC alumnus now with the Union of Concerned Scientists.

include a March 25, 2011, email from Elmo Collins, Regional Administrator in NRC's Region IV, to Linda Howell, as he prepared to leave for Japan. The subject line is "Japan," and it reads, in its entirety, as follows: "I'll need to pick up some KI and make sure I have my dosimetry as needed – what dose meter would be good for me to take? Thanks, Elmo."

Of course Mr. Collins provided himself with KI, and rightly so. NRC personnel are not reckless when it comes to their own safety or that of their children, nor should they be.[20] But if ever there is a nuclear catastrophe in this country, whether caused by terrorism or an accident, and Americans living more than 10 miles from a nuclear power plant discover that *their* children have been inadequately protected against radioactive iodine owing to the NRC's unremitting, no-holds-barred battle to prevent or limit KI stockpiling – a battle that has included misrepresenting, *including to Congress*, the findings of a Congressionally mandated study of the issue by the National Academies of Science, and working to ensure that the sensible recommendations of the NAS were rejected by the President – the consequences would be devastating, not only for the affected children, but also for the NRC.

What would the country say when it learned that KI had been removed from the Strategic National Stockpile, with the result that we are less well prepared to cope with the medical effects

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[20] By the same token, consider a March 4, 1994, letter from Jim Martin, an NRC retiree, to Hugh Thompson, then Deputy Executive Director for Operations, which was placed in the Public Document Room at that time:

> Please hold the bottom line: do not require that utilities distribute KI to the general public as a license condition. This was my bottom line over many years of discussions of the subject at the staff and the commission levels. As I said to Peter Crane at one time: If I lived near a nuclear plant, I'd have some KI for my family (it's so cheap!), but I think it would be legally obscene to require KI predistribution to the public as a condition of a license. If Peter wants KI available in the schools, then let the PTAs run car washes and buy some! At the time, they cost only 2-3 cents apiece.

I recall this meeting well; Mr. Martin made the point that for the price of the pack of cigarettes in his shirt pocket (at the time, in 1983, they sold for about $.75 a pack in the D.C. area), he could protect his whole family with KI, and he would be "crazy" not to do so. Please understand: I do not by any means intend to demonize Mr. Martin, whose letter, if read in its entirety, which I recommend, is more thoughtful and balanced than this one passage, taken in isolation, might suggest. The problem with his proposed solution, however, is that unless people are *told* that KI is desirable, the PTA's of America are not going to know to hold such bake sales, and in an actual emergency, only knowledgeable insiders, such as NRC personnel and their families, will be protected.

Incidentally, Mr. Martin made another observation in his letter, from which it can be inferred that the site at which KI would be of greatest value in preventing cancer is Indian Point (IP): "The major technical basis document at the time was the Blond & Aldrich report on the efficacy of KI. Indeed, it showed that a 'national' KI predistribution program would not be cost effective in terms of cancers avoided (half or more of the calculated cancers arise beyond 50 miles at most sites – **all except for IP, as I recall**, so the emphasis must be on the area beyond 50 miles, for the cancer issue)." [Emphasis added.]

of a nuclear disaster than we were a few years ago? The NRC Chairman and Commissioners would probably find themselves having to explain their actions not only to Congressional committees but to grand juries. Under those circumstances, it is hard to imagine that the Nuclear Regulatory Commission would even survive for long, at least under that name.[21] More likely, it would be abolished and replaced by some new regulatory body, as is currently happening in Japan.[22]

Press reports indicate that radioiodine from Fukushima has turned up in air, water, and foodstuffs far from the damaged nuclear plants.[23]To continue to insist that KI stockpiling in this country be limited to a 10 mile radius around nuclear plants, and then only in states which request the drug, would be irresponsible beyond measure. The sooner the NRC faces up to this reality, the better, and not only for the American public, but also for its own sake. The Task Force should be told to address the KI issue thoroughly and promptly. In addition, the Inspector General should be asked to investigate the staff's handling of KI matters in recent years, including, but not limited to, the appearance of NUREG-1633 in the Marburger decision, the accuracy of the 2005 Kane letter to

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[21] After 9/11, Commissioner McGaffigan called me to tell me that I had "saved the NRC from itself," through the efforts that resulted in the NRC's rule change on KI, a few months earlier.

[22] http://mdn.mainichi.jp/mdnnews/news/20110717p2g00m0dm054000c.html

[23] Consider this excerpt from an article carried by National Public Radio on March 20, at http://www.npr.org/2011/03/20/134705754/japans-efforts-to-ease-nuke-crisis-hit-setback:

> **Government Admits Mistake**
>
> Officials have begun distributing protective potassium iodide pills to people from the area around the power plant. But one official in Fukushima, Kazuma Yokota, told reporters that the government now realizes it should have distributed the pills earlier last week.
>
> Potassium iodide protects people against thyroid cancer if they have been exposed to radioactive iodine, but it must be taken promptly.
>
> The pills help reduce chances of thyroid cancer, one of the diseases that may develop from radiation exposure, by preventing the body from absorbing radioactive iodine. The official, Kazuma Yokota, said the explosion that occurred while venting the plant's Unit 3 reactor last Sunday should have triggered the distribution. But the order came only three days later.
>
> "We should have made this decision and announced it sooner," Yokota told reporters at the emergency command center in the city of Fukushima. "It is true that we had not foreseen a disaster of these proportions. We had not practiced or trained for something this bad. We must admit that we were not fully prepared."

HHS, and the 2006 response to Senator Voinovich.[24]

What I have described in this memorandum are facts as I understand them, as informed by nearly 30 years of observing the NRC's handling of the KI issue. It has been prepared in a spirit of trying to be of service both to the American people and to the NRC. In this case, dealing as it does with a medication, a quotation from Gotthold Lessing's 18th Century play "Nathan the Wise" is particularly apposite: "It is medicine, not poison, that I am handing you."

/s/

Peter Crane, Counsel for Special Projects (retired)

cc: Senator George Voinovich
Senator Johnny Isakson
Senator Thomas Carper
Representative Ed Markey
Representative Henry Waxman

[24] If need be, the Commission should explain to the Inspector General that his office's mandate in conducting investigations of "fraud, waste, and abuse" is not confined, as Mr. Mulley of OIG appeared to believe, to cases in which a federal crime appears to have been committed. Of course, federal law requires NRC communications to Congress to be accurate.

Appendix -- My Service with NRC

For the benefit of Commissioners who do not know me, I joined the NRC in early 1975, when it was 10 weeks old, and spent 27 years serving the agency in various capacities. I had been hired as a legal assistant, GS-12, by Commissioner (later Chairman) Marcus A. Rowden. In those days, it was standard for Commissioners to have two assistants, one technical and one legal, and two secretaries. (The Chairman at the time had a staff of seven: one technical assistant for reactors, another for materials, a legal assistant, an executive assistant, and three secretaries.) For the first year I was there, however, Commissioner Rowden made do with just a single assistant, me, until he added Hugh Thompson as a technical assistant in 1976.

I moved to the Office of General Counsel on the expiration of Chairman Rowden's term in 1977. Over the next 24 years (there was a one-year break in service, during which I was an administrative judge in Micronesia), I defended the NRC's actions in court with vigor and conviction. My first case, in the D.C. Circuit, involved the Mark II containment; my last, in the Sixth Circuit, resulted in a decision upholding the NRC regulatory scheme for approving the design of dry casks for spent fuel storage.

In the Ninth Circuit, some 30 years ago, I briefed, argued, and won a case defending the adequacy of the fixes that the NRC ordered in Babcock and Wilcox reactors after the Three Mile Island accident. At one point in the 1980's, I served very briefly as Acting General Counsel, in which capacity I called on the Solicitor General, the late Rex Lee, to ask him to take to the Supreme Court a case which I had briefed, argued, and lost in the D.C. Circuit. It involved the NRC's refusal to treat the "psychological impacts" of the resumed operation of Three Mile Island Unit 1 as environmental impacts within the meaning of the National Environmental Policy Act. Lee was fully in accord. He took the case to the Supreme Court, which reversed the D.C. Circuit and upheld the NRC position on a unanimous vote.

I was made Counsel for Special Projects in the mid-1980's and retired with that title in 1999. In 2001, I was brought on as a contractor to write speeches for then Chairman Meserve, and I continued in that function under Chairman Diaz until 2005. During my long tenure with NRC, I was privileged, in addition to my usual legal duties, to write speeches, testimony, and/or personal statements for Chairmen Rowden, Palladino, Hendrie, Zech, Jackson, Selin, Meserve, and Diaz, including Senate confirmation testimony for three of those just named.

While at NRC, I was invited to speak at a United Nations conference in Moscow in 1997 on responding to man-made disasters. In 1998, in my private capacity, I was a speaker at a conference at Cambridge University in England on the U.S. Government's handling of the KI issue. The conference was co-sponsored by the university, the European Commission, the National Cancer Institute, and DOE. The paper I presented may be found in published form in the 1999 volume *Radiation and Thyroid Cancer*, edited by G. Thomas, A. Karaoglou, and E. D. Williams.

Gilles, Nanette

From: Davis, Roger
Sent: Monday, July 18, 2011 3:26 PM
To: Sosa, Belkys; Gilles, Nanette
Subject: FW: Memorandum to Commission on Fukushima Task Force and KI
Attachments: 2011.July.NRCFukushimaTaskForceFinal.rtf

FYI. This is the email from Peter Crane to SECY, cc to me, that I discussed earlier. As I noted, he faults the Task Force Report for not emphasizing the issue of stockpiling and distribution of KI beyond 10 miles. Roger

From: Peter Crane [mailto:(b)(6)
Sent: Monday, July 18, 2011 11:44 AM
To: Vietti-Cook, Annette
Cc: Davis, Roger
Subject: Memorandum to Commission on Fukushima Task Force and KI

Hi Annette –

The attached memorandum is directly relevant to the briefing that the Commission will be getting tomorrow on the report, issued last week, of the Fukushima Task Force. It is time-critical. Could you please see that it is printed out and delivered to Commission offices as soon as possible? Thanks.

By the way, in it I mention that there is a March 27, 2006, letter from HHS Secretary Leavitt to Chairman Diaz that I was not able to find on ADAMS, except as an attachment to a letter from Professor Frank von Hippel of Princeton and me to Senator Lieberman, with copies to the NRC. Maybe I missed it somehow with the search terms I used. In any event, if that letter is not on ADAMS, it should be, and it is puzzling that it isn't.

Thanks –
Peter

Davis, Roger

From: Davis, Roger
Sent: Monday, July 18, 2011 3:33 PM
To: Bubar, Patrice
Subject: FW: Memorandum to Commission on Fukushima Task Force and KI
Attachments: 2011.July.NRCFukushimaTaskForceFinal.rtf

fyi

From: Davis, Roger
Sent: Monday, July 18, 2011 3:32 PM
To: Clark, Lisa; Reddick, Darani; Bupp, Margaret; Sexton, Kimberly
Cc: Vietti-Cook, Annette
Subject: FW: Memorandum to Commission on Fukushima Task Force and KI

FYI, attached is a letter emailed mid-day to SECY (cc to me) from a former OGC colleague, Peter Crane, faulting the Fukushima Task Force for failure to emphasize the issue of distribution and stockpiling of KI beyond 10 miles. I expect SECY will make distribution promptly but thought I would pass on an advance copy to the LA's. Roger

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Thanks –
Peter

Davis, Roger ~~NOT FOR PUBLIC DISCLOSURE~~

From: Vietti-Cook, Annette
Sent: Monday, July 18, 2011 5:59 PM
To: Davis, Roger; Clark, Lisa; Reddick, Darani; Bupp, Margaret; Sexton, Kimberly
Cc: Bavol, Rochelle; Laufer, Richard
Subject: RE: Memorandum to Commission on Fukushima Task Force and KI

Thank you Roger for passing to the Commission offices. I am just getting through all my email now.

From: Davis, Roger
Sent: Monday, July 18, 2011 3:32 PM
To: Clark, Lisa; Reddick, Darani; Bupp, Margaret; Sexton, Kimberly
Cc: Vietti-Cook, Annette
Subject: FW: Memorandum to Commission on Fukushima Task Force and KI

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Thanks –
Peter

Peter Crane (b)(6) / (b)(6) / (b)(6) / (b)(6) *(home),* (b)(6) *(cell)*

1044

July 18, 2011

MEMORANDUM FOR: Chairman Gregory B. Jaczko
Commissioner Kristine L. Svinicki
Commissioner George Apostolakis
Commissioner William D. Magwood, IV
Commissioner William C. Ostendorff

FROM: Peter Crane
Counsel for Special Projects, USNRC (retired)

On July 13, the NRC issued press announcements on two unrelated matters: the public release of the report of the NRC staff's Task Force on the Fukushima accident (news release No. 11-127), and the Commission's directive to the staff "to examine feasibility and need of study on radiation doses to public from nuclear medicine" (news release No. 11-128).

The Task Force report touches on, though only very minimally, the use of potassium iodide (KI) as a thyroid blocking agent; the directive on nuclear medicine relates directly to the issue of the release of patients with high doses of radioactive iodine-131 in their systems. Both as an NRC employee and as a retiree, I have been involved with these two subjects for many years – nearly 30 years, in the case of KI, and almost 20 years, with respect to radioactive patients – and I have considerable institutional knowledge in these areas.[1] I feel obligated to the current Commissioners, the agency, and the public, to share some of this history with them, and explain why the July 13 issuances are problematic. Since I see that the schedule calls for the Task Force to brief the Commission on July 19, I will in the interest of time deal with the first today and the second in a memorandum to be submitted in the near future.

The charter of the NRC staff Task Force on Fukushima was set forth in a March 23, 2011, tasking memorandum from Chairman Jaczko to R. W. Borchardt, the Executive Director for Operations (Appendix B to the report, p. 77), and the March 30, 2011, memorandum from Mr. Borchardt to Martin Virgilio and Charles Miller (Appendix C to the report, p. 79). The Task Force was given the specific task of considering, among other things, "Emergency preparedness (e.g. emergency communications, **radiological protection, emergency planning zones, dose projections and modeling, protective actions**)." [Emphasis added.]

[1] In an appendix, I will describe my 27-year service at NRC.

Protective actions include, as the report acknowledges, potassium iodide. The following seem like obvious questions: How widely was potassium iodide distributed in Japan? How far away from Fukushima did radioactive iodine show up in foodstuffs, water, and air? What kind of radiation doses to the thyroid were received by Japanese citizens, especially children, and at what distances from the reactors? What does this suggest about the need for KI beyond the 10 mile radius in which the NRC now offers it?

These are all questions that can be answered, to a greater or lesser extent, by any informed citizen who reads the newspapers and has access to a computer, but anyone whose only source of information is the NRC Task Force, which was in theory addressing such issues, would be out of luck. Indeed, such a person would not even realize that these issues existed, for the Task Force has tiptoed around them.

The Task Force must surely be aware that the NRC has come under sharp criticism for its role in preventing the implementation of a law, Section 127 of the Public Health Security and Bioterrorism Preparedness and Response Act of 2002, which would have extended the availability of KI out to a 20-mile radius. A January 2008 decision by the President's Science Advisor, Dr. John H. Marburger III, declined to implement that portion of the Act. The Task Force must also know that a bipartisan group of some 30 Members of Congress, including Rep. Ed Markey, the law's sponsor, has called on the President to revisit that decision and authorize the broader stockpiling and distribution of the drug, and that this issue is under reconsideration by the Administration.

But no reader of this report would realize any of that, or find a scintilla of information that might shed light on the question of whether current policy needs revision. What is more, an Associated Press story on March 31, 2011, quoted Patricia Milligan, the NRC's senior expert on KI matters, as saying that the NRC was "absolutely confident" that the 10 mile radius for stockpiling of KI was sufficient. Considering that the accident was still unfolding rapidly at that time, this was highly premature. It was only on March 23, after all, that Chairman Jaczko had directed the staff to examine, among other things, "emergency planning zones" and "protective actions." If the staff had completed its review of the KI issue in the intervening eight days, this was quick work indeed.[2]

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[2] Normally the NRC's consideration of KI policy is measured in years. When the NRC Commissioners, over the fierce opposition of the NRC staff, granted my petition for rulemaking on KI in early 2001, changing the NRC's regulations and also offering supplies of KI to states, it was the culmination of a process that had begun with a Differing Professional Opinion that I had filed 12 years earlier.

The Marburger decision and the NRC's role in it deserve further discussion here. As the Commission is probably aware, the legislation authorizing the expansion of KI distribution from 10 to 20 miles from nuclear power plants was passed by an overwhelming margin in 2002 and signed into law by President Bush. The White House, in a 2002 statement, hailed the result, saying that henceforth, KI, which it called "crucial" and "critical," would be available wherever needed, not just within what it termed the "artificial ten-mile barrier." The Department of Health and Human Services was given the task of implementing the law, which NRC had opposed.

But to begin distribution of KI, which HHS was eager to do, for it saw a plain need to improve protection for America's children, it was required to publish guidelines. Opponents of the law prevailed on the Office of Management and Budget to withhold its approval of those guidelines, and thereby delay implementation of the law, to the great frustration of HHS.

The same law directed the National Academies of Science to perform a study of KI. Published in 2004 under the title *Distribution and Administration of Potassium Iodide in the Event of a Nuclear Incident*, it made clear, inter alia, that "children are most likely to benefit from KI prophylaxis" (p. 4); that thyroids are at risk in a nuclear incident from "inhalation of contaminated air or ingestion of contaminated food or milk" (p. 3); that "KI should be available to infants, children, and pregnant and lactating women" (p. 5); that though KI distribution to date focused only on the 10-mile Emergency Planning Zone utilized by the NRC, the variation from site to site meant that "no single best solution exists," and that a specific incident might require KI "beyond the EPZ as well" (p. 161); and that as a result, "**KI distribution programs should consider predistribution, local stockpiling outside the emergency planning zone (EPZ), and national stockpiles and distribution capacity.**" (p. 160, emphasis in the original)

In a November 1, 2005, letter to HHS, the NRC brazenly misrepresented the findings of the NAS report. Writing to Dr. Robert Claypool of HHS, William F. Kane, NRC Deputy Executive Director for Reactor and Preparedness Programs, asserted – purportedly on the basis of the NAS report – that the only pathway of concern beyond the 10-mile radius would be ingestion, which could be controlled by interdiction of foodstuffs, and, in a particularly egregious distortion, declared that "the Academy raised questions about the usefulness of expanded distribution of KI."[3]

HHS Secretary Michael Leavitt responded with a letter to NRC Chairman Nils Diaz[4], dated

[3] This letter may be found on the NRC's ADAMS system, using accession no. ML052790498.

[4] I have so far been unable to find this letter on ADAMS, except as an attachment to a letter that Professor Frank von Hippel of Princeton University and I sent to Senator Joseph Lieberman on September 26, 2007, with a copy to the

March 27, 2006, which though couched in superficially civil terms was an acid rebuke that made clear that NRC had quoted snippets of the NAS report out of context to produce a misleading impression. He quoted the actual words of the NAS report back to Diaz: "A specific incident might call for protective actions to be restricted to a small part of the EPZ **or require that they be implemented beyond the EPZ as well,**" boldfacing the last 11 words for emphasis.[5]

NRC, which may be found as LTR-07-0685 on the ADAMS system. If Secretary Leavitt's letter is not on the system in its own right (and if not, one may ask why not), it should be added.

[5]Secretary Leavitt also wrote:

> Section 127 of the Bioterrorism Preparedness and Response Act of 2002 requires the President to make KI available to State and local governments for stockpiling and distribution, and to establish guidelines for the stockpiling of KI and for its distribution and utilization in the event of a nuclear incident. Additionally, subsection 127(f) states that these requirements *"cease to apply as requirements if the President determines that there is an alternative and more effective prophylaxis or preventive measures for adverse thyroid conditions..."* The President has not made the necessary determination here. Rather, as the President stated in 2002 when forming the Department of Homeland Security, *"...one Department would be responsible for distributing Potassium Iodide to citizens exposed - no matter where they lived. There would no longer be an artificial ten-mile barrier to treatment."* Currently, we do not believe there are "alternative and more effective... measures" than to make KI available up to 20 miles from a nuclear facility, in conjunction with the protective measures established by the NRC. [Emphasis in the original.]

Unaware at the time of HHS Secretary Leavitt's letter to NRC, I drew the Kane letter's mischaracterization of the NAS report to the attention both of the Commission, by email, and the NRC's Office of Inspector General. This was, as usual, fruitless. The EDO, Luis Reyes, replied a few weeks later with a short note that neither mentioned the NAS report nor gave a direct answer to the charge that the Kane letter had mischaracterized its findings. Instead, he wrote that "the Commission believes that Mr. Kane's letter reflected the NRC's well-considered, scientifically-based position on expanded distribution of KI." Apparently, it was a matter of indifference whether the Kane letter was factual, so long as it supported the Commission's position.

OIG declined to investigate. Its Allegations Coordinator, George Mulley, explained to me on the telephone that the first thing that OIG did, when examining an allegation, was to ask what federal law had been broken, and that there was nothing in the U.S. Code that made it illegal to deceive another federal agency. This was, I submit, an unduly pinched view of OIG's mandate.

But it was hardly surprising. OIG's record of mishandling allegations concerning the staff's treatment of KI matters goes back many years, and includes one occasion on which, contrary to OIG procedures, Inspector General David Williams disposed of an allegation with no written record, and without even informing his head of investigations, Leo Norton, that the allegation had been received. Norton, an honorable and candid person, agreed with me that this was an "off the books" handling of an allegation, and said that I could quote him to that effect. It was unique in his experience, he said, and "no way to do business." For more on OIG and KI, see also the joint letter from Professor Frank von Hippel and me to Senator Joseph Lieberman, dated 9/26/2006, with copies to the NRC, cited above, and accessible through ADAMS as LTR-07-0685.

I might add that though the concurrence page on the Kane letter, as it appears on the NRC website, indicates that the originator of the document was Patricia Milligan, the responsibility for it extends to all who reviewed and signed off on it. The same applies to those who, after seeing Secretary Leavitt's letter, nevertheless approved the response to Senator Isakson's question, which will be discussed shortly.

Secretary Leavitt's letter plainly did not faze the NRC, however, which in an April 10, 2006, letter to Senator George Voinovich, responding to questions arising from a recent oversight hearing, repeated the assertion that the NAS supported the NRC position on the undesirability of stockpiling KI beyond ten miles, and attached the Kane letter.[6] (The answer came in response to a question from Sen. Isakson.) By now, there was no excuse for inaccuracy. If the staff had somehow contrived to misread the NAS report at the time it wrote to Dr. Claypool in November 2005, any such misunderstanding had been cleared up by Secretary Leavitt, in his letter of March 27, 2006.

With his declared intention of implementing the law and providing KI in the 10 to 20- mile radius, Secretary Leavitt was on a collision course with the NRC and the nuclear industry. The White House was persuaded to forget or ignore what it had said in 2002 about eliminating the "artificial 10 mile barrier" to the distribution of this "crucial" and "critical" drug. On July 2, 2007, President Bush signed an order that stripped Leavitt of his authority over the law and transferred it to the NRC and to his own Science Advisor, Dr. Marburger, who would have the

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[6] The relevant section of the letter, at pp. 29-30, reads as follows, and may be found on the NRC website using accession no. ML060930353:

QUESTIONS FROM SENATOR ISAKSON:

During the hearing, I brought up the issue of potassium iodide, but didn't get a chance to pursue my question with the Commission. It is my understanding that the Department of Health and Human Services (HHS) has made a recommendation to expand the stockpiling of potassium iodide beyond the 10-mile radius around a nuclear facility which is the current requirement. Please provide the Commission's position on the HHS's recommendation for the record.

ANSWER:

Based on the NRC's decades of experience with nuclear power plant emergency preparedness and radiological protection of the public, it is the NRC's conclusion that expanded distribution of potassium iodide (KI) is unnecessary. Expanded distribution of KI is unnecessary because of the current, well-established, and scientifically sound framework of the NRC's emergency preparedness regulations. This framework includes predetermined protective actions for populations within the 10- and 50-mile ingestion exposure pathway Emergency Planning Zones (EPZs) to provide the necessary protection of public health and safety. These predetermined protective actions include interdiction of contaminated milk, food, and water, as well as protective measures for livestock. **NRC's conclusion is supported by a January 2004 study by the National Academy of Sciences**, which found that food testing and interdiction programs in place throughout the United States are more effective preventive strategies than expanded distribution of KI for ingestion pathways. Additionally, many States and other interested entities, including Federal agencies, have expressed opposition to the distribution of KI beyond the existing 10-mile EPZs. Additional detail on the Commission's position on HHS's draft guidelines for expanded KI distribution are [*sic*] provided in the November 1, 2005 letter from Mr. William Kane, NRC's Deputy Executive Director for Reactor and Preparedness Programs, to Dr. Claypool of HHS's Office of Mass Casualty Planning, which is attached (Attachment 7) for your convenience.

final say on whether to implement the law.

At Marburger's request, a technical evaluation paper on KI was prepared by the Potassium Iodide (KI) Subcommittee of the Federal Radiological Preparedness Coordinating Committee (FRPCC), an interagency group. On October 23, 2007, FRPCC Chair Vanessa Quinn, of FEMA, transmitted the paper to Marburger, with a cover letter that made plain the leading role of the NRC staff in the effort.[7]

Marburger's decision, issued on January 22, 2008, predictably found no need to implement the 2002 law. This is not the place to get into the legal question of whether his refusal to do so was consistent with Congressional intent and a proper reading of the statute, though I have strong views on that point; I would like instead to stay with the technical and policy bases for his decision.

Perhaps the most extraordinary thing about the Marburger decision was that the President's Science Advisor felt able to issue a 13-page decision on a drug for the prevention of cancer without ever using the word "cancer." Instead, he referred euphemistically to "adverse thyroid conditions." From the chief scientist in the United States Government, this defies comprehension. Is it conceivable that any Government official would issue a decision on the use of Sabin vaccine without ever employing the word "polio"? Of course not. But when the subject is KI and thyroid cancer, this happens again and again.[8]

Let us now look at the important question of what exactly Marburger was relying *on*. At p. 12 of

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[7] Quinn wrote: "I would be remiss if I did not specifically mention the hard work and effort put into this project by Trish Milligan, KI Subcommittee Co-Chair. Her technical knowledge and willingness to spearhead the overall coordination of this technical evaluation paper was invaluable." Just the day before, October 22, 2007, an article in *USA Today*, entitled "White House may stop plan for anti-radiation pills," included the following: "Patricia Milligan, the NRC's senior adviser for preparedness, says the commission opposes broad distribution of the pills because the best way to eliminate risk is to make sure people don't eat contaminated food. She also says the NRC is concerned about undermining the reputation of the nuclear industry. 'It's always a concern that if you expand the distribution (of the pills), you don't have confidence in the plants,' she says. 'We have studies that show the safety of our plants.'"

[8] This is certainly true at NRC as well. For example, at NRC headquarters, on July 1, 1997, anyone whose office windows faced west might have seen a television crew, with the familiar eye of the CBS Evening News on its videocamera, interviewing me in front of the building. Four hours later, the NRC, under Chairman Shirley Jackson, issued a press release stating that agency would buy KI for any state that wanted it. (At the time, the matter had been pending for seven years.) But the news release was careful not to use the word "cancer," and therefore was less helpful to readers than it might have been. It probably made little difference, however, for the NRC did nothing to implement this commitment, and two years later, still under Chairman Jackson, the Commission retracted its promise, saying that budget constraints did not allow expenditures on new initiatives of this kind.

his decision, he wrote:

> Some concerned citizens groups criticize meteorological analyses that assume a wind that blows constantly in a single direction, suggesting that variable trajectory models would better account for complex wind patterns, leading to accident consequences extending beyond current projections. In fact the opposite is true. The NRC and FEMA outline their strategies for emergency planning in the 2002 study *Assessment of the Use of Potassium Iodide (KI) as a Supplemental Public Protective Action during Severe Reactor Accidents* (NUREG 1633)[fn], which addresses the effect of meteorology on accident consequences, specifically its effect on where the offsite release goes....

The footnote included a citation to this document, which states on its cover page that it was "Prepared by P. A. Milligan/NRR."[9]

What Marburger evidently did not know was that officially, this document was in the dumpster. In November 2002, the Commission had decided, on a 4-1 vote, with Commissioner Dicus the lone dissenter, that it was unfit for publication, and that no more resources should be spent on bringing it up to standard. Commissioners' comments on it were not gentle. Commissioner McGaffigan noted that although it was the 9/11 attacks that had spurred states' interest in KI stockpiling, "the draft NUREG is silent on the subject." Commissioner Diaz wrote:

> The draft NUREG now before us is the third version we have been asked to review since mid1998. (The first version was withdrawn by the Commission and we disapproved the second one.) ... In my opinion, it's time to pull the plug.[10]

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[9] http://www.nrc.gov/reading-rm/doc-collections/commission/secys/2002/secy2002-0089/attachment1.pdf

[10] The story of the three rejected versions of NUREG-1633 is a curious one. The first version managed not to include, in its 37 pages, the fact that the Food and Drug Administration had found KI to be "safe and effective." (This was comparable to the FDA issuing a report casting doubt on the safety of a particular nuclear power plant without mentioning that there was an organization called the NRC that had found this plant to be safe.) The document strove to raise anxieties about the safety of the drug, and to warn of the lawsuits that would be faced by any state that gave it out in an emergency. It also asserted that American can authorities cautioned against giving the drug to children and pregnant women, whereas in reality, it is universally recognized, here and abroad, that the principal *benefit* of the drug is to children and pregnant women. (I should in fairness mention that NUREG-1633 was not wrong about everything, however. For example, it said of Chernobyl, at p. 14: "[I]nhalation most like was a major source of the dose received in some areas near the plant." This contradicts an assertion often made by opponents of KI: that virtually all the post-Chernobyl thyroid cancers resulted from drinking contaminated milk.)

The Commission soon received scathing comments from state health officials and others. Dr. Karim Rimawi, director of the Bureau of Environmental Radiation Protection in the New York State Health Department, wrote on September 29, 1998, that the Department "had looked forward to NRC's report in the

I do not know where Dr. Marburger got his copy of the draft NUREG – perhaps it was not from the NRC at all – but surely he could and should have been warned by his NRC advisor that the document had been rejected by the Commissioners and therefore had no place in his decision.

Relying as it did on an invalid document, Marburger's decision must therefore be considered at least partially tainted. Its pernicious effects, moreover, have extended far beyond the question of implementing the 2002 law. After its issuance, the interagency group that maintains the Strategic National Stockpile removed KI from the arsenal of protective drugs that comprise that stockpile, to which it had been added after 9/11.[11] I am told that the group felt that it had no choice, in light of the Marburger decision.

At a time at which in every other sphere of life, America is *increasing* its preparedness against terrorism, the NRC has thus been instrumental in *diminishing* our country's preparedness to deal with acts of nuclear terrorism or other nuclear catastrophes. It must be borne in mind what the consequences of insufficient preparedness will be, if such a disaster occurs: an increased incidence of thyroid cancer, especially in children who were very young, or still in the womb, at the time of exposure.[12]

I would be the last person to argue that KI is a panacea for protection against radiological

---

hope that it would assist us," but found that it had been "prepared to justify a position advocating against the use of KI for public protection, rather than as an objective review of the relevant information." "This bias," he wrote, "raises doubt as to the value of the document." He also commented: "It selectively references sources that support that point of view and ignores others that tend to justify the use of KI."

Shortly afterwards, the Commission ordered NUREG-1633 withdrawn. Commissioner Ed McGaffigan, in a memorandum quoted in the October 12, 1998, issue of *Inside N.R.C.*, wrote: "As I admitted at the public meeting, I had not read enclosure 8 [draft NUREG-1633] in any detail when I agreed to put it out for public comment and peer review as the SRM was drafted. I made the mistake of thinking no harm could come from just putting a document out for public comment. I was wrong." (At p. 8.)

Revision of the NUREG was entrusted to a large Core Group, headed by Aby Mohseni. It was on his watch that the entire Core Group, during a particularly a cold February in Rockville, spent a week at NRC expense in Tempe, Arizona. This second version was also rejected, and the project then passed into the hands of Patricia Milligan, who produced the third and final version. By the time the Commission rejected it in 2002 and "pulled the plug," in Commissioner Diaz's words, the NRC had spent a small fortune on NUREG-1633, with nothing of value to show for it.

[11] http://www.washingtonpost.com/national/us-health-care-system-unprepared-for-major-nuclear-emergency-officials-say/2011/04/07/AF6ZSavC_story.html

[12] If the example of Chernobyl is an accurate guide, we will begin seeing the first post-Fukushima childhood thyroid cancers in about five years.

disasters. Indeed, in the early days of the Fukushima accident, I went on television in Seattle to say that it would "irresponsible scaremongering" to suggest that anyone in the U.S. should now be taking KI to protect against the releases from Japan. But it is likewise irresponsible in the extreme not to have adequate supplies on hand in this country, for accidents or acts of terrorism occurring here, and of all the possible reasons for failing to stockpile it, protecting the public image of the nuclear power industry is surely the rock-bottom worst.[13]

The real question is whether KI would be useful in the event of a major release, for if not, there is no point in having it, regardless of its low cost. The opponents of KI stockpiling have long maintained that KI is unnecessary, because the whole problem of thyroid protection can be solved by instructing people to refrain from drinking milk after a major nuclear release. For example, in the early days of the Fukushima accident, a March 13 article in the *New York Times* quoted a radiation expert at Columbia, Dr. David Brenner:

> Dr. Brenner said the iodine pills were protective, but were "a bit of a myth" because their use is based on the belief that the risk is from inhaling radioactive iodine. Actually, he said, 98 percent of people's exposure comes from milk and other dairy products.
>
> "The way radioactive iodine gets into human beings is an indirect route," he said. "It falls to the ground, cows eat it and make milk with radioactive iodine, and you get it from drinking the milk. You get very little from inhaling it. The way to prevent it is just to stop people from drinking the milk." He said that the epidemic of thyroid cancer around Chernobyl could have been prevented if the government had immediately stopped people from drinking milk.

I have no idea where Dr. Brenner got this 98% figure; most sources I have seen think that 70 or 80 percent of the Chernobyl exposures came from the milk pathway, not more. At any rate, once I-131 began showing up in Tokyo's tap water, I wrote a letter to the *New York Times*, published on March 26, that was implicitly a slap at Dr. Brenner and the reporter who had so uncritically relied on him.[14]

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[13] Even if we assume for purposes of argument that stockpiling KI would cause Americans to worry about the safety of nuclear power plants (and after Fukushima, it seems unlikely that KI would play any significant role in any such worries they may have), that is separate from the question of whether we should have the drug on hand as part of preparedness for acts of *terrorism*. The public relations needs of the nuclear power industry regarding power plant safety should have no bearing on whether we are ready to cope with a nuclear device exploded by terrorists.

[14] To the Editor:

The detection of radioactive iodine 131 in Tokyo's drinking water ("Anxiety Up as Tokyo Issues Warning on Its Tap Water," front page, March 24), in amounts considered unhealthy for children, makes clear that potassium

Whether for that reason or some other, Dr. Brenner's public position on KI changed almost instantaneously. On the afternoon of the same day, March 26, a glowing profile of him, "Countering Fears With Just the Facts," was posted on the *New York Times* website (it appeared in print on March 29), which included the following:

> Potassium iodide pills are widely recommended to protect the thyroid gland from radioactive iodine, but Dr. Brenner said it was better just to stop drinking milk until the threat had passed.
>
> His message changed, however, when radioactive iodine turned up in tap water in Tokyo. Though the public was advised that babies, children and pregnant women should not drink the water, Dr. Brenner conceded that some exposure might still be hard to avoid, and that using potassium iodide was a reasonable precaution.
>
> "I've been maybe a little overstrong in saying that potassium iodide doesn't have a role to play," he said. "But usually the problem is milk. To me, the levels in water came as a surprise."

But is it really a "myth," as Dr. Brenner suggested in the earlier article, that inhalation of I-131 after a radiological release is a danger?

Nearly 20 years ago, the Environmental Protection Agency issued a "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," EPA 400-R-92-001 (May 1992)[15], that included the following, at p. 5-20: "If a major release of radioiodine or respirable particulate

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iodide must be administered if children are to be adequately protected against thyroid cancer caused by ingested and inhaled iodine 131. Interdiction of milk supplies, though important, is plainly insufficient.

Japan's apparent preparedness with potassium iodide contrasts with the situation in the United States. In response to 9/11, Congress passed a law to create stockpiles of potassium iodide for populations within a 20-mile radius of nuclear reactors, rather than the 10-mile radius within which the Nuclear Regulatory Commission offers it to states that request it.

But the N.R.C., which had opposed the law, fought successfully to keep it from taking effect. In 2008 President George W. Bush's science adviser, John H. Marburger III, declared that potassium iodide was not needed beyond the 10-mile radius, and that the law therefore would not be implemented.

The events in Japan demand that the Obama administration act quickly to reverse this unjustified rejection of a sensible law.

Peter Crane
Seattle, March 24, 2011

[15] http://www.epa.gov/radiation/docs/er/400-r-92-001.pdf

materials occurs, **inhalation dose will be the controlling pathway.**" [Emphasis added.] It recommended, among other things, consideration of the use of KI. It made the point that though evacuation in an emergency is the ideal option, you can get a radiation dose while evacuating, and that automobiles offer only about 10% shielding.

The Food and Drug Administration issued guidance on KI in 2001.[16] At p. 8, after noting that the post-Chernobyl exposures to radioiodines came "largely" from the milk pathway, it said:

> In this or similar accidents, for those residing in the immediate area of the accident or otherwise directly exposed to the radioactive plume, **inhalation of radioiodines may be a significant contributor to individual and population exposures.** ... The risk depends on factors such as the magnitude and rate of the radioiodine release, wind direction and other atmospheric conditions, and thus may affect people both near and far from the accident site. [Emphasis added.]

There was also a useful report from the International Atomic Energy Agency in 2002.[17] At p. 52, the joint IAEA/WHO committee that prepared it makes the point that "iodine prophylaxis is intended **primarily as a protective action against inhalation,**" in the short term, and suggests amending the International Basic Safety Standards to reflect this. [Emphasis added.]

In 2003, the Medical Preparedness and Response Sub-Group of the Department of Homeland Security Working Group on Radiological Dispersal Device Preparedness prepared a report saying that if terrorists detonated a radiological dispersal device containing radioiodine or a 10-kiloton improvised nuclear weapon, millions of doses of KI might be needed to deal with the fallout. It said, at p. 62: "Urgent consideration for giving KI to pregnant women (especially 2nd and 3rd trimesters) and children is appropriate."[18]

On June 30, 2011, in response to a Freedom of Information Act request, the NRC placed a large number of documents relating to the Fukushima accident onto the ADAMS system.[19] They

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[16] http://www.fda.gov/downloads/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/ucm080542.pdf

[17] http://www-pub.iaea.org/MTCD/publications/PDF/Pub1133_scr.pdf

[18] http://www.orau.gov/hsc/RadMassCasualties/content/resources/Radiologic_Medical_Countermeasures_051403.pdf

[19] For this information, I am indebted to David Lochbaum, an NRC alumnus now with the Union of Concerned Scientists.

include a March 25, 2011, email from Elmo Collins, Regional Administrator in NRC's Region IV, to Linda Howell, as he prepared to leave for Japan. The subject line is "Japan," and it reads, in its entirety, as follows: "I'll need to pick up some KI and make sure I have my dosimetry as needed – what dose meter would be good for me to take? Thanks, Elmo."

Of course Mr. Collins provided himself with KI, and rightly so. NRC personnel are not reckless when it comes to their own safety or that of their children, nor should they be.[20] But if ever there is a nuclear catastrophe in this country, whether caused by terrorism or an accident, and Americans living more than 10 miles from a nuclear power plant discover that *their* children have been inadequately protected against radioactive iodine owing to the NRC's unremitting, no-holds-barred battle to prevent or limit KI stockpiling – a battle that has included misrepresenting, *including to Congress*, the findings of a Congressionally mandated study of the issue by the National Academies of Science, and working to ensure that the sensible recommendations of the NAS were rejected by the President – the consequences would be devastating, not only for the affected children, but also for the NRC.

What would the country say when it learned that KI had been removed from the Strategic National Stockpile, with the result that we are less well prepared to cope with the medical effects

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[20]By the same token, consider a March 4, 1994, letter from Jim Martin, an NRC retiree, to Hugh Thompson, then Deputy Executive Director for Operations, which was placed in the Public Document Room at that time:

> Please hold the bottom line: do not require that utilities distribute KI to the general public as a license condition. This was my bottom line over many years of discussions of the subject at the staff and the commission levels. As I said to Peter Crane at one time: If I lived near a nuclear plant, I'd have some KI for my family (it's so cheap!), but I think it would be legally obscene to require KI predistribution to the public as a condition of a license. If Peter wants KI available in the schools, then let the PTAs run car washes and buy some! At the time, they cost only 2-3 cents apiece.

I recall this meeting well; Mr. Martin made the point that for the price of the pack of cigarettes in his shirt pocket (at the time, in 1983, they sold for about $.75 a pack in the D.C. area), he could protect his whole family with KI, and he would be "crazy" not to do so. Please understand: I do not by any means intend to demonize Mr. Martin, whose letter, if read in its entirety, which I recommend, is more thoughtful and balanced than this one passage, taken in isolation, might suggest. The problem with his proposed solution, however, is that unless people are *told* that KI is desirable, the PTA's of America are not going to know to hold such bake sales, and in an actual emergency, only knowledgeable insiders, such as NRC personnel and their families, will be protected.

Incidentally, Mr. Martin made another observation in his letter, from which it can be inferred that the site at which KI would be of greatest value in preventing cancer is Indian Point (IP): "The major technical basis document at the time was the Blond & Aldrich report on the efficacy of KI. Indeed, it showed that a 'national' KI predistribution program would not be cost effective in terms of cancers avoided (half or more of the calculated cancers arise beyond 50 miles at most sites – **all except for IP, as I recall**, so the emphasis must be on the area beyond 50 miles, for the cancer issue)." [Emphasis added.]

of a nuclear disaster than we were a few years ago? The NRC Chairman and Commissioners would probably find themselves having to explain their actions not only to Congressional committees but to grand juries. Under those circumstances, it is hard to imagine that the Nuclear Regulatory Commission would even survive for long, at least under that name.[21] More likely, it would be abolished and replaced by some new regulatory body, as is currently happening in Japan.[22]

Press reports indicate that radioiodine from Fukushima has turned up in air, water, and foodstuffs far from the damaged nuclear plants.[23]To continue to insist that KI stockpiling in this country be limited to a 10 mile radius around nuclear plants, and then only in states which request the drug, would be irresponsible beyond measure. The sooner the NRC faces up to this reality, the better, and not only for the American public, but also for its own sake. The Task Force should be told to address the KI issue thoroughly and promptly. In addition, the Inspector General should be asked to investigate the staff's handling of KI matters in recent years, including, but not limited to, the appearance of NUREG-1633 in the Marburger decision, the accuracy of the 2005 Kane letter to

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[21] After 9/11, Commissioner McGaffigan called me to tell me that I had "saved the NRC from itself," through the efforts that resulted in the NRC's rule change on KI, a few months earlier.

[22] http://mdn.mainichi.jp/mdnnews/news/20110717p2g00m0dm054000c.html

[23] Consider this excerpt from an article carried by National Public Radio on March 20, at http://www.npr.org/2011/03/20/134705754/japans-efforts-to-ease-nuke-crisis-hit-setback:

> **Government Admits Mistake**
>
> Officials have begun distributing protective potassium iodide pills to people from the area around the power plant. But one official in Fukushima, Kazuma Yokota, told reporters that the government now realizes it should have distributed the pills earlier last week.
>
> Potassium iodide protects people against thyroid cancer if they have been exposed to radioactive iodine, but it must be taken promptly.
>
> The pills help reduce chances of thyroid cancer, one of the diseases that may develop from radiation exposure, by preventing the body from absorbing radioactive iodine. The official, Kazuma Yokota, said the explosion that occurred while venting the plant's Unit 3 reactor last Sunday should have triggered the distribution. But the order came only three days later.
>
> "We should have made this decision and announced it sooner," Yokota told reporters at the emergency command center in the city of Fukushima. "It is true that we had not foreseen a disaster of these proportions. We had not practiced or trained for something this bad. We must admit that we were not fully prepared."

HHS, and the 2006 response to Senator Voinovich.[24]

What I have described in this memorandum are facts as I understand them, as informed by nearly 30 years of observing the NRC's handling of the KI issue. It has been prepared in a spirit of trying to be of service both to the American people and to the NRC. In this case, dealing as it does with a medication, a quotation from Gotthold Lessing's 18th Century play "Nathan the Wise" is particularly apposite: "It is medicine, not poison, that I am handing you."

/s/

Peter Crane, Counsel for Special Projects (retired)

cc: Senator George Voinovich
Senator Johnny Isakson
Senator Thomas Carper
Representative Ed Markey
Representative Henry Waxman

[24] If need be, the Commission should explain to the Inspector General that his office's mandate in conducting investigations of "fraud, waste, and abuse" is not confined, as Mr. Mulley of OIG appeared to believe, to cases in which a federal crime appears to have been committed. Of course, federal law requires NRC communications to Congress to be accurate.

Appendix – My Service with NRC

For the benefit of Commissioners who do not know me, I joined the NRC in early 1975, when it was 10 weeks old, and spent 27 years serving the agency in various capacities. I had been hired as a legal assistant, GS-12, by Commissioner (later Chairman) Marcus A. Rowden. In those days, it was standard for Commissioners to have two assistants, one technical and one legal, and two secretaries. (The Chairman at the time had a staff of seven: one technical assistant for reactors, another for materials, a legal assistant, an executive assistant, and three secretaries.) For the first year I was there, however, Commissioner Rowden made do with just a single assistant, me, until he added Hugh Thompson as a technical assistant in 1976.

I moved to the Office of General Counsel on the expiration of Chairman Rowden's term in 1977. Over the next 24 years (there was a one-year break in service, during which I was an administrative judge in Micronesia), I defended the NRC's actions in court with vigor and conviction. My first case, in the D.C. Circuit, involved the Mark II containment; my last, in the Sixth Circuit, resulted in a decision upholding the NRC regulatory scheme for approving the design of dry casks for spent fuel storage.

In the Ninth Circuit, some 30 years ago, I briefed, argued, and won a case defending the adequacy of the fixes that the NRC ordered in Babcock and Wilcox reactors after the Three Mile Island accident. At one point in the 1980's, I served very briefly as Acting General Counsel, in which capacity I called on the Solicitor General, the late Rex Lee, to ask him to take to the Supreme Court a case which I had briefed, argued, and lost in the D.C. Circuit. It involved the NRC's refusal to treat the "psychological impacts" of the resumed operation of Three Mile Island Unit 1 as environmental impacts within the meaning of the National Environmental Policy Act. Lee was fully in accord. He took the case to the Supreme Court, which reversed the D.C. Circuit and upheld the NRC position on a unanimous vote.

I was made Counsel for Special Projects in the mid-1980's and retired with that title in 1999. In 2001, I was brought on as a contractor to write speeches for then Chairman Meserve, and I continued in that function under Chairman Diaz until 2005. During my long tenure with NRC, I was privileged, in addition to my usual legal duties, to write speeches, testimony, and/or personal statements for Chairmen Rowden, Palladino, Hendrie, Zech, Jackson, Selin, Meserve, and Diaz, including Senate confirmation testimony for three of those just named.

While at NRC, I was invited to speak at a United Nations conference in Moscow in 1997 on responding to man-made disasters. In 1998, in my private capacity, I was a speaker at a conference at Cambridge University in England on the U.S. Government's handling of the KI issue. The conference was co-sponsored by the university, the European Commission, the National Cancer Institute, and DOE. The paper I presented may be found in published form in the 1999 volume *Radiation and Thyroid Cancer*, edited by G. Thomas, A. Karaoglou, and E. D. Williams.

Davis, Roger

From: Vietti-Cook, Annette
Sent: Monday, July 18, 2011 6:25 PM
To: Peter Crane
Cc: Davis, Roger
Subject: RE: Memorandum to Commission on Fukushima Task Force and KI

Just getting to emails and have printed your letter and am having it walked around. Roger got to it before me and forwarded to the Commissioner offices this afternoon so they will have received twice.

From: Peter Crane [mailto (b)(6)
Sent: Monday, July 18, 2011 11:44 AM
To: Vietti-Cook, Annette
Cc: Davis, Roger
Subject: Memorandum to Commission on Fukushima Task Force and KI

Hi Annette –

The attached memorandum is directly relevant to the briefing that the Commission will be getting tomorrow on the report, issued last week, of the Fukushima Task Force. It is time-critical. Could you please see that it is printed out and delivered to Commission offices as soon as possible? Thanks.

By the way, in it I mention that there is a March 27, 2006, letter from HHS Secretary Leavitt to Chairman Diaz that I was not able to find on ADAMS, except as an attachment to a letter from Professor Frank von Hippel of Princeton and me to Senator Lieberman, with copies to the NRC. Maybe I missed it somehow with the search terms I used. In any event, if that letter is not on ADAMS, it should be, and it is puzzling that it isn't.

Thanks –
Peter

NOT F. NOT FOR PUBLIC DISCLOSURE

Davis, Roger

om: Vietti-Cook, Annette
nt: Monday, July 18, 2011 6:43 PM
o: Batkin, Joshua; Coggins, Angela; Monninger, John; Clark, Lisa; Sharkey, Jeffry; Reddick, Darani; Sosa, Belkys; Davis, Roger; Bubar, Patrice; Nieh, Ho
Cc: Bavol, Rochelle; Laufer, Richard; Wright, Darlene; Lewis, Antoinette
Subject: FW: Memorandum to Commission on Fukushima Task Force and KI
Attachments: 2011.July.NRCFukushimaTaskForceFinal.rtf

Just in case you have not seen yet, I am forwarding. Roger forwarded this earlier in the day to legal assistants. Angie of my staff made copies and walked around this evening.

NOT FOR PUBLIC DISCLOSURE

From: Peter Crane [mailto:(b)(6)
Sent: Monday, July 18, 2011 11:44 AM
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Cc: Davis, Roger
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Thanks –
Peter

Gilles, Nanette

From:	George Apostolakis [apostola@MIT.EDU]
Sent:	Monday, July 18, 2011 8:43 AM
To:	Gilles, Nanette
Subject:	Fwd: TEPCO study
Attachments:	ATT00004.htm; TEPCO_tsunami_NPP_Study.pdf; ATT00005.htm; 2007 _Pageoph_Japanese_NPPs.pdf; ATT00006.htm

---- Forwarded message from costas@usc.edu ----
Date: Sun, 17 Jul 2011 17:59:34 -0700
From: Costas Synolakis <costas@usc.edu>
Reply-To: Costas Synolakis <costas@usc.edu>
Subject: TEPCO study
To: apostola@mit.edu

George, I am afraid I didn't send you the TEPCO study, presented in Nov 2010 "we assessed and confirmed the safety..." I attach it

I am also attaching another paper on the Japanese methodology about tsunami assessment, followed in the TEPCO study - it is essentially the journal version of their standards and guidelines. At the outset it says "Earthquakes of magnitude 8 would periodically occur in and around Japan". The last author is Nobu Shuto, the most senior Japanese tsunamista, and ex-Professor at Tohoky University. What I found interesting is that they don't discuss anything about benchmarking numerical models, but only describe how scenario modeling should produce results that exceed historical events. Yes, thank you. However, in the example they provide on a M=7.8 earthquake in the Sea of Japan, the max tsunami height they calculate is about 20m. Why the TEPCO engineers who were aware of this paper didn;t question their results where a M=8.4 event produces a <6m runup, hopefully Hollywood will eventually find out.

Take care,

Costas

Costas Synolakis
Professor of Civil and Environmental Engineering, Director, Tsunami Research Center Viterbi School of Engineering, University of Southern California Los Angeles, California 90089-2531
www.usc.edu/dept/tsunamis

Beauty is truth, truth beauty
this is all you know on earth,
and all you need to know.
John Keats.

---- End forwarded message ----

Tsunami Assessment for Nuclear Power Plants in Japan.

Makoto TAKAO, PE

TOKYO ELECTRIC POWER COMPANY

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Agenda

1. Tsunami assessment for NPP on the Pacific coast.

2. Operational status of NPP after the Feb. 28, 2010 tsunami from Chile.

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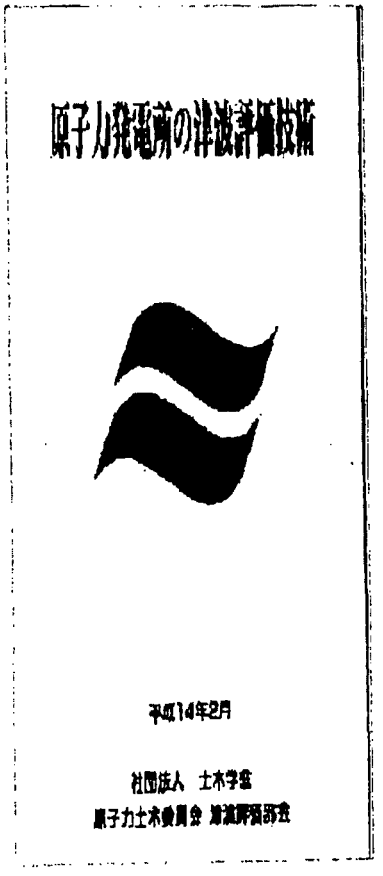
Agenda

1. Tsunami assessment for NPP on the Pacific coast.

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JSCE Method

"Tsunami Assessment Method for Nuclear Power Plants in Japan (2002)"



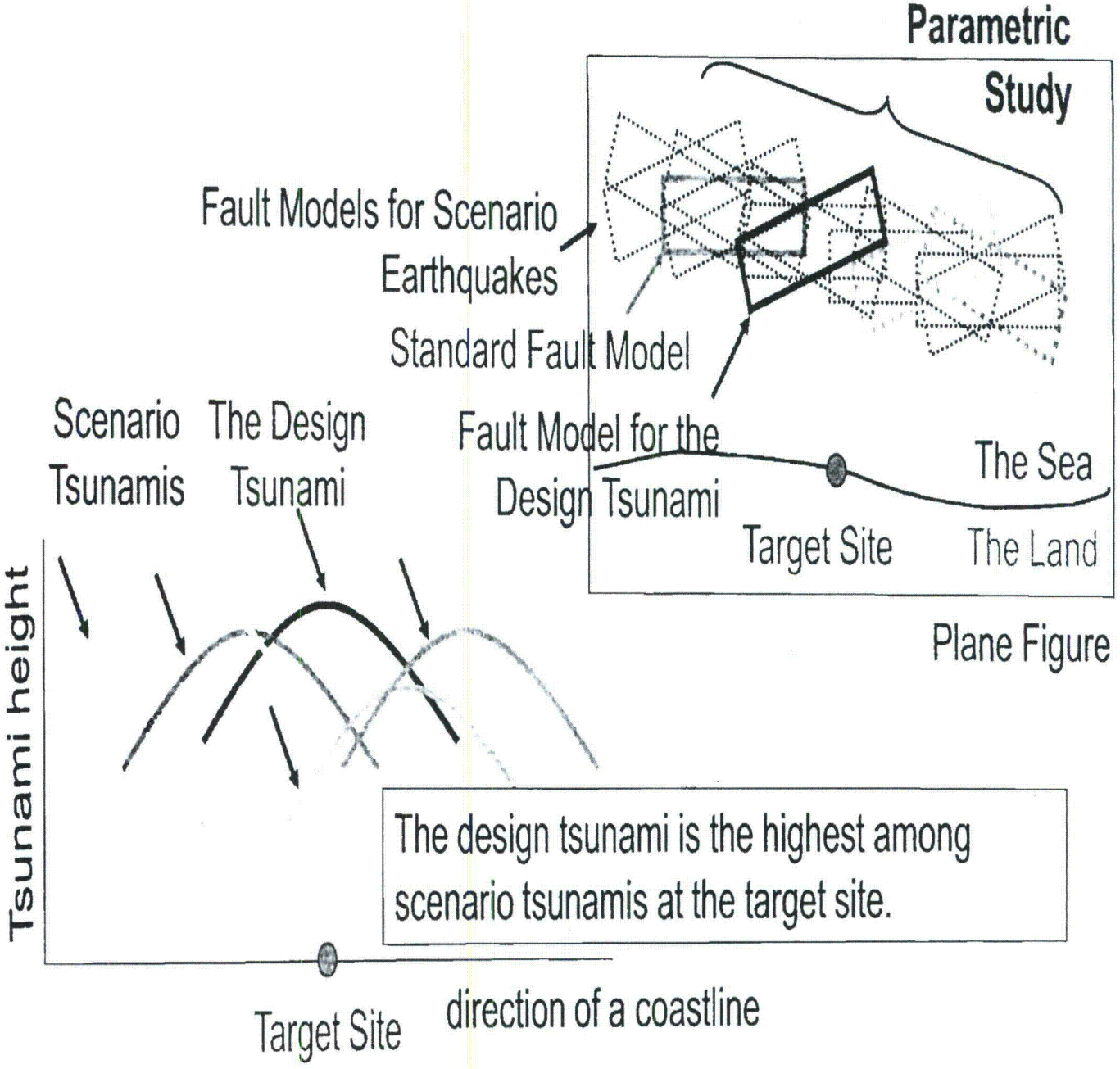
published by

Tsunami Evaluation Subcommittee,
Nuclear Civil Engineering Committee,
JSCE (Japan Society of Civil Engineers)

English version
http://www.jsce.or.jp/committee/ceofnp/Tsunami/eng/tsunami_eng.html

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Parametric Study of Tsunami Source



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TEPCO's Nuclear Power Stations

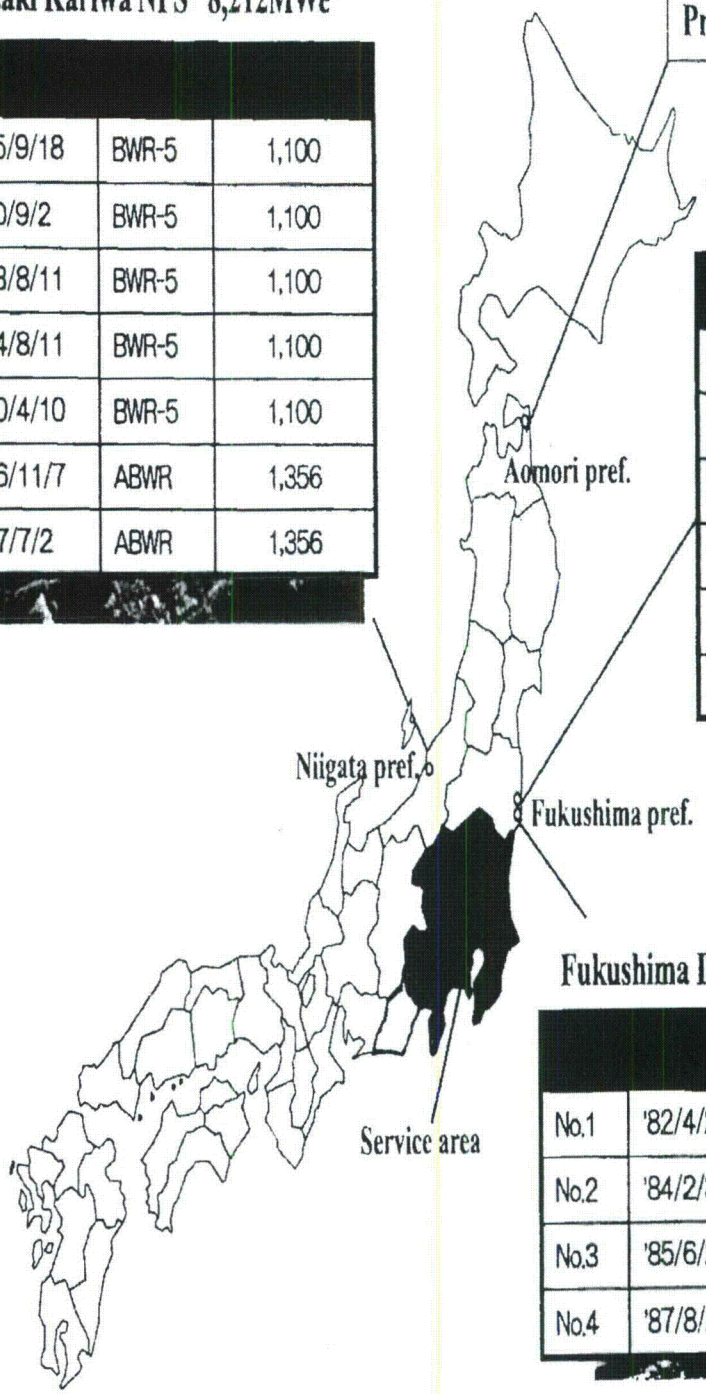
Higashidori Nuclear Power Construction Preparation Office

Kashiwazaki Kariwa NPS 8,212MWe

No.1	'85/9/18	BWR-5	1,100
No.2	'90/9/2	BWR-5	1,100
No.3	'93/8/11	BWR-5	1,100
No.4	'94/8/11	BWR-5	1,100
No.5	'90/4/10	BWR-5	1,100
No.6	'96/11/7	ABWR	1,356
No.7	'97/7/2	ABWR	1,356

Fukushima Daiichi NPS 4,696MWe

No.1	'71/3/26	BWR-3	460
No.2	'74/7/18	BWR-4	784
No.3	'76/3/27	BWR-4	784
No.4	'78/10/12	BWR-4	784
No.5	'78/4/18	BWR-4	784
No.6	'79/10/24	BWR-5	1,100



Fukushima Daini NPS 4,400MWe

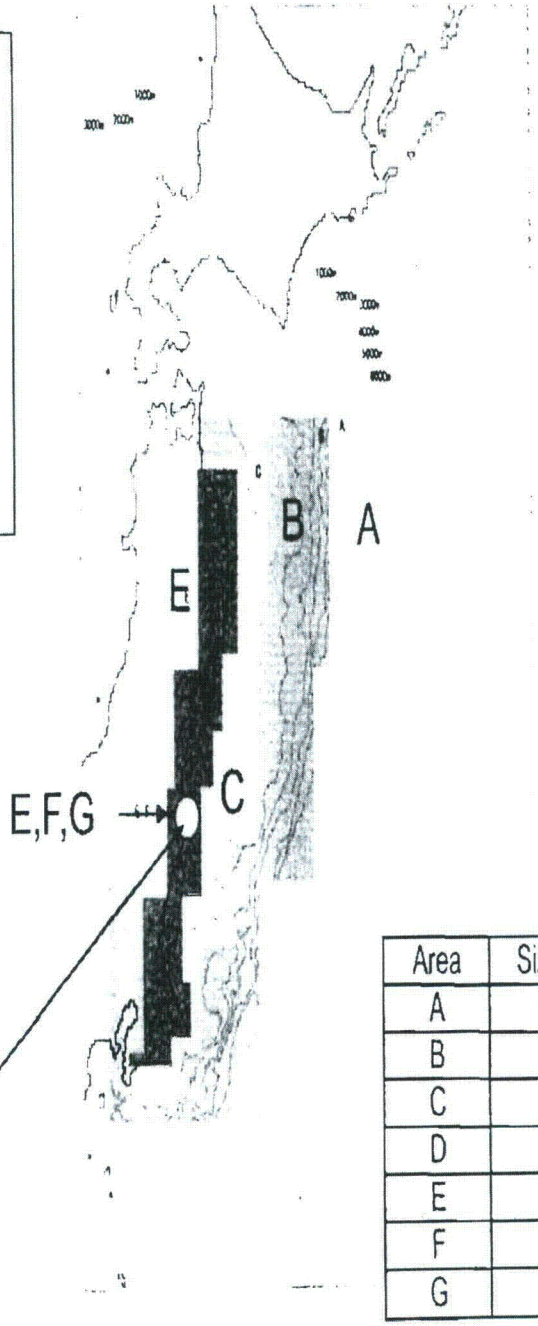
No.1	'82/4/20	BWR-5	1,100
No.2	'84/2/3	BWR-5	1,100
No.3	'85/6/21	BWR-5	1,100
No.4	'87/8/25	BWR-5	1,100

東京電力 TEPCO

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Numerical Model for the near field

- ✓ Non-linear long wave theory (shallow water)
- ✓ Staggered mesh
- ✓ Leap frog method

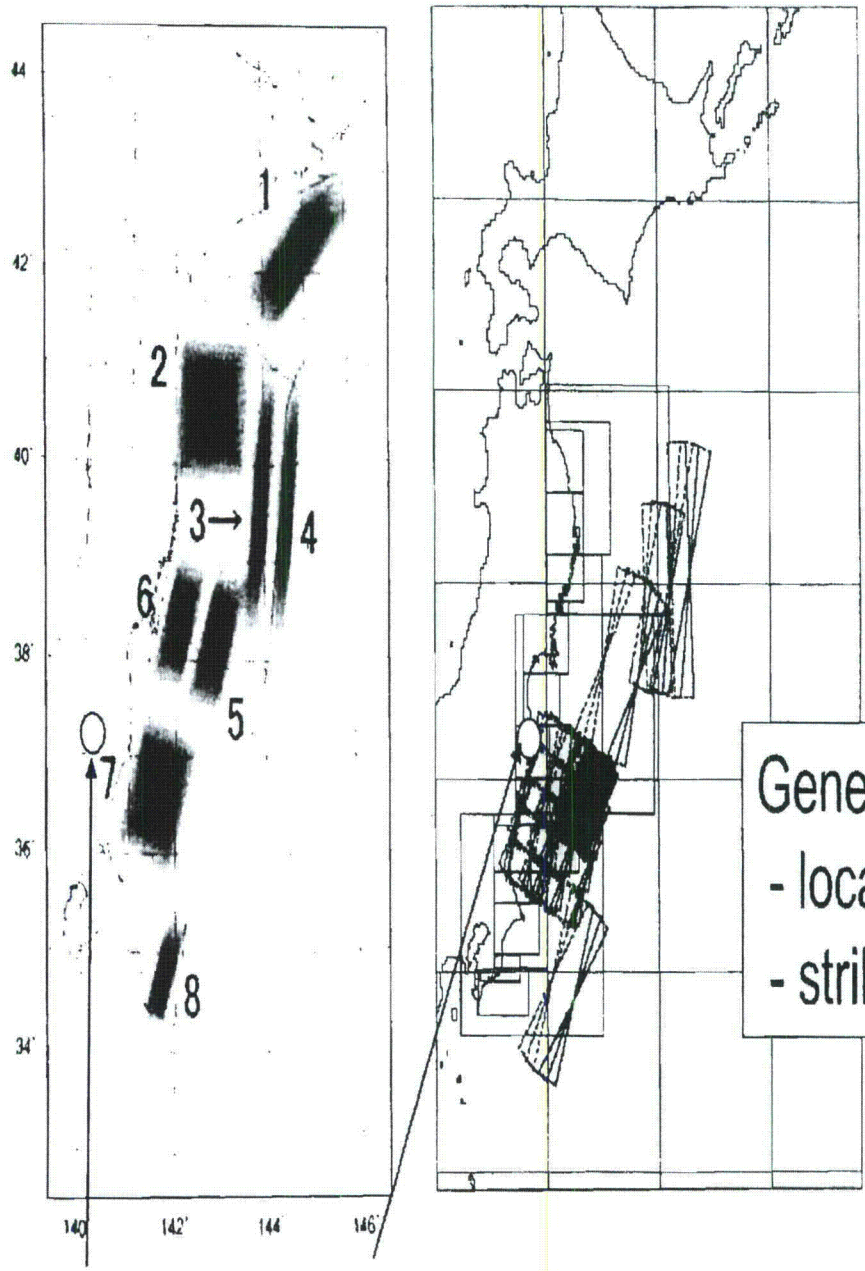


Area	Size of Grid
A	4320m
B	2160m
C	720m
D	240m
E	80m
F	40m
G	20m

東京電力

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General parametric study in the near field



General parametric study
- location
- strike

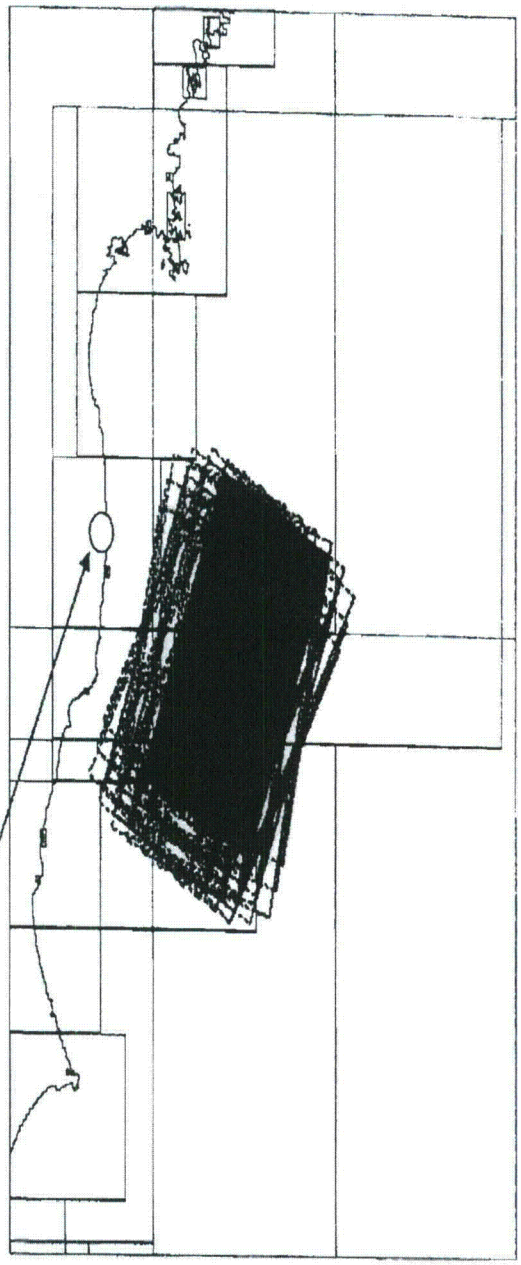
Fukushima Daiichi NPS

東京電力 TEPCO

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Detailed parametric study in the near field

Detailed parametric study
- location
- strike
- depth
- dip angle
- slip angle



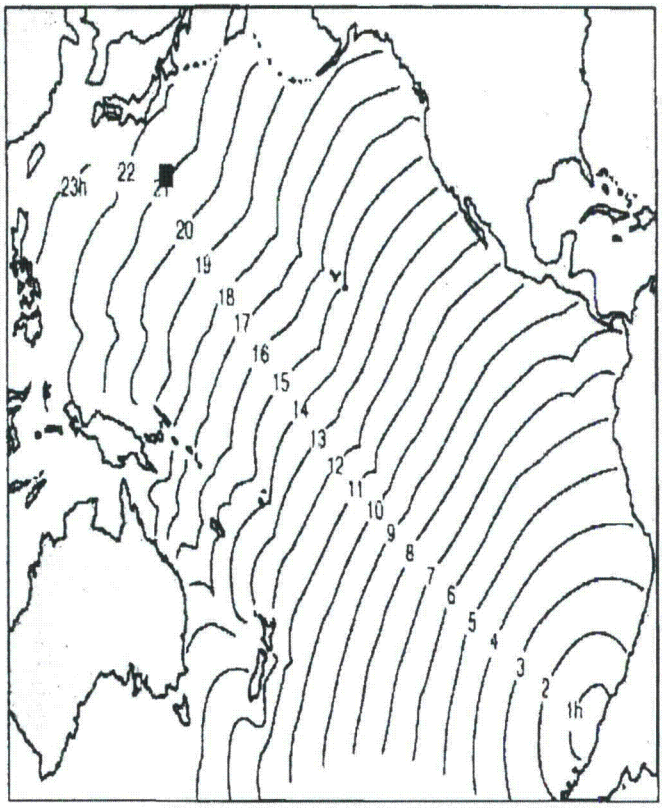
Fukushima Daiichi NPS

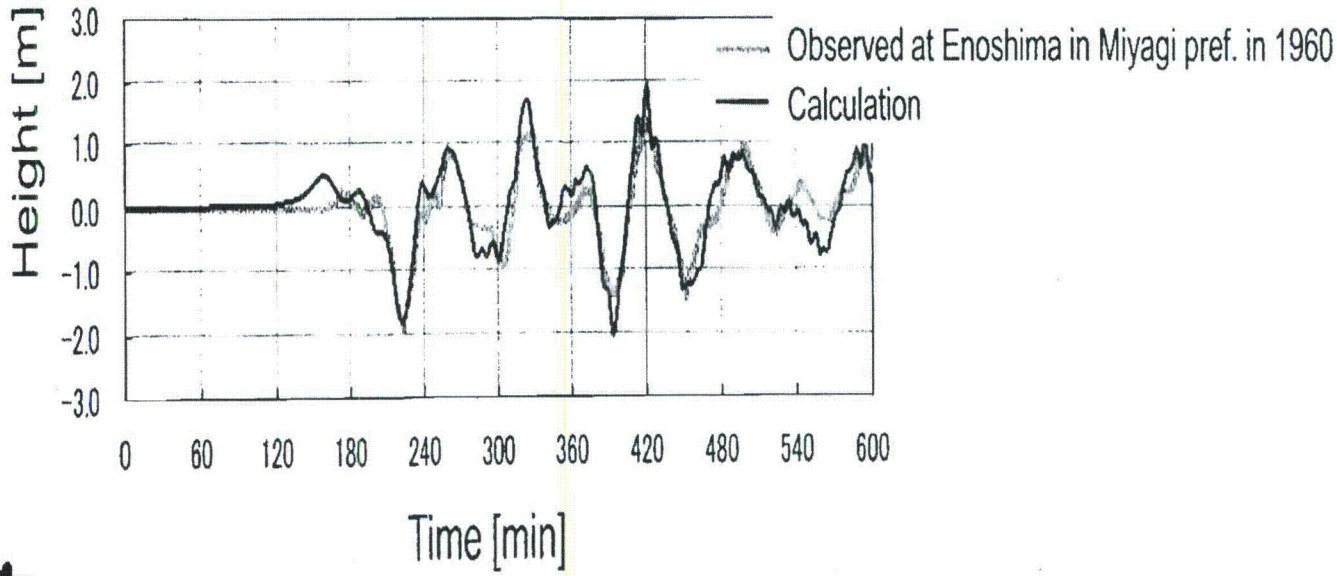
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Tsunami from far field

- ✓ Linear dispersive theory for far field (spherical-coordinate system)
- ✓ Non-linear long wave theory for near field (Cartesian coordinate system)
- ✓ Staggered mesh
- ✓ Leap frog method

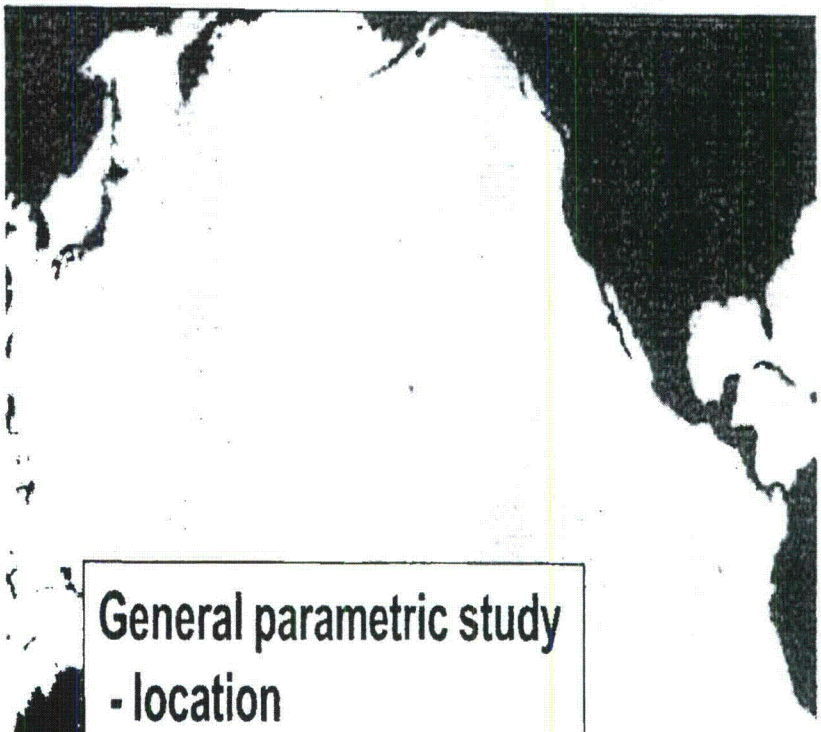




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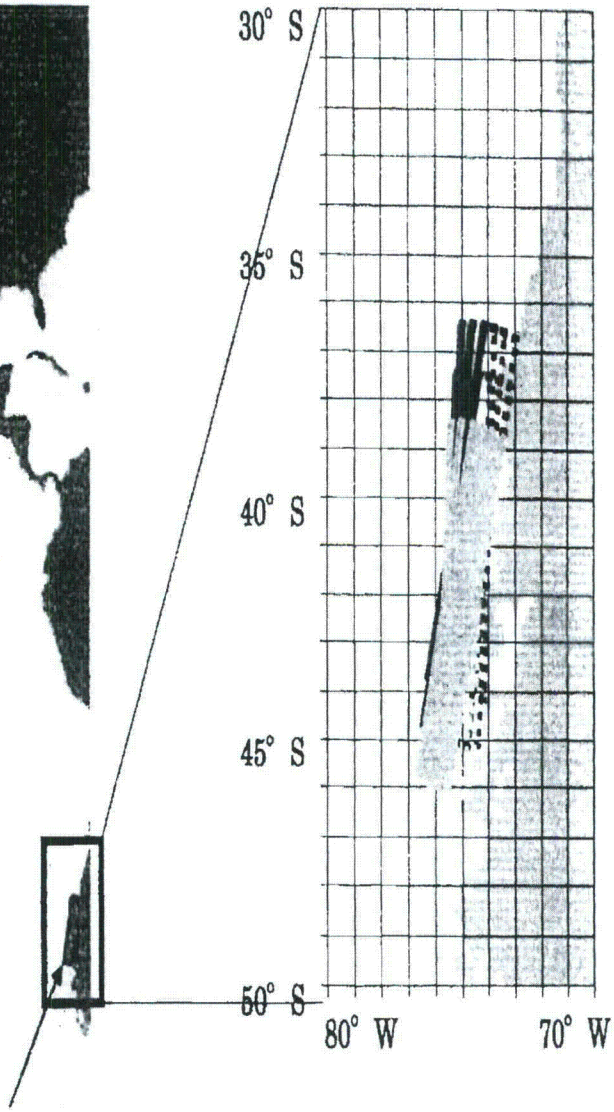
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Parametric study in the far field



General parametric study
- location
- strike

Detailed parametric study
- depth
- dip angle
- slip angle



Standard fault model
1960 Chilean earthquake

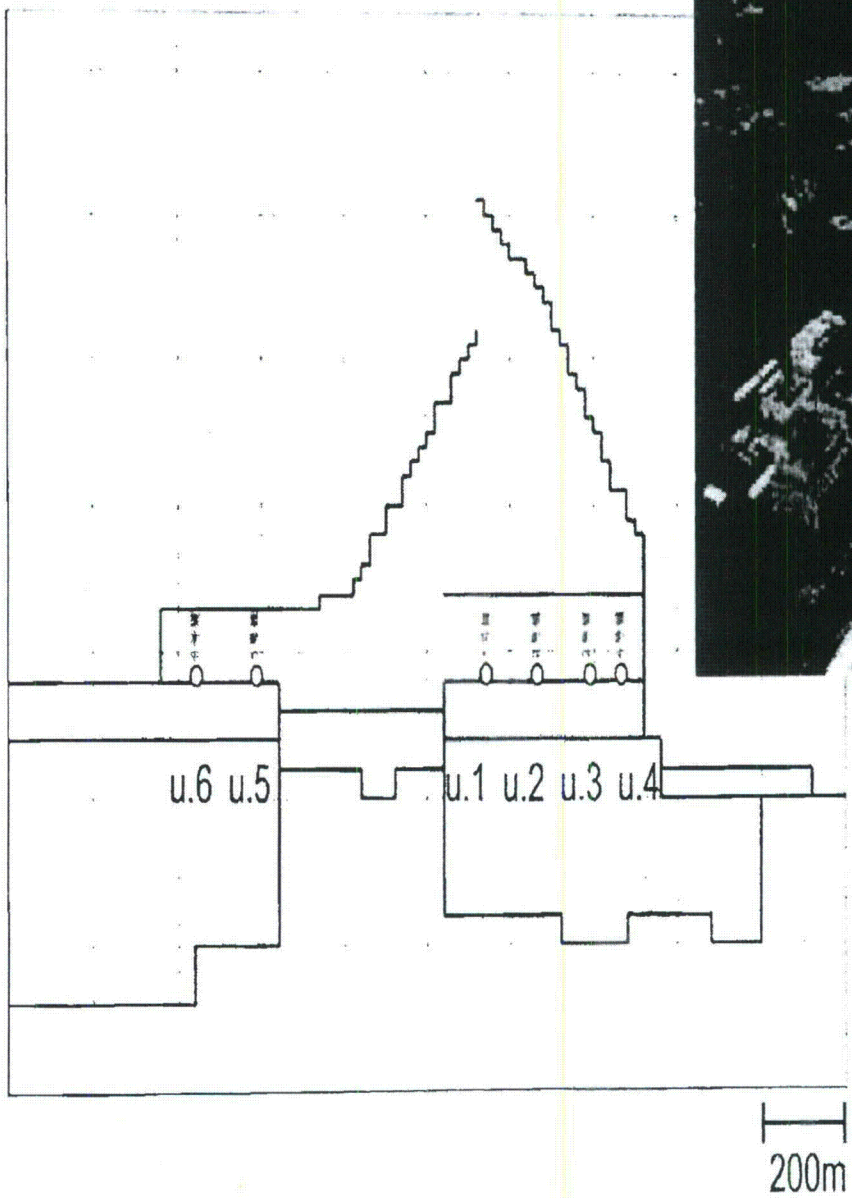
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Location of assessment points

Fukushima Daiichi NPS



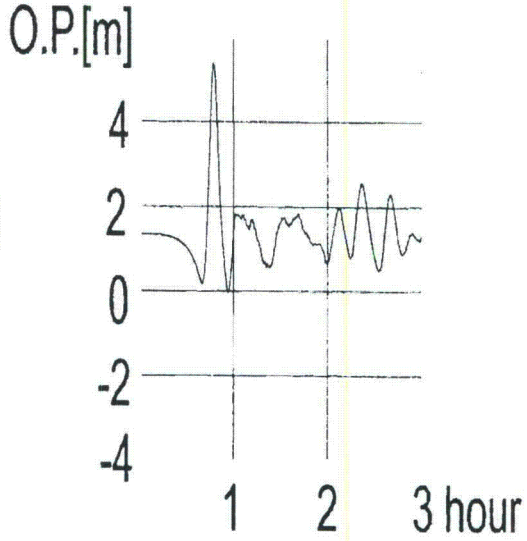


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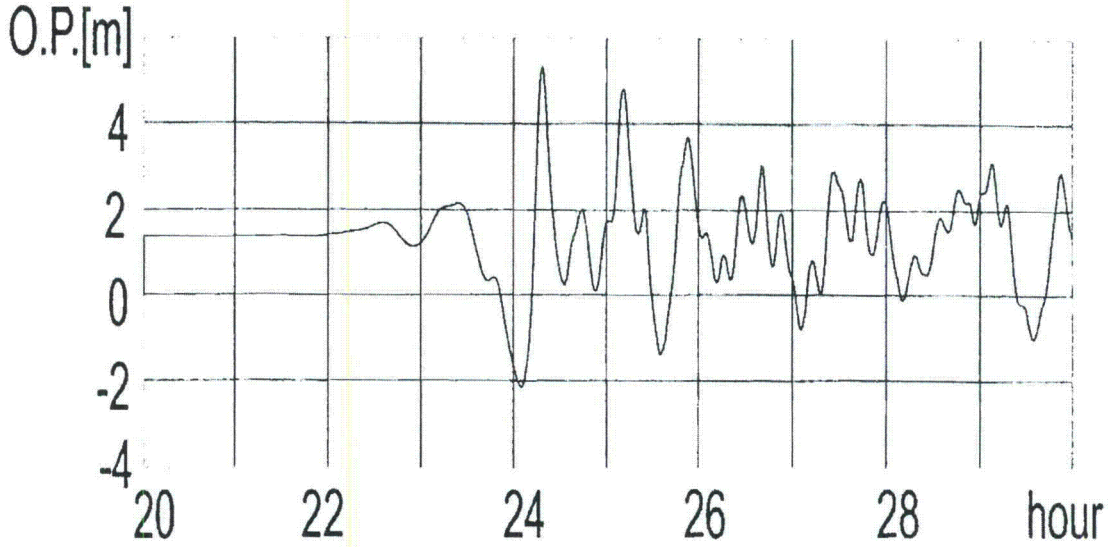
Time History of the design tsunamis

Near Field Tsunami



elapsed time since earthquake occurred

Far Field Tsunami - Chili -



elapsed time since earthquake occurred

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Consideration of tide and safety evaluation

The Design Tsunami

⇩ ⇦ Tidal Conditions

Design High Water Level

= Maximum water rise + Mean of high tides

Design Low Water Level

= Maximum water fall + Mean of low tides

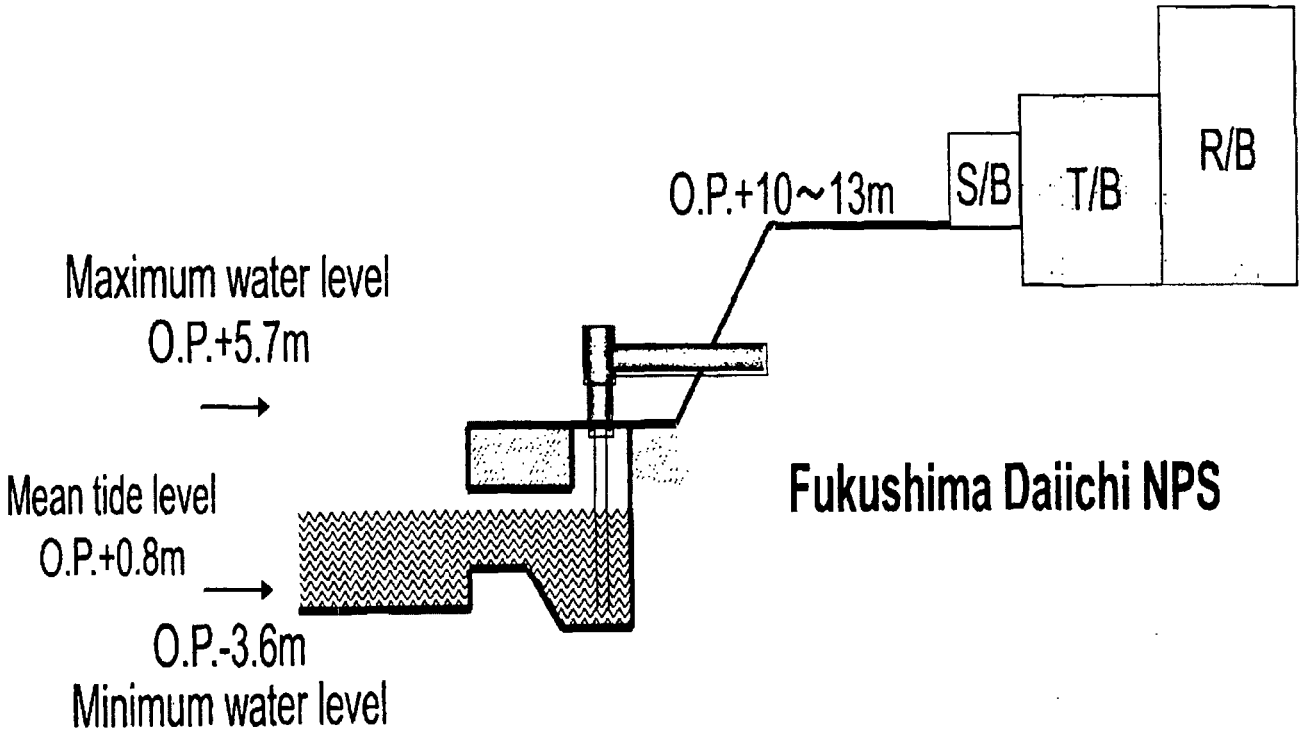
⇩

Evaluation of the safety of NPP

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Summary of Evaluation

Maximum water level = 4.4m + O.P.+1.3m = O.P.+5.7m
Minimum water level = -3.6m – O.P.±0.0m = O.P.-3.6m



We assessed and confirmed the safety of the nuclear plants based on the JSCE method which was published in 2002.

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Agenda

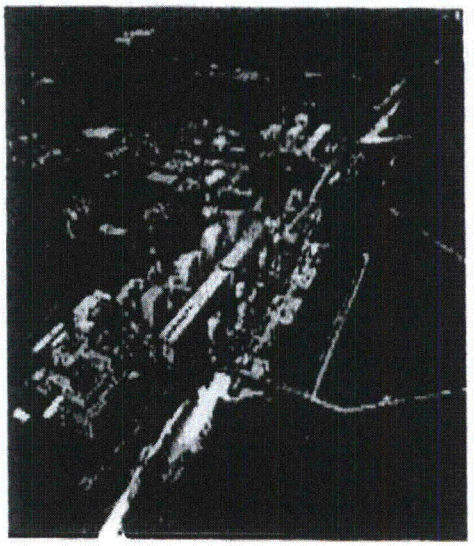
2. Operational status of NPP after the Feb. 28, 2010 tsunami from Chile.

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Operational status of NPP on Feb.28

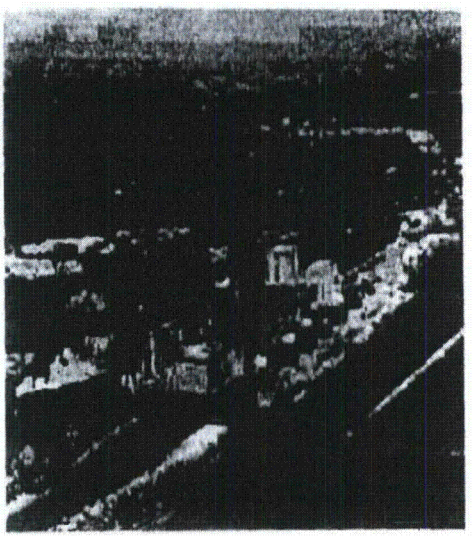
Fukushima Daiichi NPS

unit 1	in operation	459 MWe
unit 2	in operation	786 MWe
unit 3	in operation	789 MWe
unit 4	in operation	789 MWe
unit 5	in operation	823 MWe
unit 6	in operation	1,152 MWe



Fukushima Daini NPS

unit 1	in operation	1,113 MWe
unit 2	in operation	1,116 MWe
unit 3	regular maintenance	
unit 4	in operation	1,117 MWe



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Feb. 28th NPS Correspondence (1/2)

A manual containing emergency and restoration protocol in the event of a major disaster has been created.

In the event that the Japan Meteorological Agency (JMA) issues a "Tsunami Warning" for the coastline near the NPS, the following measures are to be executed:

1. The Central Control Room Operators are to maintain vigilance in monitoring plant operations.
2. The Site Superintendent is to contact employees who are on standby in a separate office room or at home.
3. If necessary, an emergency headquarter is to be set up.

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Feb. 28th NPS Correspondence (2/2)

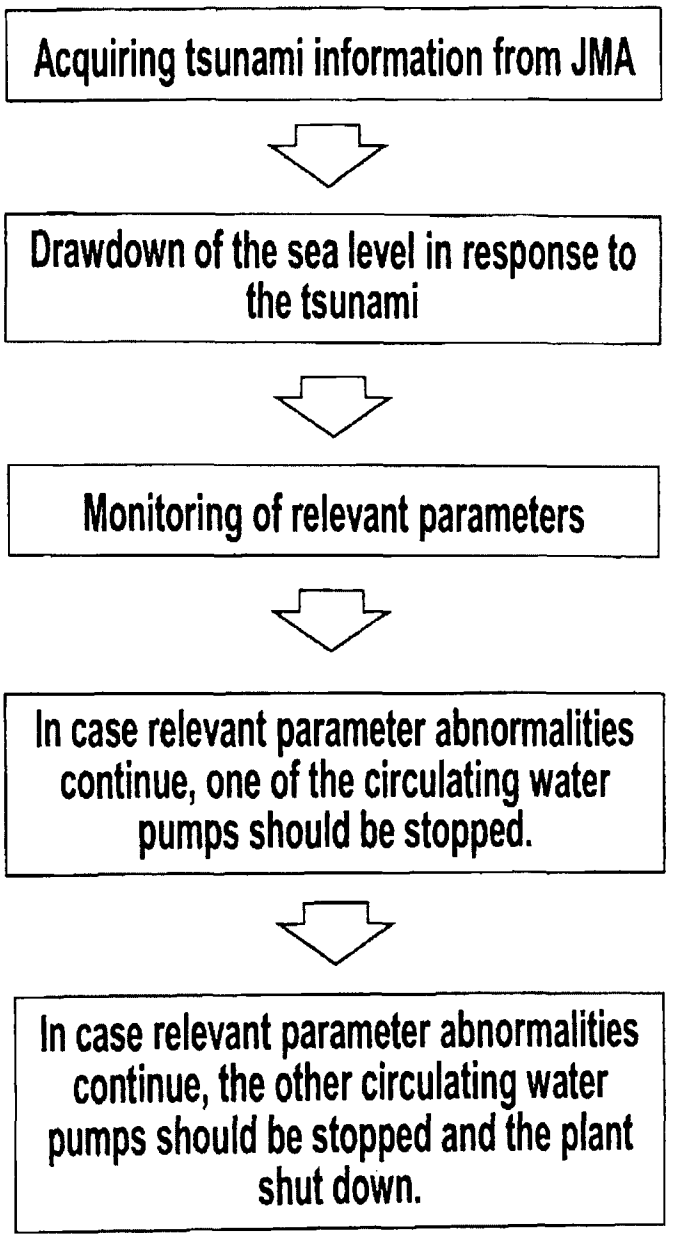
Both Fukushima Daiichi NPS and Fukushima Daini NPS executed the below measures in response to a "Tsunami warning" issued by JMA on Feb.28.

- ✓Discontinued the work and inspection of the area facing the ocean.
- ✓Measured the sea level utilizing a tide gauge and via several installed TV cameras monitored the ocean conditions .
- ✓Contacted employees to ready them for the execution of emergency disaster measures.

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Correspondence based on Sea Level Measurements

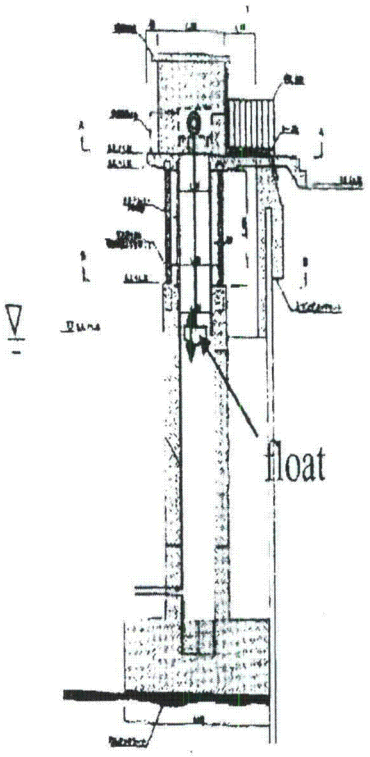
- ✓ Utilizing the JSCE method, we assessed the ability of the NPP to withstand potential tsunamis.
- ✓ Based on the assessment results, the level of the seawater pumps was improved.
- ✓ "Accident Operating Procedure (AOP)" for tsunamis was established.

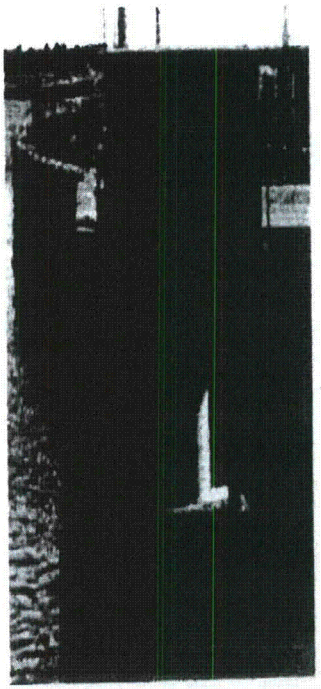


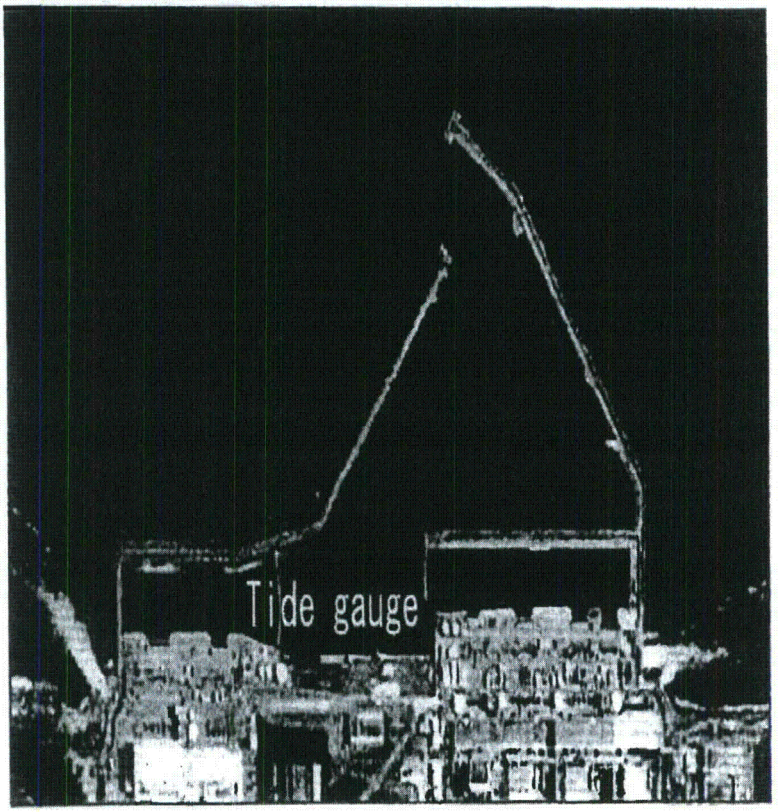
Flowchart on the basis of AOP

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Tide gauge at Fukushima Daiichi NPS





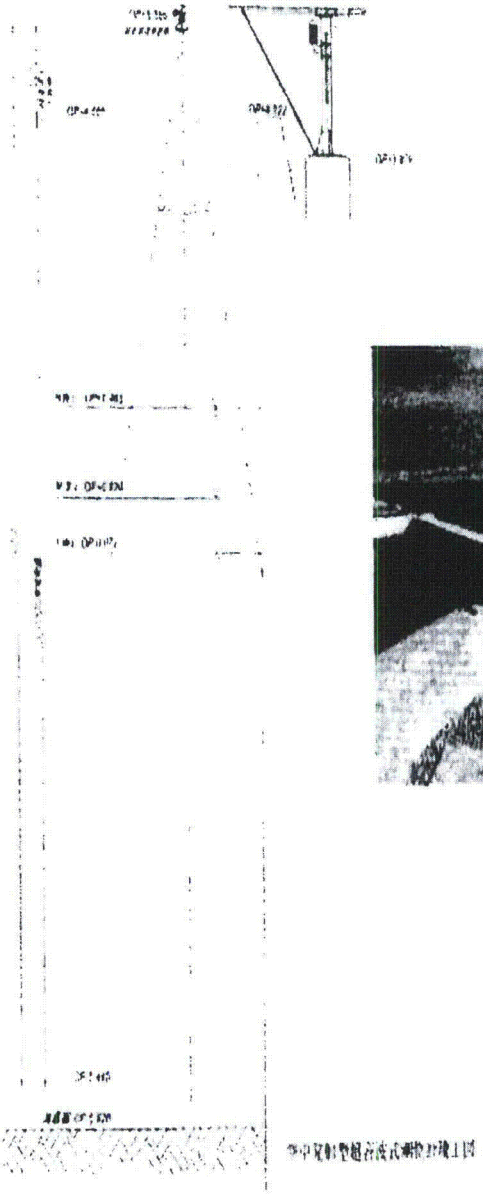


A float-type tide gauge is set up inside the harbor of the NPP.

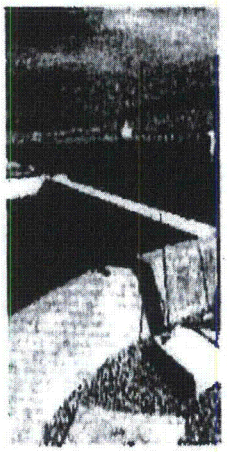
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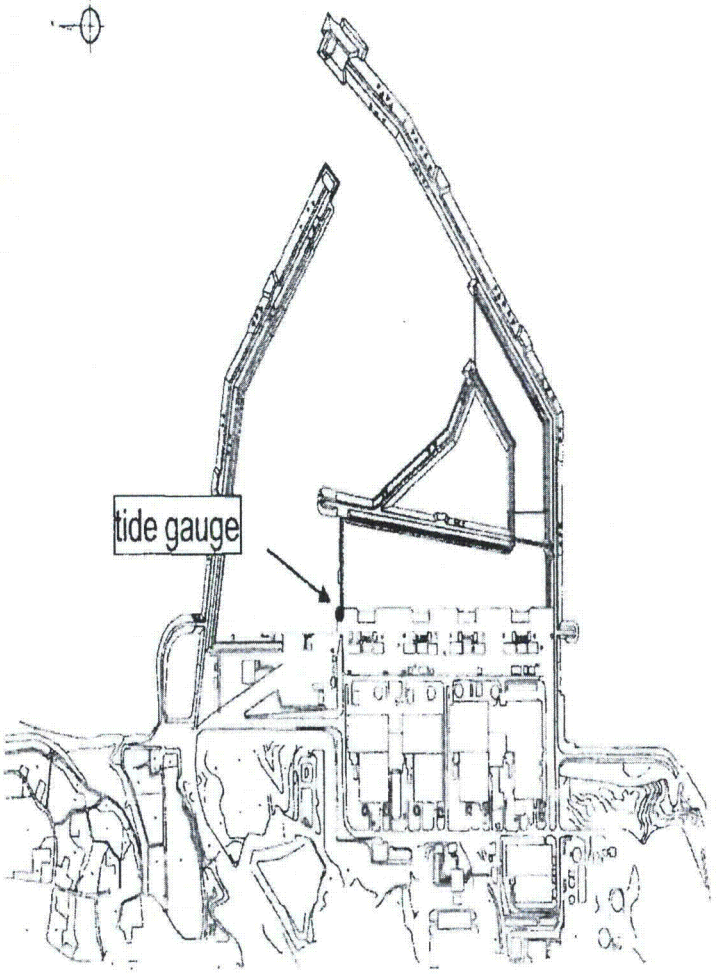
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Wave gauge at Fukushima Daini NPS



An ultrasonic-type tide gauge is installed inside the harbor of the NPP.



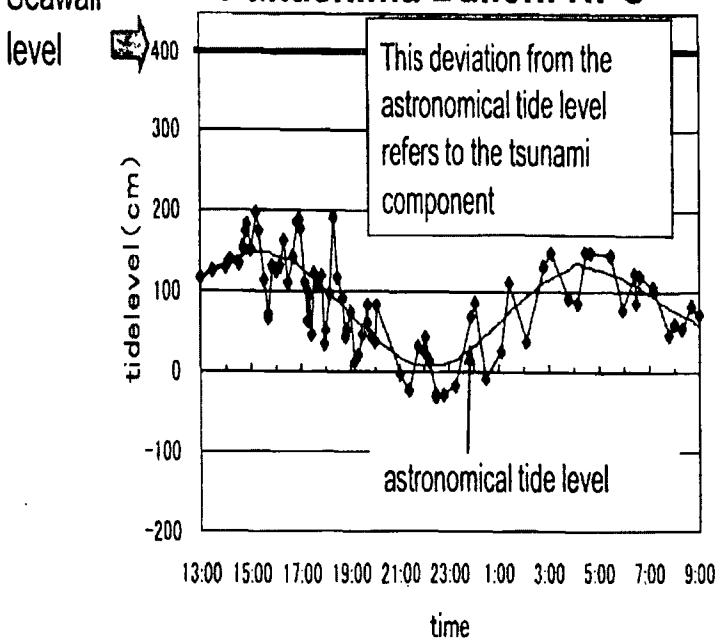


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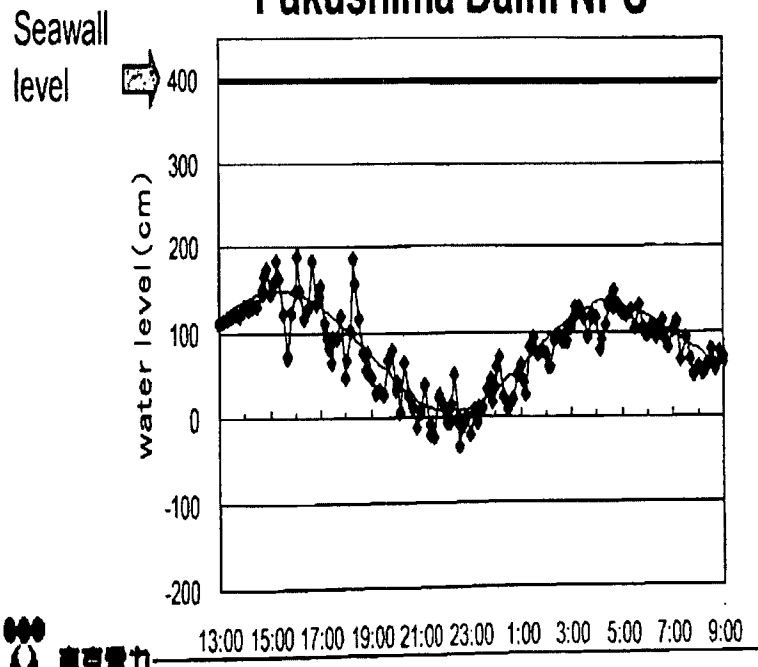
Observational result of Chile tsunami on Feb.28

Fukushima Daiichi NPS



- ✓ Deviation from the astronomical tide was observed.
- ✓ The highest sea level did not reach the seawall level.
- ✓ The lowest sea level did not fall below the intake water level of the circulating pumps.
- ✓ Normal operations were not impacted.

Fukushima Daini NPS



	Tsunami component	
	rising	drawdown
Fukushima Daiichi	+ 0.6m	- 0.8m
Fukushima Daini	+ 1.0m	- 0.8m

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Summary

- ✓ We assessed and confirmed the safety of the nuclear power plants based on the JSCE method which was published in 2002.
- ✓ On Feb. 28, in response to the "Tsunami warning" issued by the Japan Meteorological Agency, appropriate measures in accordance with "Accident Operating Procedures (AOP) " were executed.
- ✓ Daily operations were NOT impacted.

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Thank you very much for your kind attention.



ANDOU Hiroshige

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Pure appl. geophys. 164 (2007) 565–576
0033–4553/07/030565–12
DOI 10.1007/s00024-006-0176-1

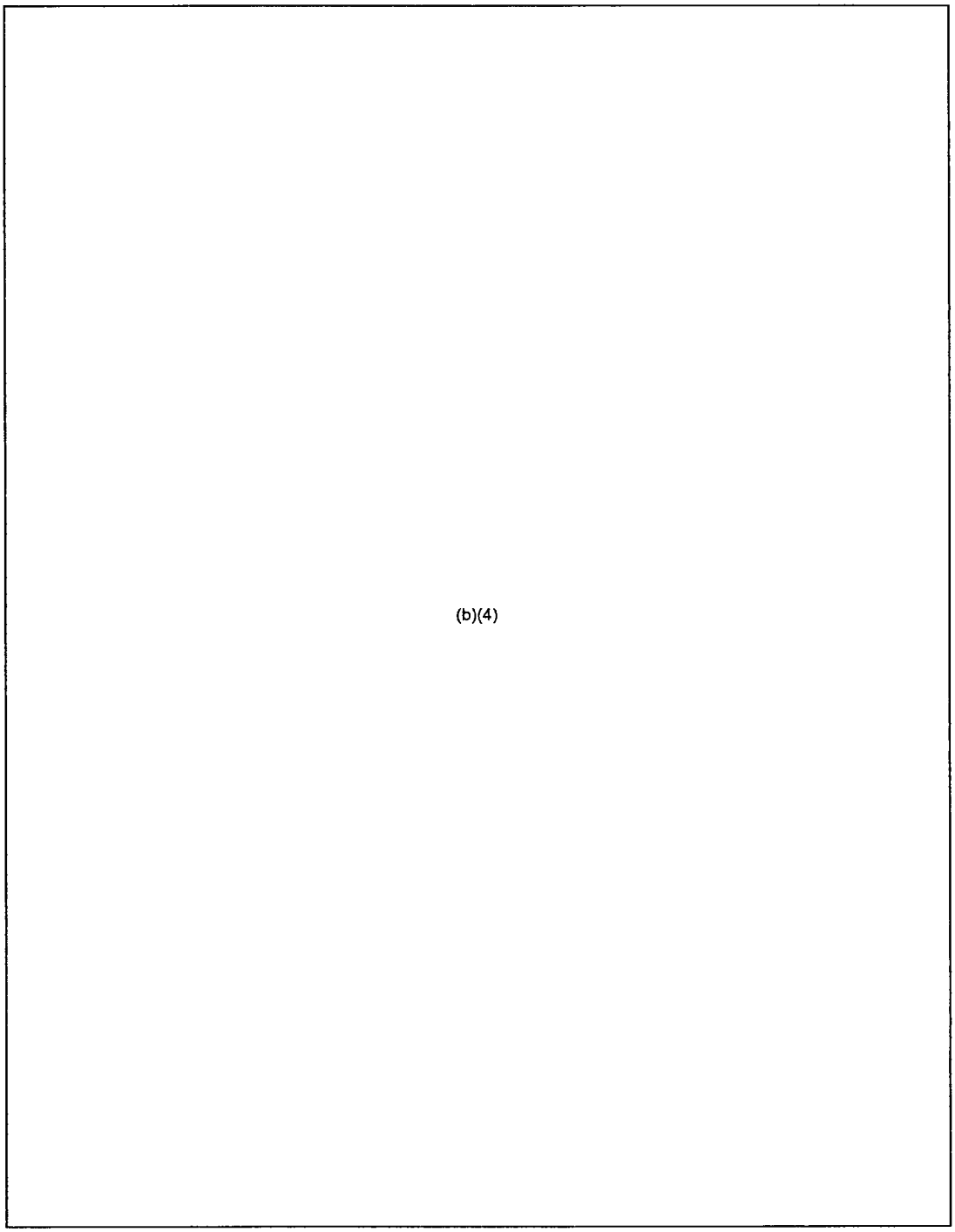
© Birkhäuser Verlag, Basel, 2007

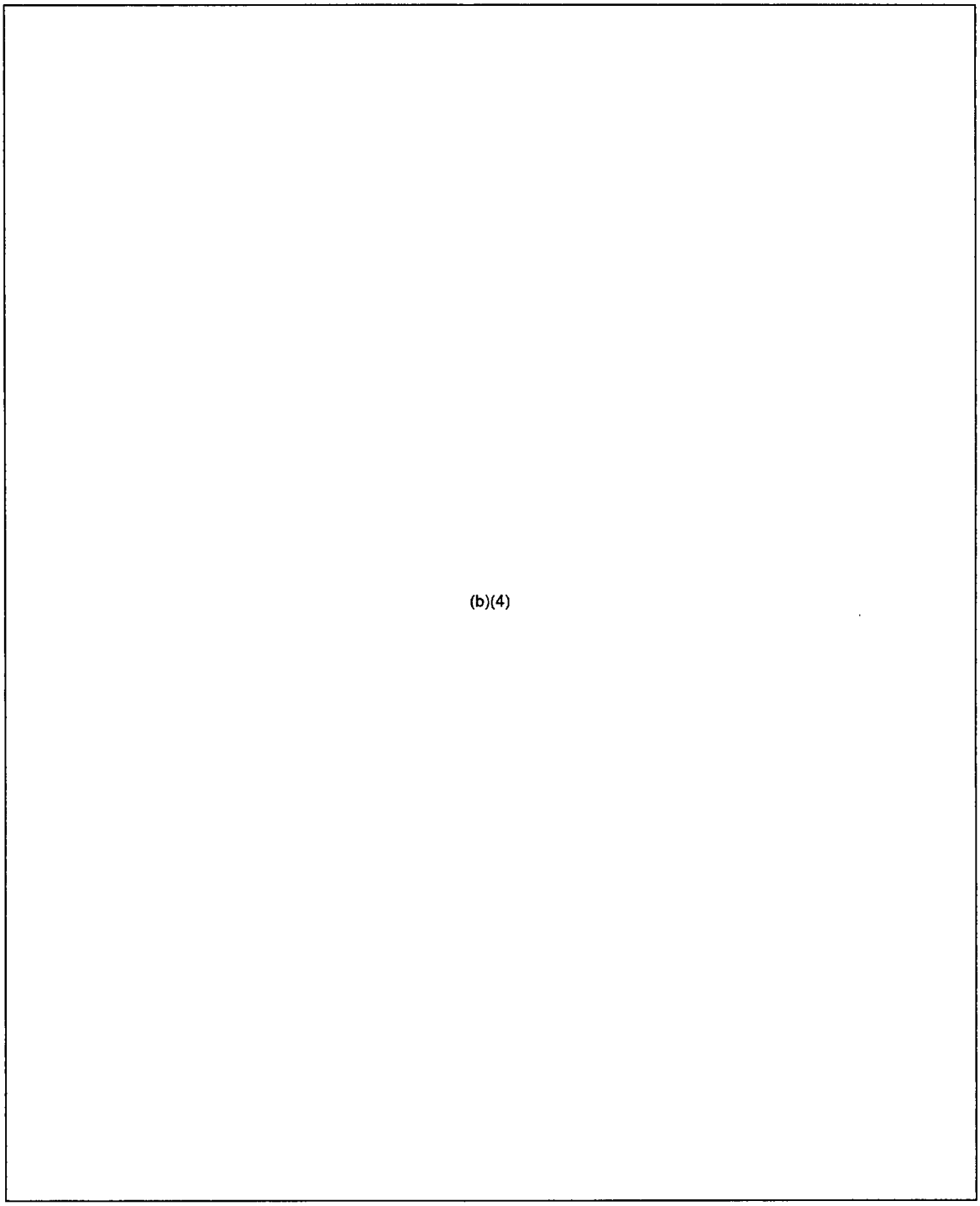
Pure and Applied Geophysics

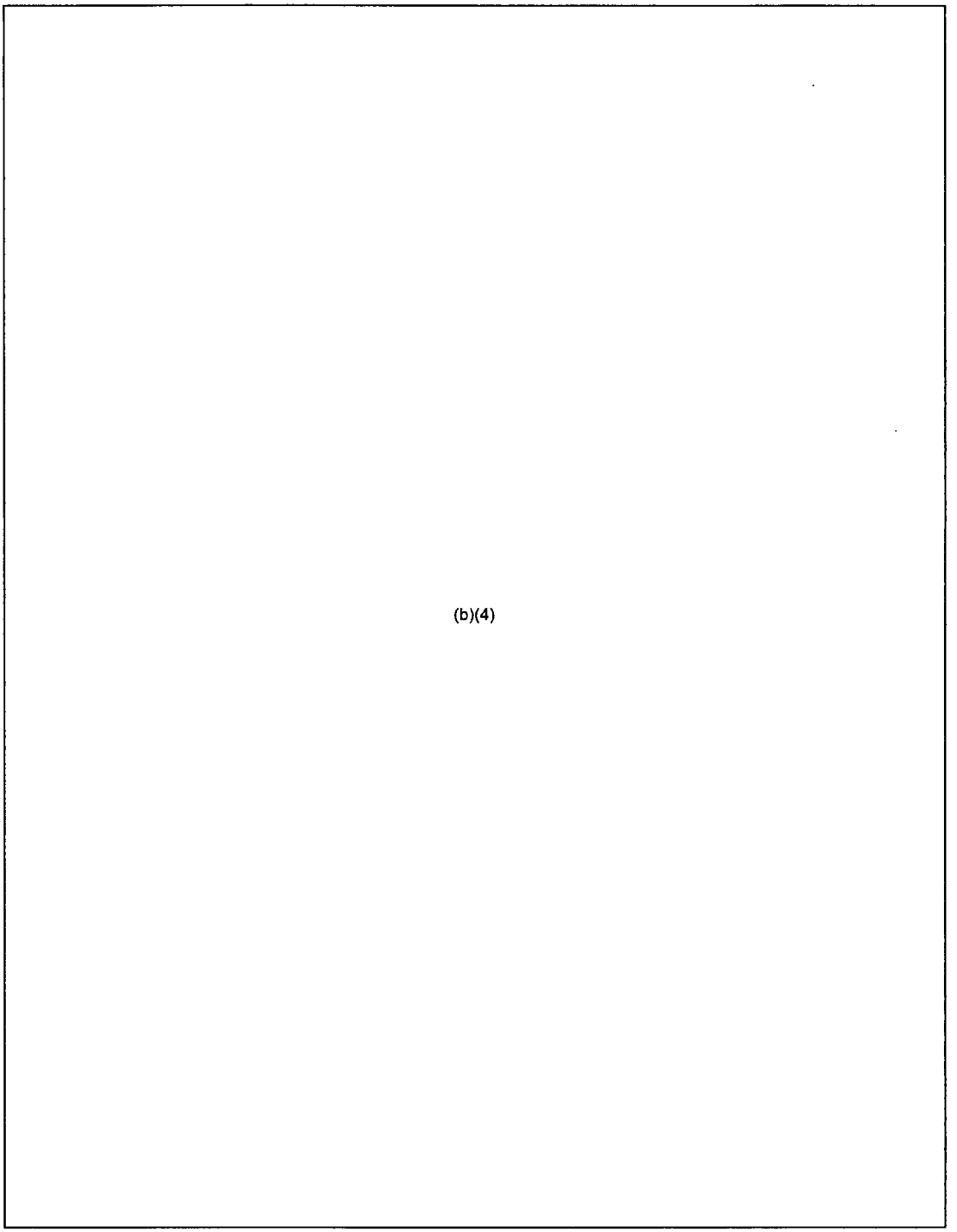
Tsunami Assessment for Risk Management at Nuclear Power Facilities in Japan

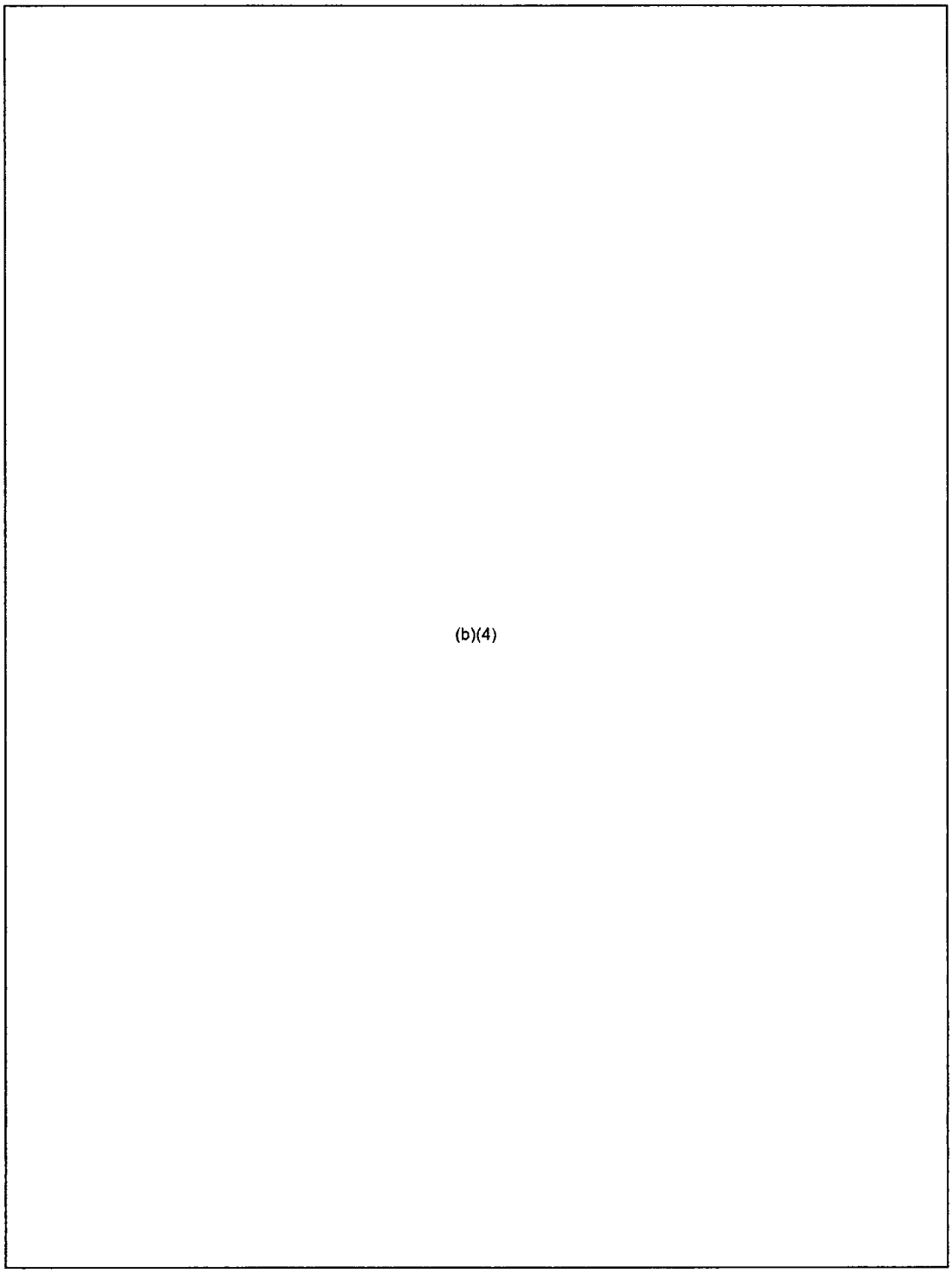
KEN YANAGISAWA,[1] FUMIHIKO IMAMURA,[2] TSUTOMU SAKAKIYAMA,[3] TADASHI ANNAKA,[4] TOMOYOSHI TAKEDA,[1] and NOBUO SHUTO[5]

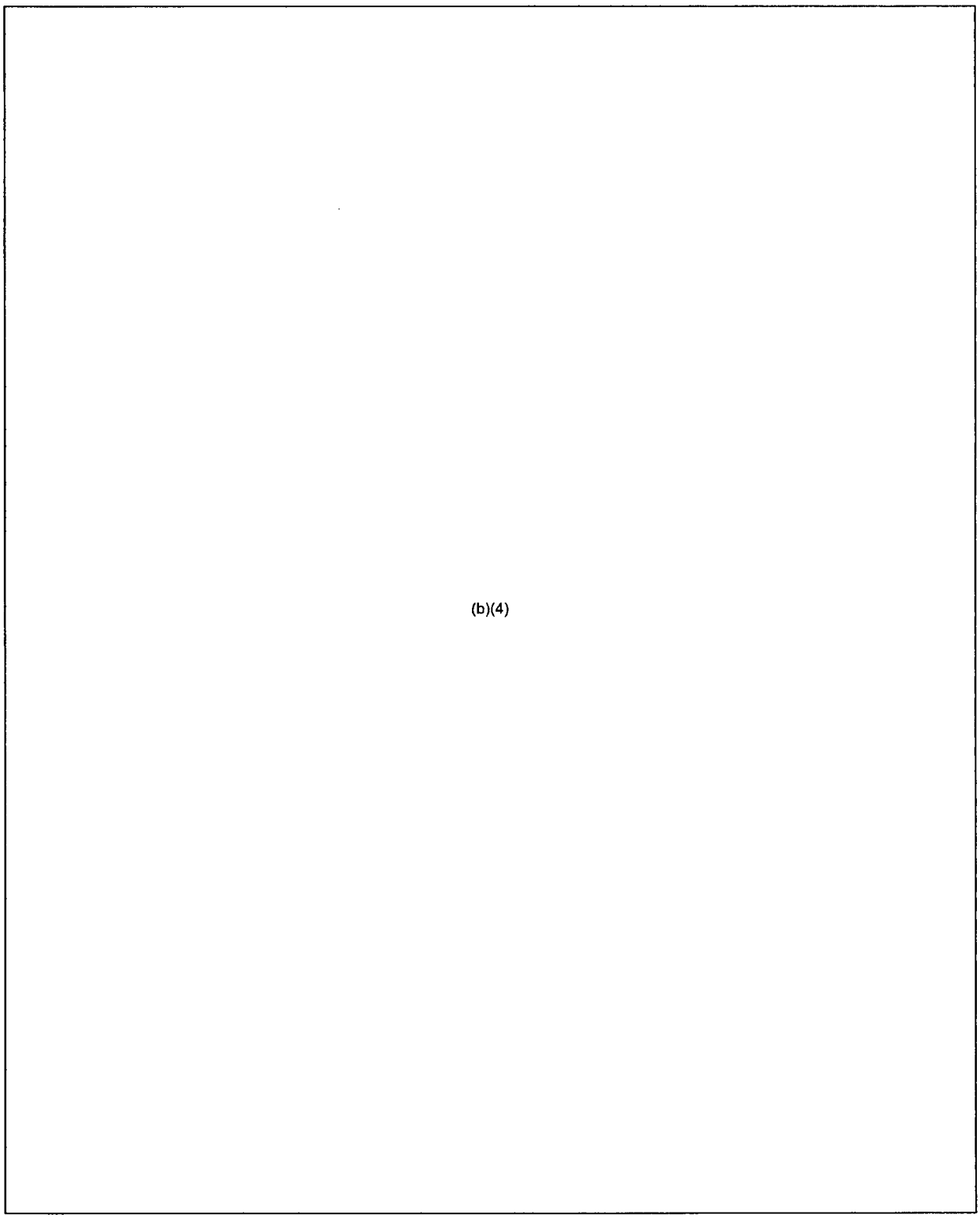
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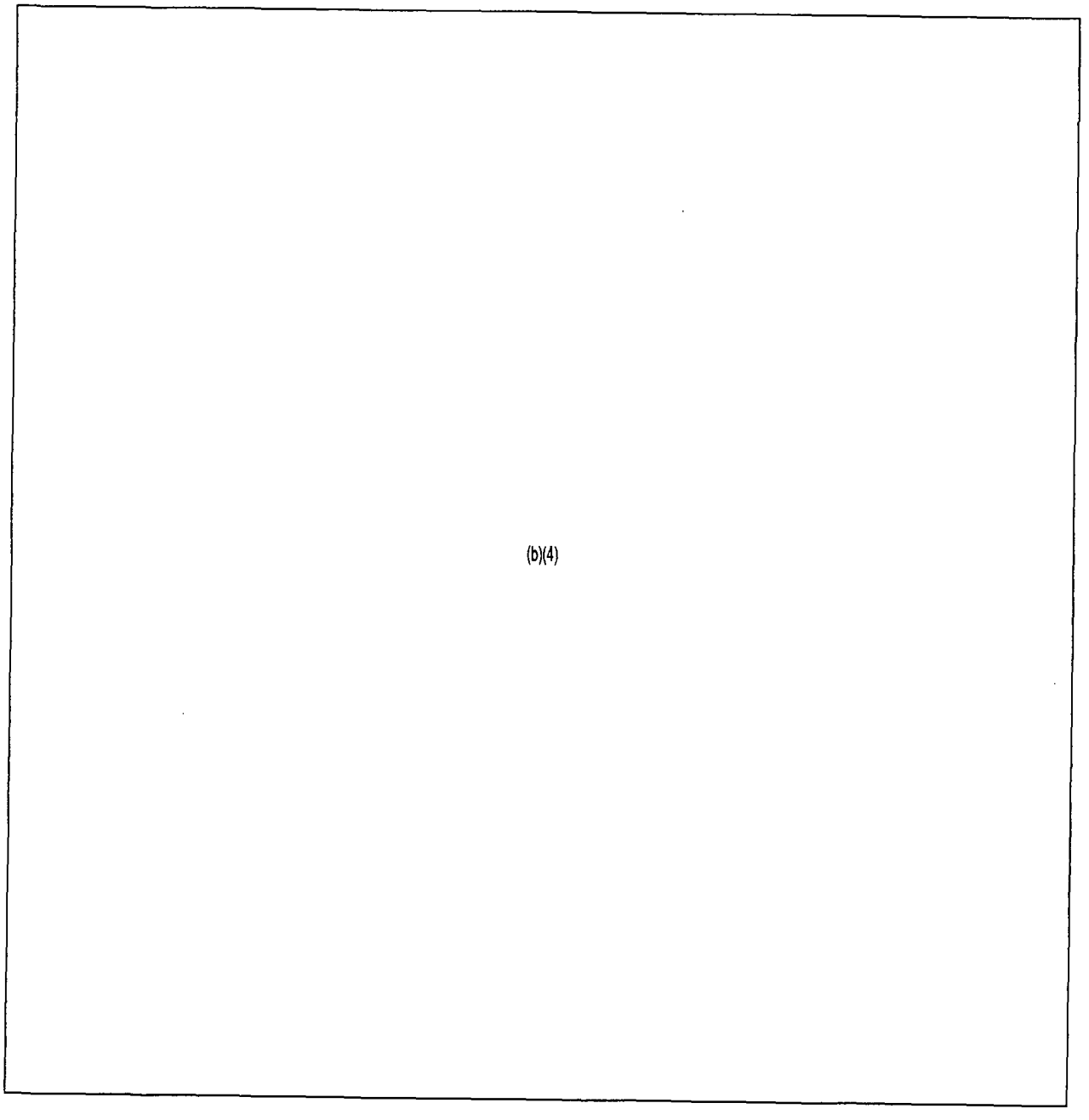

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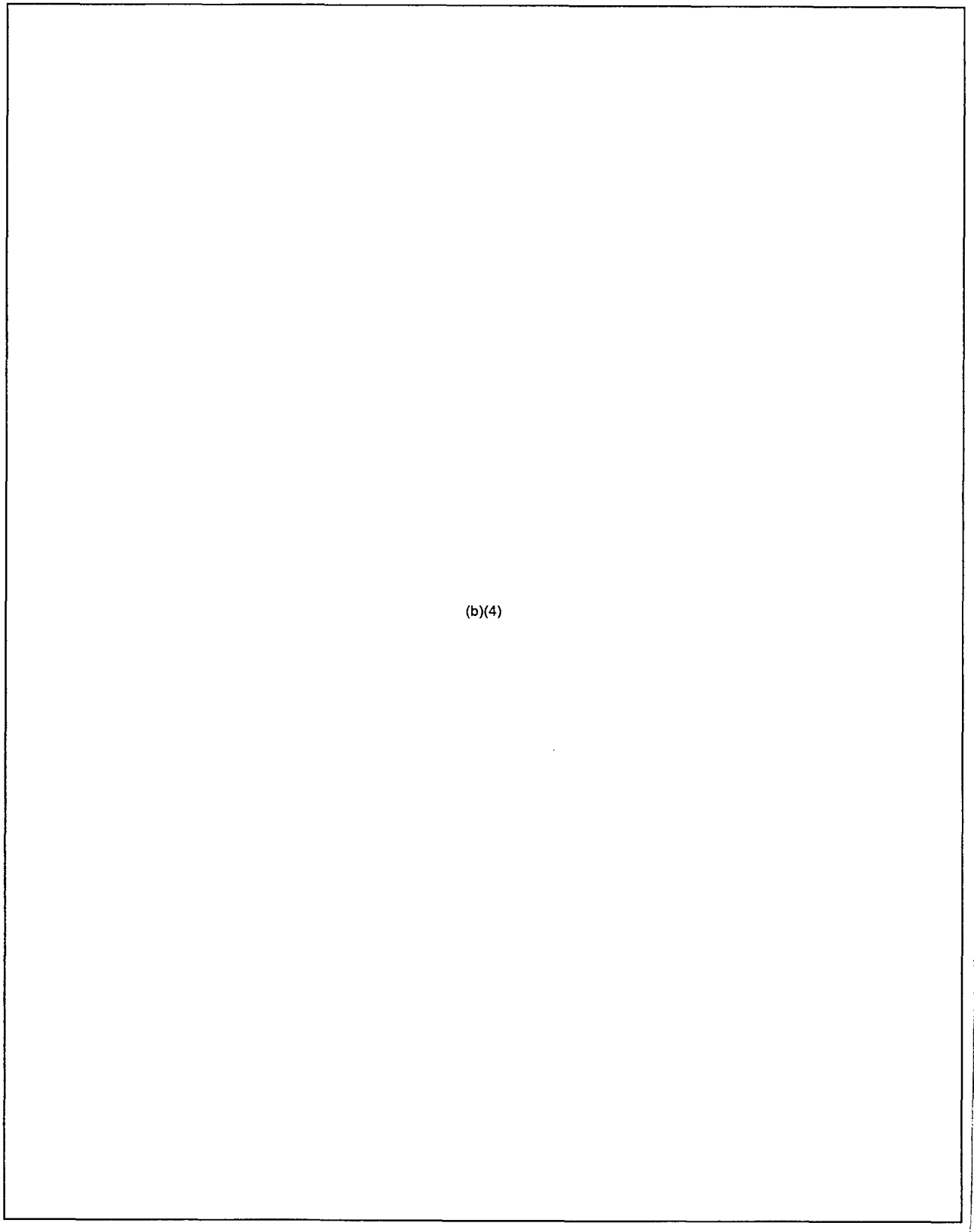

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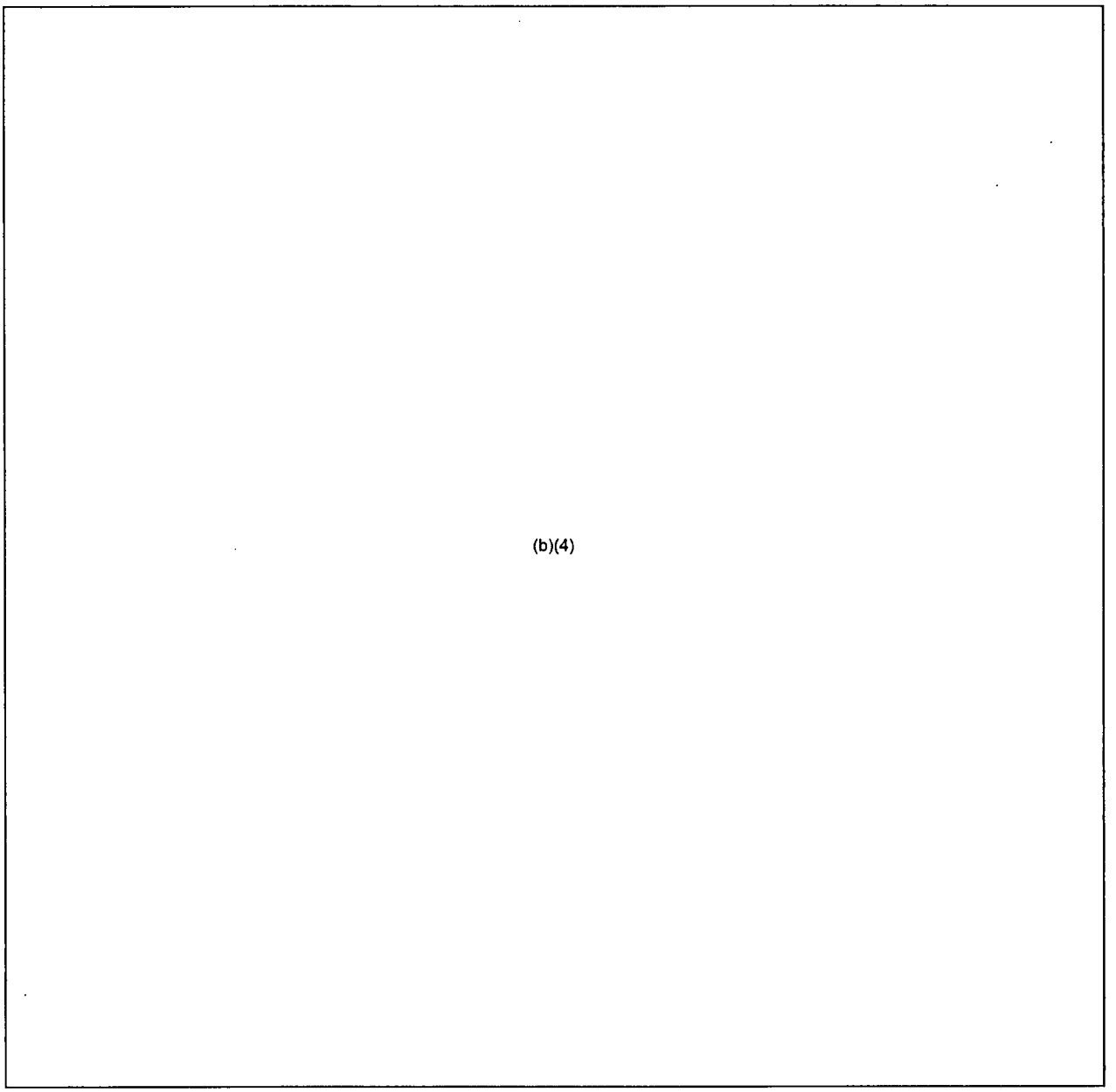
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Davis, Roger

From: Gilles, Nanette
Sent: Tuesday, July 19, 2011 10:24 PM
To: Sosa, Belkys; Apostolakis, George; Davis, Roger
Subject: Re: TF recommendations and timetable to respond

OK

Sent from my NRC Blackberry

From: Sosa, Belkys
To: Apostolakis, George; Gilles, Nanette; Davis, Roger
Sent: Tue Jul 19 21:40:15 2011
Subject: Re: TF recommendations and timetable to respond

Ok

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Apostolakis, George
To: Sosa, Belkys; Gilles, Nanette; Davis, Roger
Sent: Tue Jul 19 21:39:00 2011
Subject: Re: TF recommendations and timetable to respond

8:30 am?

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Sosa, Belkys
To: Gilles, Nanette; Apostolakis, George; Davis, Roger
Sent: Tue Jul 19 20:50:21 2011
Subject: Re: TF recommendations and timetable to respond

Yes

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Gilles, Nanette
To: Apostolakis, George; Sosa, Belkys; Davis, Roger
Sent: Tue Jul 19 20:48:10 2011
Subject: RE: TF recommendations and timetable to respond

OK.

From: Apostolakis, George
Sent: Tuesday, July 19, 2011 8:46 PM
To: Gilles, Nanette; Sosa, Belkys; Davis, Roger
Subject: Re: TF recommendations and timetable to respond

Shall we do it tomorrow morning before the TF meeting?

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Gilles, Nanette
To: Sosa, Belkys; Apostolakis, George; Davis, Roger
Sent: Tue Jul 19 20:33:53 2011
Subject: RE: TF recommendations and timetable to respond

I agree with Belkys' suggestion about explaining the U.S. design requirements. You could follow this up with a statement that this is further evidence to support the task force's conclusion that an event similar to the Fukushima event is highly unlikely in the U.S.

From: Sosa, Belkys
Sent: Tuesday, July 19, 2011 7:50 PM
To: Apostolakis, George; Davis, Roger; Gilles, Nanette
Subject: Re: TF recommendations and timetable to respond

Recommend explaining the US design requirement for external events such as earthquake and flooding accounts for the worst event ever historically recorded for the site. Clearly the design limits for Diachi didn't account for Tsunamis as recent as 10yrs earlier than the plant was built...or something to that effect...

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Apostolakis, George
To: Sosa, Belkys; Davis, Roger; Gilles, Nanette
Sent: Tue Jul 19 19:16:55 2011
Subject: Fw: TF recommendations and timetable to respond

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

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From: Boffey, Philip <phboff@nytimes.com>
To: Apostolakis, George
Sent: Tue Jul 19 18:22:02 2011
Subject: RE: TF recommendations and timetable to respond

I'm not sure what you are driving at with your point that the tsunami was not "unthinkable." What does it mean in the U.S. context? That we should take a harder look at things we thought improbable?

You may recall that I interviewed you on background in Rockville three months ago. These questions, too, can be answered on background.

I need to write an editorial -- possibly on Wednesday or possibly later in the week -- focusing on the Task Force's 90-day report and what if anything the Commission should do in response to it.

Could you give me some quick impressions as to whether you think the task force recommendations should be approved more or less as they are now or require much more rigorous analysis before moving forward, as the industry contends.

Also, your thoughts on Chairman Yaczko's proposed 90-day period for the commission to vote on the task force recommendations. Is that feasible, or not?

I realize that more information needs to be gathered about the Fukushima incident and from stakeholders at further meetings but I assume you have heard enough by now to have at least preliminary thoughts on what the commission should do in response to the TF report, and on what timetable..

Thanks for any help you can give,

Philip M. Boffey
Editorial Writer
The New York Times
620 Eighth Avenue
New York, N.Y. 10018
Phone: (212) 556-4485
Fax: 212-556-3815
Email: phboff@nytimes.com

Gilles, Nanette

From: Sosa, Belkys
Sent: Tuesday, July 19, 2011 5:09 PM
To: Apostolakis, George; Davis, Roger; Gilles, Nanette; Baggett, Steven
Subject: FYI: NGO letter regarding Task Force's recommendations
Attachments: 20110719-ngo-group-letter-to-nrc.pdf

From: CMRAPOSTOLAKIS Resource
Sent: Tuesday, July 19, 2011 8:31 AM
To: Blake, Kathleen
Subject: FW: NGO letter regarding Task Force's recommendations

From: Dave Lochbaum [mailto:DLochbaum@ucsusa.org]
Sent: Tuesday, July 19, 2011 8:17 AM
To: CHAIRMAN Resource; CMRSVINICKI Resource; CMRAPOSTOLAKIS Resource; CMRMAGWOOD Resource; CMROSTENDORFF Resource
Subject: NGO letter regarding Task Force's recommendations

Good Morning:

On behalf of 15 national, regional, and local public interest groups, I am submitting the attached electronic copy of a letter regarding the Task Force's recommendations. Hard copies of this letter will be in the mail today.

Thanks,

David Lochbaum
Director, Nuclear Safety Project
Union of Concerned Scientists
PO Box 15316
Chattanooga, TN 37415
(423) 468-9272 office
(b)(6) cell
dlochbaum@ucsusa.org

July 19, 2011

Gregory B. Jaczko, Chair
Kristine L. Svinicki, Commissioner
William D. Magwood IV, Commissioner
George Apostolakis, Commissioner
William C. Ostendorff, Commissioner

Dear Commissioners:

We the undersigned respectfully urge you to provide the NRC staff with the resources and direction necessary to fully implement the recommendations from the July 12, 2011, report by the Near-Term Task Force titled "Enhancing Reactor Safety in the 21st Century" as expeditiously as possible. Based on its assessment of the accident at Fukushima Daiichi and its consequences, the Task Force made numerous recommendations to better protect the American public from low probability, high consequence events by reducing vulnerabilities at U.S. reactors and upgrading mitigation measures. While we have significant concerns about the scope of the review undertaken and the adequacy of some of its recommendations, the Task Force's report provides a starting point for improving nuclear safety in the U.S. and should be acted upon by the Commission. Now that these issues have been identified and their resolution outlined, Americans are unnecessarily at elevated risk until the NRC successfully implements these recommendations.

We recognize and appreciate that the scope and complexity of some recommendations means they will take some time to address, even if the full resources of the agency were applied to that effort. We understand that the recommendations made by the NRC's 90-day review cannot be implemented within 90 days. We request that you set a deadline for the adoption of each recommendation, and take appropriate steps to ensure that robust public participation is an intrinsic element of this process. We also suggest you consider how you might answer the following question from Congress when scheduling these deadlines:

> *Commissioner, wasn't the safety issue that led to this accident specifically raised by the Task Force in July 2011? Why had you not resolved that very issue by the time _____ occurred?*

If you have an honest, solid answer, you will be able to look the Congress and the American public in the eyes and say that you took every reasonable action to protect against the tragic outcome. But when such an answer is lacking, there is clearly work to be done with deliberate haste to prevent the low probability event from causing its high consequences.

We commend the Task Force for dedicating their report to the people of Japan, especially those who responded to the accident at Fukushima. The Task Force concluded its dedication with this expression:

> *It is our strong desire and our goal to take the necessary steps to assure that the result of our labors will prevent the need for a repetition of theirs.*

We admire and respect this sentiment. Now it's time for the Commission to do its part and take the steps necessary for this commendable goal to be achieved.

Sincerely (arranged alphabetically by organization name),

Rochelle Becker, Executive Director
Alliance for Nuclear Responsibility
PO Box 1328
San Luis Obispo, CA 93406

Sandra Gavutis
Executive Director
C-10 Foundation
44 Merrimac St.
Newburyport, MA 01985

Deb Katz
Executive Director
Citizens Awareness Network
P.O. Box 83
Shelburne Fall, MA 01370

Michael J. Keegan
Don't Waste Michigan
PO Box 463
Monroe, Michigan 48161

Ray Shadis
Executive Director
Earth Day Commitment
Friends of the Coast-Opposing Nuclear Pollution
Post Office Box 98
Edgecomb, Maine 04556

Jim Riccio
Greenpeace
Washington, DC

Manna Jo Greene, Environmental Director
Hudson River Sloop Clearwater, Inc.
724 Wolcott Ave.
Beacon, NY 12508

Geoffrey H. Fettus
Senior Project Attorney
Natural Resources Defense Council

Edward Childs, President
New England Coalition on Nuclear Pollution
Post Office Box 545
Brattleboro, Vermont 05302

Jim Warren, Executive Director
North Carolina Waste Awareness & Reduction
Network (NC WARN)
Durham, NC

David A. Kraft, Director
Nuclear Energy Information Service (NEIS)
3411 W. Diversey #16
Chicago, IL 60647

Michele Boyd
Physicians for Social Responsibility
Washington, DC

Phillip Musegaas, Esq.
Hudson River Program Director
Riverkeeper, Inc.
20 Secor Road
Ossining, NY 10562

Jane Swanson, spokesperson
San Luis Obispo Mothers For Peace
San Luis Obispo, CA

David Lochbaum
Director, Nuclear Safety Project
Union of Concerned Scientists
PO Box 15316
Chattanooga, TN 37415

Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

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(b)(5)

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Gilles, Nanette ~~NOT FOR PUBLIC DISCLOSURE~~

From: Gilles, Nanette
Sent: Wednesday, July 27, 2011 9:47 AM
To: Apostolakis, George
Cc: Sosa, Belkys
Subject: Time Line for Action on NTTF Report
Attachments: Time Line.docx

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

TIMLINE FOR ACTION ON NEAR-TERM TASK FORCE REPORT RECOMMENDATIONS

(b)(5)

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OT FOR PUBLIC DISCLOSURE

Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

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NOT FOR PUBLIC DISCLOSURE

Filename:	Vote-SECY-11-0093e.docx
Directory:	P:
Template:	C:\Documents and Settings\nvg\Application Data\Microsoft\Templates\Normal.dotm
Title:	
Subject:	
Author:	nvg
Keywords:	
Comments:	
Creation Date:	7/27/2011 10:04:00 AM
Change Number:	4
Last Saved On:	7/27/2011 10:12:00 AM
Last Saved By:	nvg
Total Editing Time:	10 Minutes
Last Printed On:	12/2/2011 11:35:00 AM
As of Last Complete Printing	
Number of Pages:	2
Number of Words:	804 (approx.)
Number of Characters:	4,584 (approx.)

NOT FOR PUBLIC DISCLOSURE

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Davis, Roger

From: Biggins, James
Sent: Wednesday, July 27, 2011 5:00 PM
To: Sosa, Belkys; Apostolakis, George; Gilles, Nanette
Cc: Blake, Kathleen; Davis, Roger
Subject: RE: Query: Action on recommendations of the Task Force review of Fukushima

Belkys,

(b)(5)

-Jim

From: Sosa, Belkys
Sent: Wednesday, July 27, 2011 4:53 PM
To: Apostolakis, George; Gilles, Nanette; Biggins, James
Cc: Blake, Kathleen; Davis, Roger
Subject: Query: Action on recommendations of the Task Force review of Fukushima

(b)(5)

From: Robert R. Holt [mailto:(b)(6)
Sent: Wednesday, July 27, 2011 12:14 PM
To: CMRAPOSTOLAKIS Resource
Subject: Action on recommendations of the Task Force review of Fukushima

Dear Commissioner Apostolakis,

I hope that the Commission has not already reached a decision about the July 12 document, *Recommendations for Enhancing Reactor Safety in the 21st Century: The Near Term Task Force Review of Insights from the Fukushima Dai-ichi Accident*. Stories in the press indicate that a majority of the five of you favor deferring any action on any of its recommendations until the whole matter can be studied further. Let me respectfully urge that there are important reasons to take some actions now, on the basis of the work the Task Force has done, while further study continues. Several very important recommendations, based on good data, have time-urgency, and any delay might have serious consequences.

I personally believe that the Task Force correctly urged that the Commission issue "orders to ensure that licensees take [the 12] near-term actions" specified in Appendix A. Enough has been factually established to back them up conclusively. Consider, for example, the undeniable fact that none of the spent fuel cooling pools in American nuclear plants have monitoring devices that can provide the control room with immediate information about the integrity of the pool, the temperature of the water and its level. It should be immediately evident that no reactor, especially not those of the GE Mark I boiling water design, should be allowed to continue operating until such instrumentation has been installed. That is particularly urgent in view of the fact that American pools are several times more densely packed than those in Japan. And this is only one such problem or design deficiency, some of which—e.g., the defective vents for hydrogen—have long been known but have been

ignored. Now we know that it was a mistake merely to recommend the vent change instead of mandating it, and they should be fixed at once.

Let me add one strong recommendation of my own: that the licensing and *license-extension process be suspended* until the stations in question have fully complied with all 12 recommended orders. It would be intolerable to go ahead and grant a 20-year extension of an operating license before knowing that the worst dangers in design and practice had been successfully addressed, an abdication of your basic mission: Protecting people and the environment, not the nuclear industry. The matter is especially urgent to me, because I can see the Pilgrim plant only 23 miles away across Cape Cod Bay from my house in Truro, and I know that Entergy is pushing hard for a quick decision to extend their license, which ends in a few months. It seems incredible that the NRC would relicense this leaking, rusty, poorly managed plant of an obsolete design that could no longer be approved for new construction, especially after the recent disaster at Fukushima.

Sincerely yours,

Robert R. Holt, Ph.D.
Professor Emeritus, New York University

Commissioner Apostolakis' Comments on SECY-11-0093
Near-Term Report and Recommendations for Agency Actions
Following the Events in Japan

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(b)(5)

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NOT FOR PUBLIC DISCLOSURE

Filename:	Vote-SECY-11-0093g.docx
Directory:	P:
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Title:	
Subject:	
Author:	nvg
Keywords:	
Comments:	
Creation Date:	7/28/2011 2:49:00 PM
Change Number:	16
Last Saved On:	7/28/2011 4:43:00 PM
Last Saved By:	gea
Total Editing Time:	84 Minutes
Last Printed On:	12/2/2011 11:36:00 AM
As of Last Complete Printing	
Number of Pages:	2
Number of Words:	789 (approx.)
Number of Characters:	4,498 (approx.)

NOT FOR PUBLIC DISCLOSURE

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Davis, Roger

om: Biggins, James
nt: Friday, July 29, 2011 4:23 PM
: Sosa, Belkys; Apostolakis, George; Gilles, Nanette; Baggett, Steven; Davis, Roger
Subject: RE: Query: New NRC Daily Notes for July 29, 2011

[redacted]

Jim

From: Sosa, Belkys
Sent: Friday, July 29, 2011 4:17 PM
To: Apostolakis, George; Gilles, Nanette; Baggett, Steven; Biggins, James; Davis, Roger
Subject: Query: New NRC Daily Notes for July 29, 2011

[redacted]

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Daily Notes for July 29, 2011

ADM

~~(OUO-SII)~~

On July 26, 2011, the NRC received six petitions for rulemaking (PRMs) based on the Fukushima Task Force Report (the Report) from the Natural Resources Defense Council, Inc. Each PRM has been docketed separately. The Office of Administration plans to publish a consolidated *Federal Register* notice (FRN) acknowledging receipt of the PRMs. The FRN will not request public comment at this time, but will include the docket ID for each PRM for the public to track further agency actions on the PRMs. The NRC will commit in the FRN to publish a second FRN that will state the NRC's plan for resolving the PRMs based on the Commission's handling of the recommendations in the Report.

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Davis, Roger

From: Peter Crane
Sent: Monday, August 01, 2011 10:53 AM
To: Peter Crane
Subject: Those lucky Japanese!

In an article by Jerry Cuttler and Myron Pollycove, published in 2009, we get the real scoop on accidents, radiation, and thyroid cancer: radiation emissions from major accidents are not harmful and may even be beneficial; thyroid cancer in Belarus after Chernobyl may not have been caused by Chernobyl at all; it is not appropriate to conclude that persons who developed thyroid cancer after receiving x-rays to the head and neck as children did so as a result of the radiation; and radiation does not appear to be a cause of thyroid cancer.

These statements speak for themselves. (See actual quotations below.) BEIR VII, published by the National Research Council of the National Academies of Science in 2006, spent a couple of pages explaining why the views of Pollycove and a frequent co-author of his, Feinendegen, were scientifically worthless.

Yet for 11 years, Pollycove was the staff's principal advisor on radiation and health, and it was on his assurance that the NRC declared in 1997 that internal dose from released patients was not an issue, something it acknowledged in 2008 was a mistake. By then, the deregulation had taken place, and reversing course would have been extremely difficult.

If you read Pollycove's resume on line, you will find him represented, as of 2007, as "special assistant to the Deputy Executive Director for Operations" of the NRC. To those who saw the NRC Weekly Information Report for October 12, 2001, reporting the departure from the NRC of Myron Pollycove, described as a "consultant," this will come as a surprise. (He was certainly a Visiting Medical Fellow, but not to my knowledge ever Special Assistant to the DEDO.) I'll paste in one such site at the bottom of this message.

Anyone who wants to know how the NRC got itself into the morass it now finds itself in with respect to the regulation of radiation in medicine should read the full article, to get a clearer idea of Dr. Pollycove's thinking. This would also preclude any notion that I am quoting him out of context.

– Peter Crane

What if an accident occurs? In spite of the extraordinary care taken to avoid such events, an accident could happen and a release of radioactivity is possible. As with any industrial accident, people living near the plant would be informed promptly and emergency measures would be taken to prevent anyone from receiving a significant dose of radiation. No immediate deaths in the surrounding population would be expected. The question is whether there might be adverse health effects that might shorten life expectancy. Research has shown that a low dose or a low dose rate of ionizing radiation in living organisms is generally stimulatory rather than inhibitory (UNSCEAR 1994, Kondo 1993, Académie des Sciences 1997, Pollycove and Feinendegen 2001, Mitchel 2007a). This means that the radiation exposure would not be harmful and might even be beneficial.

Based on the relatively few fatalities (31), the Chernobyl accident will be remembered as a validation that nuclear power is probably the safest means of large-scale energy production, as was also demonstrated by the Three Mile Island accident (Jaworowski 2007).

Similarly, other studies of many children given large doses of radiation for enlarged tonsils and adenoids identified relatively few thyroid cancers. Because of the high rate of natural occurrence of thyroid cancer, it is not appropriate to attribute such thyroid cancer cases to radiation exposure (Lenihan 1993).

The effects of better reporting, heightened awareness, and screening after the Chernobyl accident may be a cause of the observed increase of thyroid cancer in Belarus; it might not be an effect of radiation at all (Jaworowski 2008b).

It has been claimed that thyroid cancer is the most common long-term effect of low dose radiation exposure in children. Nuclear safety regulations are based on tight radioiodine dose limits. A review of many recent scientific publications does *not* support this concern. Thyroid cancer is not an uncommon occurrence in most populations; it does not appear to be related to radiation exposure.

Citation:

Dose Response. 2009; 7(1): 52–89. PMCID: PMC2664640
Published online 2008 November 10. doi: 10.2203/dose-response.08-024.Cuttler
Copyright © 2009 University of Massachusetts
Nuclear Energy and Health: And the Benefits of Low-Dose Radiation Hormesis
Jerry M. Cuttler
Cuttler & Associates Inc., Mississauga, ON, Canada
Myron Pollycove
School of Medicine, University of California San Francisco, San Francisco, CA
Address correspondence to Jerry M. Cuttler, Cuttler & Associates Inc., 1781 Medallion Court,

---

Myron Pollycove, MD Named Two-Time Cambridge Who's Who Professional of the Year in Radiation Oncology Research

Rockville, MD, July 04, 2007 –(PR.com)– Myron Pollycove, MD, Chairman of Radiation, Science and Health, Inc. has been named Cambridge Who's Who Professional of the Year in Radiation Oncology Research for 2007-2008, the second year Pollycove has been honored. The Cambridge Who's Who selection committee hand picks these special Who's Who honorees based on accomplishments, academic achievement, leadership and service.

Pollycove has been practicing clinical pathology and nuclear medicine for 57 years. As Chairman of Radiation, Science and Health (http://www.radscihealth.org/rsh), Pollycove performs research on the effects of high and low doses of radiation on health, cancer prevention and DNA structure. As Special Assistant to the Deputy EDO, Materials, Research, State Programs for the U.S. Nuclear Regulatory Commission since 1991, Pollycove provides expertise in the medical use and regulation of radioisotopes and research in the biological effects of exposure to low-dose ionizing radiation.

NOT FOR PUBLIC DISCLOSURE

GEA Comments

MEMORANDUM TO: R. W. Borchardt
Executive Director for Operations

Edwin M. Hackett, Executive Director
Advisory Committee on Reactor Safeguards

FROM: Annette L Vietti-Cook, Secretary

SUBJECT: STAFF REQUIREMENTS – SECY-11-0093 – NEAR-TERM REPORT AND RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING THE EVENTS IN JAPAN

(b)(5)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

cc: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff
OGC
CFO
OCA
OPA
Office Directors, Regions, ACRS, ASLBP (via E-Mail)
PDR

RE

(b)(5)

Additional Commissioner Comments to be Included in the SRM if Agreed to by a Majority of the Commission

(b)(5)

(b)(5)

(b)(5)

Gilles, Nanette NOT FOR PUBLIC DISCLOSURE

From: Gilles, Nanette
Sent: Monday, August 01, 2011 5:11 PM
To: 'ghalnon@firstenergycorp.com'
Subject: RE: Follow up

Greg – Thank you for getting back to us on this issue. I will pass this on to the Commissioner.

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: ghalnon@firstenergycorp.com [mailto:ghalnon@firstenergycorp.com]
Sent: Monday, August 01, 2011 11:30 AM
To: Gilles, Nanette
Subject: Follow up

Hi Nan,
The end of last month FirstEnergy executive met with Commissioner Apostolakis and yourself for a chat about First Energy. The commissioner asked if the NEI/INPO organization in response to the Fukushima event would be issuing a public report. Jim Lash (FirstEnergy Generation President) committed to getting back with your office with the answer. As it turns out, much has happened since the end of June, however, Mr Lash communicated to me that Chip Pardee, the industry's lead for the response, said he would consider the concept and in future meetings with the Commission, the path forward would become more clear. In short, the answer to his question (I know the commissioner likes direct answers) is that the Industry group will consider a public report out in some forum and Mr Pardee would be communicating plans to the Commission in the future.
I know this does not fully answer the question, we played some phone tag but I thought an email would communicate what we did to follow up from our visit. Call if you would like to discuss further.
Respectfully
Greg

Greg Halnon
Director Regulatory Affairs
FirstEnergy Nuclear Operating Company
76 S. Main St
A-GO-2
Akron, OH 44308
Office: 330-384-5638
Cell (b)(6)
Fax: 330-315-9577

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Gilles, Nanette NOT FOR PUBLIC DISCLOSURE

From: Gilles, Nanette
Sent: Monday, August 01, 2011 5:12 PM
To: Apostolakis, George
Cc: Sosa, Belkys
Subject: FW: Follow up

Commissioner – See the response below from First Energy (they dropped in last month) to a question you had about the industry's Fukushima Task Force.

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: ghalnon@firstenergycorp.com [mailto:ghalnon@firstenergycorp.com]
Sent: Monday, August 01, 2011 11:30 AM
To: Gilles, Nanette
Subject: Follow up

Nan,
e end of last month FirstEnergy executive met with Commissioner Apostolakis and yourself for a chat about First Energy. The commissioner asked if the NEI/INPO organization in response to the Fukushima event would be issuing a public report. Jim Lash (FirstEnergy Generation President) committed to getting back with your office with the answer. As it turns out, much has happened since the end of June, however, Mr Lash communicated to me that Chip Pardee, the industry's lead for the response, said he would consider the concept and in future meetings with the Commission, the path forward would become more clear. In short, the answer to his question (I know the commissioner likes direct answers) is that the Industry group will consider a public report out in some forum and Mr Pardee would be communicating plans to the Commission in the future.
I know this does not fully answer the question, we played some phone tag but I thought an email would communicate what we did to follow up from our visit. Call if you would like to discuss further.
Respectfully
Greg

Greg Halnon
Director Regulatory Affairs
FirstEnergy Nuclear Operating Company
76 S. Main St
A-GO-2
Akron, OH 44308
Office: 330-384-5638
Cell: (b)(6)
Fax: 330-315-9577

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Gilles, Nanette

om: Gilles, Nanette
nt: Thursday, August 04, 2011 5:55 PM
To: Sosa, Belkys; Davis, Roger
Subject: GA Response to Inhofe - Comparison with Japan
Attachments: Inhofe response - 8July11.docx; 110708_Apostolakis_JMI ltr to NRC on reg comparison.pdf

Here is my proposed draft for the response to the July 13th letter from Inhofe requesting that we do a comparison of U.S. and Japan's regulatory requirements. I've also attached the incoming letter. Recall that this is one of the letters that was sent to each office individually.

Comments, please.

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

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NOT FOR PUBLIC DISCLOSURE

The Honorable James M. Inhofe
United States Senate
Ranking Member, Committee on
Environment and Public Works
Washington, DC 20510-6175

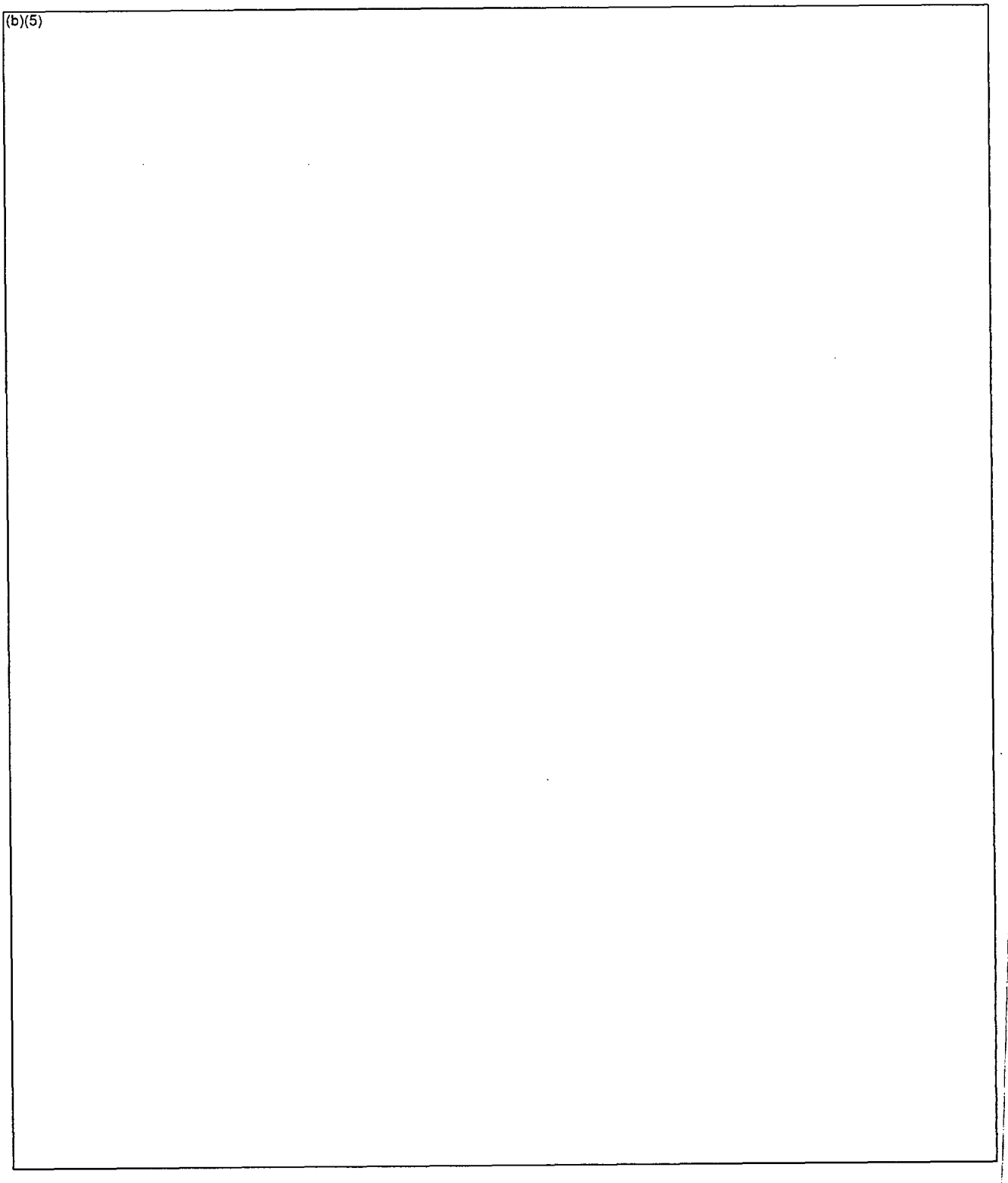
Dear Senator Inhofe:

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Sincerely,

George Apostolakis

NOT FOR PUBLIC DISCLOSURE

Gilles, Nanette

om: Gilles, Nanette
nt: Friday, August 05, 2011 10:37 AM
To: Apostolakis, George
Cc: Sosa, Belkys; Davis, Roger
Subject: FW: CORR-11-0094 - Upton-Due 8/5
Attachments: corr110094.docx

(b)(5)

Thanks,
Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Sosa, Belkys
Sent: Thursday, August 04, 2011 5:40 PM
To: Davis, Roger; Gilles, Nanette
Subject: RE: CORR-11-0094 - Upton-Due 8/5

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From: Davis, Roger
Sent: Thursday, August 04, 2011 5:21 PM
To: Gilles, Nanette; Sosa, Belkys
Subject: RE: CORR-11-0094 - Upton-Due 8/5

(b)(5)

From: Gilles, Nanette
Sent: Thursday, August 04, 2011 5:20 PM
To: Sosa, Belkys
Cc: Davis, Roger
Subject: CORR-11-0094 - Upton-Due 8/5

(b)(5)

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

NOT FOR PUBLIC DISCLOSURE

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The Honorable Fred Upton
Chairman, Committee on Energy and Commerce
United States House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

(b)(5)

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(b)(5)

Sincerely,

Gregory B. Jaczko

NOT FOR PUBLIC DISCLOSURE

Identical letters sent to:

The Honorable Fred Upton
United States House of Representatives
Washington, D.C. 20515

The Honorable Joe Barton
United States House of Representatives
Washington, D.C. 20515

The Honorable Cliff Stearns
United States House of Representatives
Washington, D.C. 20515

The Honorable Ed Whitfield
United States House of Representatives
Washington, D.C. 20515

The Honorable John Shimkus
United States House of Representatives
Washington, D.C. 20515

The Honorable Joseph K. Pitts
United States House of Representatives
Washington, D.C. 20515

The Honorable Mary Bono Mack
United States House of Representatives
Washington, D.C. 20515

The Honorable Greg Walden
United States House of Representatives
Washington, D.C. 20515

The Honorable Michael C. Burgess
United States House of Representatives
Washington, D.C. 20515

The Honorable Lee Terry
United States House of Representatives
Washington, D.C. 20515

The Honorable Marsha Blackburn
United States House of Representatives
Washington, D.C. 20515

The Honorable Sue Myrick
United States House of Representatives
Washington, D.C. 20515

The Honorable Brett Guthrie
United States House of Representatives
Washington, D.C. 20515

The Honorable Tim Murphy
United States House of Representatives
Washington, D.C. 20515

The Honorable David B. McKinley
United States House of Representatives
Washington, D.C. 20515

The Honorable Cathy McMorris Rodgers
United States House of Representatives
Washington, D.C. 20515

The Honorable John Sullivan
United States House of Representatives
Washington, D.C. 20515

The Honorable Brian P. Bilbrey
United States House of Representatives
Washington, D.C. 20515

The Honorable John Phillip Gingrey
United States House of Representatives
Washington, D.C. 20515

The Honorable Steve Scalise
United States House of Representatives
Washington, D.C. 20515

The Honorable Leonard Lance
United States House of Representatives
Washington, D.C. 20515

The Honorable Peter Olson
United States House of Representatives
Washington, D.C. 20515

The Honorable Gregg Harper
United States House of Representatives
Washington, D.C. 20515

The Honorable Robert E. Latta
United States House of Representatives
Washington, D.C. 20515

The Honorable Adam Kinzinger
United States House of Representatives
Washington, D.C. 20515

The Honorable H. Morgan Griffith
United States House of Representatives
Washington, D.C. 20515

The Honorable Henry A. Waxman
United States House of Representatives
Washington, D.C. 20515

The Honorable Diana DeGette
United States House of Representatives
Washington, D.C. 20515

The Honorable Bobby L. Rush
United States House of Representatives
Washington, D.C. 20515

The Honorable Gene Green
United States House of Representatives
Washington, D.C. 20515

The Honorable Frank Pallone, Jr.
United States House of Representatives
Washington, D.C. 20515

The Honorable G. K. Butterfield
United States House of Representatives
Washington, D.C. 20515

The Honorable Anna G. Eshoo
United States House of Representatives
Washington, D.C. 20515

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Field Code Changed

August 10, 2011

MEMORANDUM TO: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff

FROM: Annette L. Vietti-Cook, Secretary /s/

SUBJECT: DRAFT STAFF REQUIREMENTS MEMORANDUM SECY-11-0093 – NEAR-TERM REPORT AND RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING THE EVENTS IN JAPAN

(b)(5)

Attachment:
As stated

cc: EDO
OGC

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NOT FOR PUBLIC DISCLOSURE

WDM comments

(b)(5)

MEMORANDUM TO: R. W. Borchardt
Executive Director for Operations

Edwin M. Hackett, Executive Director
Advisory Committee on Reactor Safeguards

FROM: Annette L. Vietti-Cook, Secretary

SUBJECT: STAFF REQUIREMENTS – SECY-11-0093 – NEAR-TERM REPORT AND RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING THE EVENTS IN JAPAN

(b)(5)

NOT FOR PUBLIC DISCLOSURE

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cc: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff
OGC
CFO
OCA
OPA
Office Directors, Regions, ACRS, ASLBP (via E-Mail)
PDR

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Additional Commissioner Comments to be Included in the SRM
If Agreed to by a Majority of the Commission

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NOT FOR PUBLIC DISCLOSURE

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Gilles, Nanette

om: Gilles, Nanette
nt: Wednesday, August 10, 2011 4:51 PM
To: Davis, Roger
Subject: Response to Inhofe
Attachments: QFRs-Inhofe-EPW Committee Hearing16Jun11.docx

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

NOT FOR PUBLIC DISCLOSURE

Environment and Public Works Committee Hearing
June 16, 2011
Follow-Up Questions for Written Submission

Questions for Apostolakis

Senator James M. Inhofe

1. Do you believe the Commission would benefit from greater involvement of the ACRS on the NRC's longer term review rather than merely reviewing the staff's final product? If not, why not?

(b)(5)

2. Please describe the processes the NRC uses to revise its regulatory requirements following new information or world events. Notwithstanding the seriousness of the events in Japan, there doesn't seem to be a reason to alter the Commission's normal processes to take account of any lessons learned from the events in Japan given the repeated assurances that U.S. plants are operating safely. Do you agree? If not, why not?

(b)(5)

3. Do the Commission's regulations provide a mechanism for applying lessons learned from Japan to COLs or certified designs already issued? Is there any material difference in NRC's ability to apply those lessons to COLs or certified designs as opposed to plants that are currently licensed and operating?

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4. Given NRC's authority to apply lessons learned from Japan to the operating fleet, and the state of the art review the COL and design certification applications have undergone, it doesn't make any sense to delay the licensing process on these applications during the review of the Japan situation. Do you agree? If not, why not?

~~NOT FOR PUBLIC DISCLOSURE~~

Gilles, Nanette

From: Gilles, Nanette
Sent: Wednesday, August 10, 2011 5:09 PM
To: Davis, Roger
Subject: RE: CORR-Letter to Markey on NTTF Recommendations

(b)(5)

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Davis, Roger
Sent: Wednesday, August 10, 2011 5:04 PM
To: Gilles, Nanette
Subject: RE: CORR-Letter to Markey on NTTF Recommendations

(b)(5)

ee WDM introduced

From: Gilles, Nanette
Sent: Wednesday, August 10, 2011 4:27 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: CORR-Letter to Markey on NTTF Recommendations

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

hone: 301-415-1180
nail: nanette.gilles@nrc.gov

~~NOT FOR PUBLIC DISCLOSURE~~

From: Apostolakis, George
Sent: Tuesday, August 09, 2011 5:19 PM
To: Gilles, Nanette
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: Re: CORR-Letter to Markey on NTTF Recommendations

NOT FOR PUBLIC DISCLOSURE

(b)(5)

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Gilles, Nanette
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Sent: Tue Aug 09 17:09:17 2011
Subject: CORR-Letter to Markey on NTTF Recommendations

Commissioner – I have reviewed CORR-11-0098, which is a response to Rep. Markey on applicability of the Near-Term Task Force recommendations to plants licensed before the GDCs. I recommend the changes noted below. Our response is due by Thursday, Aug. 11.

Dear Congressman Markey:

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

Davis, Roger

From: Davis, Roger
Sent: Wednesday, August 10, 2011 5:09 PM
To: Gilles, Nanette
Subject: RE: CORR-Letter to Markey on NTTF Recommendations

(b)(5)

From: Gilles, Nanette
Sent: Wednesday, August 10, 2011 5:09 PM
To: Davis, Roger
Subject: RE: CORR-Letter to Markey on NTTF Recommendations

(b)(5)

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Davis, Roger
Sent: Wednesday, August 10, 2011 5:04 PM
To: Gilles, Nanette
Subject: RE: CORR-Letter to Markey on NTTF Recommendations

(b)(5)

From: Gilles, Nanette
Sent: Wednesday, August 10, 2011 4:27 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: CORR-Letter to Markey on NTTF Recommendations

(b)(5)

Nanette V. Gilles
Technical Assistant for Reactors

NOT FOR PUBLIC DISCLOSURE

Gilles, Nanette

From: Apostolakis, George
Sent: Thursday, August 11, 2011 2:40 AM
To: Gilles, Nanette
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: Task Force SRM
Attachments: SECY-11-0093 draft srm GA.docx

(b)(5)

From: Gilles, Nanette
Sent: Wednesday, August 10, 2011 5:29 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: Task Force SRM

(b)(5)

Nan

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Technical Assistant for Reactors
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Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

~~NOT FOR PUBLIC DISCLOSURE~~

Sosa, Belkys

From: Apostolakis, George
Sent: Thursday, August 11, 2011 11:41 AM
To: Gilles, Nanette
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: CORR-Letter to Markey on NTTF Recommendations

OK

From: Gilles, Nanette
Sent: Wednesday, August 10, 2011 4:27 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: CORR-Letter to Markey on NTTF Recommendations

(b)(5)

Nan

nette V. Gilles
echnical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Apostolakis, George
Sent: Tuesday, August 09, 2011 5:19 PM
To: Gilles, Nanette
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: Re: CORR-Letter to Markey on NTTF Recommendations

OK

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Gilles, Nanette
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Sent: Tue Aug 09 17:09:17 2011
Subject: CORR-Letter to Markey on NTTF Recommendations

~~NOT FOR PUBLIC DISCLOSURE~~

NOT FOR PUBLIC DISCLOSURE

(b)(5)

Nan

nette V. Gilles
chnical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

Gilles, Nanette

From: Gilles, Nanette
Sent: Thursday, August 11, 2011 9:43 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: Task Force SRM
Attachments: RE: DRAFT SRM - SECY-11-0093 (Near-Term Report - Events in Japan); RE: DRAFT SRM - SECY-11-0093 (Near-Term Report - Events in Japan)

[redacted]

From: Apostolakis, George
Sent: Thursday, August 11, 2011 2:40 AM
To: Gilles, Nanette
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: Task Force SRM

[redacted]

From: Gilles, Nanette
Sent: Wednesday, August 10, 2011 5:29 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: Task Force SRM

[redacted]

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

NOT FOR PUBLIC DISCLOSURE

Filename:	SECY-11-0093 draft srm GA.docx
Directory:	P:
Template:	C:\Documents and Settings\nvg\Application Data\Microsoft\Templates\Normal.dotm
Title:	
Subject:	
Author:	Kenneth R. Hart
Keywords:	
Comments:	
Creation Date:	8/11/2011 1:24:00 AM
Change Number:	4
Last Saved On:	8/11/2011 1:36:00 AM
Last Saved By:	George Apostolakis
Total Editing Time:	13 Minutes
Last Printed On:	12/2/2011 12:09:00 PM
As of Last Complete Printing	
Number of Pages:	7
Number of Words:	1,534 (approx.)
Number of Characters:	8,748 (approx.)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

Field Code Changed

August 10, 2011

MEMORANDUM TO: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff

FROM: Annette L. Vietti-Cook, Secretary /s/

SUBJECT: DRAFT STAFF REQUIREMENTS MEMORANDUM
SECY-11-0093 – NEAR-TERM REPORT AND
RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING
THE EVENTS IN JAPAN

(b)(5)

Attachment:
As stated

cc: EDO
OGC

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

(b)(5)

MEMORANDUM TO: R. W. Borchardt
Executive Director for Operations

Edwin M. Hackett, Executive Director
Advisory Committee on Reactor Safeguards

FROM: Annette L. Vietti-Cook, Secretary

SUBJECT: STAFF REQUIREMENTS – SECY-11-0093 – NEAR-TERM REPORT AND RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING THE EVENTS IN JAPAN

(b)(5)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

cc: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff
OGC
CFO
OCA
OPA
Office Directors, Regions, ACRS, ASLBP (via E-Mail)
PDR

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NOT FOR PUBLIC DISCLOSURE

Additional Commissioner Comments to be Included in the SRM if Agreed to by a Majority of the Commission

(b)(5)

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(b)(5)

NOT FOR PUBLIC DISCLOSURE

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Field Code Changed

August 10, 2011

MEMORANDUM TO: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff

FROM: Annette L. Vietti-Cook, Secretary /s/

SUBJECT: DRAFT STAFF REQUIREMENTS MEMORANDUM SECY-11-0093 – NEAR-TERM REPORT AND RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING THE EVENTS IN JAPAN

(b)(5)

Attachment:
As stated

cc: EDO
OGC

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NOT FOR PUBLIC DISCLOSURE

Filename:	SECY-11-0093 srm WCO.docx
Directory:	P:
Template:	C:\Documents and Settings\nvg\Application Data\Microsoft\Templates\Normal.dotm
Title:	
Subject:	
Author:	Kenneth R. Hart
Keywords:	
Comments:	
Creation Date:	8/12/2011 3:38:00 AM
Change Number:	2
Last Saved On:	8/12/2011 3:38:00 AM
Last Saved By:	George Apostolakis
Total Editing Time:	2 Minutes
Last Printed On:	12/2/2011 12:09:00 PM
As of Last Complete Printing	
Number of Pages:	6
Number of Words:	1,451 (approx.)
Number of Characters:	8,271 (approx.)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

August 10, 2011 [WCO edits 8/11/11]

MEMORANDUM TO: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff

FROM: Annette L. Vietti-Cook, Secretary /s/

SUBJECT: DRAFT STAFF REQUIREMENTS MEMORANDUM
SECY-11-0093 – NEAR-TERM REPORT AND
RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING
THE EVENTS IN JAPAN

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OGC

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MEMORANDUM TO: R. W. Borchardt
Executive Director for Operations

Edwin M. Hackett, Executive Director
Advisory Committee on Reactor Safeguards

FROM: Annette L. Vietti-Cook, Secretary

SUBJECT: STAFF REQUIREMENTS – SECY-11-0093 – NEAR-TERM REPORT AND RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING THE EVENTS IN JAPAN

(b)(5)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

(ACRS)

(SECY Suspense: following submission of prioritization notation vote paper to the Commission)

cc: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff
OGC
CFO
OCA
OPA
Office Directors, Regions, ACRS, ASLBP (via E-Mail)
PDR

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Additional Commissioner Comments to be Included in the SRM if Agreed to by a Majority of the Commission

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Filename:	SECY-11-0093 WDM.docx
Directory:	P:
Template:	C:\Documents and Settings\nvg\Application Data\Microsoft\Templates\Normal.dotm
Title:	
Subject:	
Author:	Kenneth R. Hart
Keywords:	
Comments:	
Creation Date:	8/12/2011 3:36:00 AM
Change Number:	2
Last Saved On:	8/12/2011 3:36:00 AM
Last Saved By:	George Apostolakis
Total Editing Time:	4 Minutes
Last Printed On:	12/2/2011 12:10:00 PM
As of Last Complete Printing	
Number of Pages:	7
Number of Words:	1,443 (approx.)
Number of Characters:	8,227 (approx.)

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Field Code Changed

August 10, 2011

MEMORANDUM TO: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff

FROM: Annette L. Vietti-Cook, Secretary /s/

SUBJECT: DRAFT STAFF REQUIREMENTS MEMORANDUM SECY-11-0093 – NEAR-TERM REPORT AND RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING THE EVENTS IN JAPAN

(b)(5)

Attachment:
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cc: EDO
OGC

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WDM Comments

MEMORANDUM TO: R. W. Borchardt
Executive Director for Operations

Edwin M. Hackett, Executive Director
Advisory Committee on Reactor Safeguards

FROM: Annette L. Vietti-Cook, Secretary

SUBJECT: STAFF REQUIREMENTS – SECY-11-0093 – NEAR-TERM REPORT AND RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING THE EVENTS IN JAPAN

(b)(5)

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(b)(5)

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cc: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
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Office Directors, Regions, ACRS, ASLBP (via E-Mail)
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Filename:	11-0093 srm-GEA.docx
Directory:	P:
Template:	C:\Documents and Settings\nvg\Application Data\Microsoft\Templates\Normal.dotm
Title:	
Subject:	
Author:	Kenneth R. Hart
Keywords:	
Comments:	
Creation Date:	8/12/2011 8:00:00 AM
Change Number:	3
Last Saved On:	8/12/2011 8:31:00 AM
Last Saved By:	nvg
Total Editing Time:	31 Minutes
Last Printed On:	12/2/2011 11:50:00 AM
As of Last Complete Printing	
Number of Pages:	6
Number of Words:	1,416 (approx.)
Number of Characters:	8,075 (approx.)

NOT FOR PUBLIC DISCLOSURE

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Field Code Changed

August 10, 2011

MEMORANDUM TO: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff

FROM: Annette L. Vietti-Cook, Secretary /s/

SUBJECT: DRAFT STAFF REQUIREMENTS MEMORANDUM
SECY-11-0093 – NEAR-TERM REPORT AND
RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING
THE EVENTS IN JAPAN

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Attachment:
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cc: EDO
OGC

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GEA Comments

MEMORANDUM TO: R. W. Borchardt
Executive Director for Operations

Edwin M. Hackett, Executive Director
Advisory Committee on Reactor Safeguards

FROM: Annette L. Vietti-Cook, Secretary

SUBJECT: STAFF REQUIREMENTS – SECY-11-0093 – NEAR-TERM REPORT AND RECOMMENDATIONS FOR AGENCY ACTIONS FOLLOWING THE EVENTS IN JAPAN

(b)(5)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

(b)(5)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

cc: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff
OGC
CFO
OCA
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Office Directors, Regions, ACRS, ASLBP (via E-Mail)
PDR

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NOT FOR PUBLIC DISCLOSURE

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NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

(b)(5)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

From: Gilles, Nanette
Sent: Friday, August 12, 2011 7:42 AM
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: Re: Task Force SRM

(b)(5)

Sent from my NRC Blackberry

From: Apostolakis, George
To: Gilles, Nanette
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Sent: Fri Aug 12 05:10:36 2011
Subject: RE: Task Force SRM

Nan:

(b)(5)

GA

From: Gilles, Nanette
Sent: Thursday, August 11, 2011 9:43 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: Task Force SRM

NOT FOR PUBLIC DISCLOSURE

(b)(5)

Nan

From: Apostolakis, George
Sent: Thursday, August 11, 2011 2:40 AM
To: Gilles, Nanette
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: Task Force SRM

(b)(5)

From: Gilles, Nanette
Sent: Wednesday, August 10, 2011 5:29 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: Task Force SRM

(b)(5)

Nan

inette V. Gilles
echnical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

Sosa, Belkys

om: Gilles, Nanette
nt: Friday, August 12, 2011 9:55 AM
o: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: Task Force SRM

(b)(5)

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Apostolakis, George
Sent: Friday, August 12, 2011 9:54 AM
To: Gilles, Nanette
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: Re: Task Force SRM

(b)(5)

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Gilles, Nanette
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Sent: Fri Aug 12 09:43:46 2011
Subject: RE: Task Force SRM

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

NOT FOR PUBLIC DISCLOSURE

From: Apostolakis, George
Sent: Friday, August 12, 2011 5:11 AM
To: Gilles, Nanette
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: Task Force SRM

Nan:

(b)(5)

GA

From: Gilles, Nanette
Sent: Thursday, August 11, 2011 9:43 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: Task Force SRM

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From: Apostolakis, George
Sent: Thursday, August 11, 2011 2:40 AM
To: Gilles, Nanette
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: RE: Task Force SRM

(b)(5)

From: Gilles, Nanette
Sent: Wednesday, August 10, 2011 5:29 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Baggett, Steven; Davis, Roger
Subject: Task Force SRM

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

Sosa, Belkys ~~NOT FOR PUBLIC DISCLOSURE~~

From: Gilles, Nanette
Sent: Friday, August 12, 2011 12:00 PM
To: Davis, Roger; Sosa, Belkys
Subject: RE: Response to Inhofe

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Davis, Roger
Sent: Friday, August 12, 2011 11:27 AM
To: Gilles, Nanette
Subject: RE: Response to Inhofe

n,

(b)(5)

Roger

From: Gilles, Nanette
Sent: Wednesday, August 10, 2011 4:51 PM
To: Davis, Roger
Subject: Response to Inhofe

(b)(5)

Nan

Nanette V. Gilles
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S. Nuclear Regulatory Commission

ne: 301-415-1180
Email: nanette.gilles@nrc.gov

~~NOT FOR PUBLIC DISCLOSURE~~

NOT FOR PUBLIC DISCLOSURE

Gilles, Nanette

From: Gilles, Nanette
Sent: Tuesday, August 16, 2011 5:10 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Davis, Roger; Baggett, Steven
Subject: RE: DRAFT SRM - SECY-11-0093 (Near-Term Report - Events in Japan)

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(b)(5)

NOT FOR PUBLIC DISCLOSURE

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Apostolakis, George
Sent: Tuesday, August 16, 2011 7:04 AM
To: Gilles, Nanette
Cc: Sosa, Belkys; Davis, Roger
Subject: DRAFT SRM - SECY-11-0093 (Near-Term Report - Events in Japan)

(b)(5)

~~NOT FOR PUBLIC DISCLOSURE~~

Baggett, Steven

om: Sosa, Belkys
nt: Tuesday, August 16, 2011 5:45 PM
To: Baggett, Steven; Apostolakis, George; Davis, Roger; Gilles, Nanette
Subject: FYI: Frontline Interview 8/25

(b)(5)

Below is information from Scott Burnell for your awarness.

Steve

~~NOT FOR PUBLIC DISCLOSURE~~

From: Jon Palfreman [mailto:jpalfreman@pfgmedia.com]
Sent: Tuesday, August 16, 2011 2:02 PM
To: Burnell, Scott
Cc: Kate McMahon
Subject: Re: Frontline Interview 8/25

Scott...it will be a two camera interview, with Miles O'Brien as correspondent.

m aware that Dr Apostolakis will be expressing his own opinions and not speaking for the agency.

The basic objective is to discuss the issues raised by and lessons learned from the Fukushima Daiichi accident and of course to talk about the recommendations of the NRC Task Force.
This is a great opportunity to engage the audience with some of the nuclear safety issues raised by this nuclear disaster. This was a beyond design basis natural disaster, one in which a plant proved highly vulnerable to common cause failure. The earthquake/tsunami led to a prolonged Station Blackout, where onsite and offsite power vanished virtually simultaneously. This rapidly progressed into a severe accident with multiple hydrogen explosions.... an accident that released radiation into the environment causing considerable social and economic disruption. Our audience will want to understand what nuclear safety enhancements are being considered in the US to protect against and mitigate such an event happening here.

One issue, of course, is how adequately the NRCs patchwork of rules, and mandatory and voluntary guidelines deals with such low probability high consequence events.

Look forward to seeing you on August 25. My colleague Kate McMahon will be in touch with you and Brenda Akstulewicz to confirm the details.

best,

Jon

On Aug 15, 2011, at 11:32 AM, Burnell, Scott wrote:

Hi Jon;

ave you had the chance to firm up the questions and/or specific topics for next week? Thanks.

Scott

-----Original Message-----
From: Burnell, Scott
Sent: Tuesday, August 02, 2011 11:35 AM
To: Jon Palfreman
Cc: Brenner, Eliot
Subject: RE: Hi

Hi Jon;

I'll double-check with the Commissioner's staff on that particular time. Please keep in mind that if the Commission is still considering the task force recommendations on the 25th, Commissioner Apostolakis might not be able to have an in-depth conversation on the subject.

Scott

-----Original Message-----
From: Jon Palfreman [mailto:jpalfreman@pfgmedia.com]
Sent: Tuesday, August 02, 2011 11:21 AM
To: Burnell, Scott
Subject: Hi

Scott, regarding the interview with Commissioner Apostolakis on August 25, we would like the slot beginning at 3.00 pm if possible and we will be likely using a room in the Marriott across the street.
Regarding questions, the focus will be on lessons learned from Fukushima and proposals to enhance nuclear safety in US nuclear plants.

best,

Jon

Sosa, Belkys

m: Gilles, Nanette
nt: Wednesday, August 17, 2011 5:41 PM
o: Baggett, Steven; Sosa, Belkys
Cc: Davis, Roger
Subject: Turnover Notes

Steve/Belkys - I will be checking e-mail daily, so I should be able to respond to any urgent issues that arise this week. Next week, I will be in class at MIT and will not be able to check e-mail as often. I will be back in the office on Friday, 8/26. Here are the active items on my plate:

- (b)(5)
- (b)(5)

I think that's it. See you all next week.

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

Apostolakis, George

m: Woody Epstein [sep@scandpower.com]
t: Wednesday, August 24, 2011 3:07 AM
Yamaguchi, Akira
Cc: Ninokata-sensei; (b)(6) KURAMOTO Takahiro
Subject: RE: Kyoto Landslide Sympo_Panel discussion
Attachments: An Open Letter from Woody Epstein to the Genshiryoku.pdf

Importance: High

Gentlemen,

Please read my attached letter to everyone. If my English is too difficult, then I will have this translated tomorrow.

I am looking forward to your comments.

Woody

Woody Epstein
Senior Principal Consultant
Manager of Risk Consulting, Japan

Japan +81 (0)80-4401-5417
USA: +1 202-657-5417
Skype (b)(6)

---

m: Yamaguchi, Akira [yamaguchi@see.eng.osaka-u.ac.jp]
nt: Wednesday, August 24, 2011 00:40
To: Woody Epstein
Cc: 電中研 松山; Ninokata-sensei; (b)(6) KURAMOTO Takahiro
Subject: Re: Kyoto Landslide Sympo_Panel discussion

Dear Woody,

We confused the Landslide Sympo and the Tsunami Hazard WS.

This is my personal point. As you say, I insist on the best science and engineering. The AESJ takes any theories and models if they go through technical discussion. The JSCE method is the only one that accords the condition at present. I put the priority on the early issuance of AESJ standard.

I wish we would have the the Tsunami hazard WS as soon as possible. But I want to invite Japanese key researchers such as Satake sensei, Matsuyama san. Also I have an appointment on October 13.

So I appreciate it very much if you would manage things so that we place the Workshop on appropriate date for us.

Best regards,

//////////////////////////////////
Akira Yamaguchi, Ph.D.
Professor
Department of Energy and Environment Engineering
Osaka University
2-1 Yamadaoka Suita, Osaka 565-0871 Japan

Tel: 06-6879-7890
Fax: 06-6879-7891
E-mail:yamaguchi@see.eng.osaka-u.ac.jp

On 2011/08/23 8:57, Woody Epstein wrote:
Dear All,

The eMail from Satake-sensei confirms what I said on Thursday in Tokyo:

1. Dr. Watts has been invited to be on the panel discussion on the Tohoku tsunami at the conference in Kyoto;
2. Satake-sensei cannot attend our proposed workshop if it is on October 13-14.

My questions have not been answered:

1. Will the AESJ consider only the tsunami hazard method from the JSCE?
2. How will the tsunami hazard results be used in a PRA?
3. Will the AESJ review the other methods such as the "Logic Tree Approach", the methods of Dr. Watts, the historical Bayesian approach, the geological approach, or the EPRI methodology?

We are in a serious situation in Japan. The public does not trust nuclear professionals or the Japanese government.

The AESJ must do the best science possible. We must consider all methods of tsunami hazard and the methods for putting the hazard results into PRA, both the Large Event Tree Method and the Large Fault Tree Method.

Please consider my opinion.

dy

Woody Epstein
Senior Principal Consultant
Manager of Risk Consulting, Japan

Japan +81 (0)80-4401-5417
USA: +1 202-657-5417
Skype: (b)(6)

From: Kenji Satake [satake@eri.u-tokyo.ac.jp]
Sent: Monday, August 22, 2011 22:43
To: yamaguchi@see.eng.osaka-u.ac.jp; 電中研 松山
Cc: KURAMOTO Takahiro; Woody Epstein
Subject: Re: Kyoto Landslide Sympo_Panel discussion

山口先生，松山様，倉本様

東大地震研の佐竹です．情報が錯綜しているようです．

私の理解では，以下の通りです．

1．10月24，25，26日のワークショップは，海底地滑りに関するもので，（海底地滑りによる）津波はトピックの一つであるが，地震による津波はトピックに入っていなかった

3月11日の地震を受けて，急遽参加者の中から数人を選んでパネルディスカッションを計画．私がモデレーターに指名されている．

3. 上記ワークショップに参加する Phil Watts から、上記ワークショップの前（10 月 13－14 日？）に大阪で 津波 PSA のワークショップを開きたいという打診があった.

上の日程は地震学会（10 月 12－15 日）と重なっているのと，その後も私は別件があり，10 月は空いている日程がなとから，私は参加をお断りした.

8 月初めに Phil Watts から送られてきた flyer を添付します. これが山口先生がおっしゃっていたものだとは先ほどまで気づきませんでした.

At 15:48 11/08/22, Yamaguchi, Akira wrote:

佐竹先生、松山様

大阪大学の山口です。津波 PRA 標準では大変お世話になっております。

さて、以前にお問い合わせしました津波ハザードのワークショップが 10 月 24 日から 26 日に開催されるとのこと。

このワークショップには、佐竹先生、松山様もご出席されるのでしょうか。また、この場で、土木学会の手法などは論点となるのでしょうか。私どもも、注視しておきたいと考えています。

また、このワークショップ開催は、学会標準の投票中、あるいはパブリックコメントの途中になると思います。必要であれば準備が必要となるかもしれません。

多忙のところ恐縮ですが、ご意見をお聞かせいただければ幸いです。

////////////////////////////////////
Akira Yamaguchi, Ph.D.
Professor
Department of Energy and Environment Engineering
Osaka University
2-1 Yamadaoka Suita, Osaka 565-0871 Japan
Tel: 06-6879-7890
Fax: 06-6879-7891

E-mail:yamaguchi@see.eng.osaka-u.ac.jp

On 2011/08/19 0:27, KURAMOTO Takahiro wrote:

Dear Woody-san:
=
The landslide sympo. will be held = on Oct 24,25,26.
I find = the website of sympo. as follows:
p://www.landslide.jp/

--
= KURAMOTO Takahiro

= = = Nuclear Engineering, Ltd. (NEL)
= = = Deputy General Manager
= = = (Design Group, Safety Group)
= = Design Service Division
= = = = = Tel: = +81-6-6446-9361
= = = = = = = e-mail: tkuramoto@neltd.co.jp
= = = = = = = Web: http://www.neltd.co.jp/html/top-eng.html
=
The Information contained in this message is intended for the addressee only.
If you are not the addressee, please notify the sender immediately by return e-mail and delete this message.
Thank you.
=

From: Woody Epstein [mailto:sep@scandpower.com]
Sent: Thursday, August 18, 2011 6:34 PM
To: yamaguchi@see.eng.osaka-u.ac.jp
Cc: tkuramoto@neltd.co.jp
Subject: FW: Re: Kyoto Landslide Sympo_Panel discussion
Importance: High

Dear Yamaguchi-sensei,
=
Thank you for the good talk.
=
Please read below the invitation for Dr. Watts.
=
Woody

From: Toshiya Kanamatsu <toshiyak@jamstec.go.jp>
Subject: Kyoto Landslide Sympo_Panel discussion
To: (b)(6)
Cc: "Kenji Satake" <satake@eri.u-tokyo.ac.jp>
Date: Wednesday, August 3, 2011, 9:39 PM

Dr. Philip Watts

Thank you for your joining ISSMMTC Kyoto symposium in the next October.
We are planning to have three panel discussions during this symposium. = One of them is tentatively entitled "Tsunami and 2011 Tohoku Earthquake", and I would like to ask you to be one of panelists for that panel, if you are interesting in.

Details are not yet fixed, but
= 1) it is about one hour session, =
= 2) Satake-san will lead this panel
= 3) about 10 minutes presentation for each panelist concerning "Tsunami and 2011 Tohoku Earthquake"
are planed.

We would appreciate it if you could present in the panel discussion.
Thank you for your consideration and I look forward to hearing your intention from you.

sincerely,

Toshiya Kanamatsu

IFREE/Subduction Geodynamics Research Team

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

2-15 Natsushima-cho

suka, 237-0061 Japan

++++++++++++++++++++++++++++

佐竹　健治
東京大学　地震研究所
〒113-0032　東京都文京区弥生 1-1-1
電子メール　satake@eri.u-tokyo.ac.jp
電話 03-5841-0219; FAX: 03-3814-5507

An Open Letter from Woody Epstein to the Genshiryoku-mura

Gentlemen:

I understand the words of Yamaguchi-sensei. Respectfully, I must disagree.

In April, 2011, I sent to Yamaguchi-sensei my simple, but effective, Bayesian study of tsunami recurrence.

In May, Yamaguchi-sensei said to me that we must find a tsunami expert because all current methods in Japan are methods from civil engineers.

In June, Dr. David Johnson recommended Dr. Watts and his work as important for Japan. I read the papers and researched his expertise. On July 8th, 2011, I sent to all of you the papers and CV of Dr. Watts and his methods.

I think that this was enough time to consider methods other than the method of the Japan Society of Civil Engineers (JSCE). Now, I think that consideration of other methods was not important for the AESJ.

Yamaguchi-sensei says "I put priority on the early issuance of AESJ Standard". Yamaguchi-sensei says this because he wants the Standard to be ready for the stress tests.

I put priority on the people of Japan and NPP safety. Everyone in the nuclear world is looking at Japan. Everyone in the world is concerned that we are honest and take our time doing the best science available. The Genshiryoku-mura is not only in Japan. Now it is the world. The ANS, ASME, ACRS, and NRC would never hurry in place of safety. Safety is first, always.

The Japanese people do not trust the nuclear professionals of Japan. We must change this. We cannot let NPP continue to operate if they are at risk of CDF and LERF higher than regulatory limits. This is our number one job.

Let us take more time to consider other methods which are accepted in many different countries: PerfectWave, Geowave, Funwave, Topics, and GOTHIC are all examples.

If this means that the AESJ Standard will be late, then this is OK. If this means that the stress test will be late, then this is OK. It is better to be late than to be un-safe. This is what we would do in the USA.

We know that the JSCE method underestimated tsunami height at Onagawa, Fukushima Daiichi, and Fukushima Daini. We know that the JSCE method could not calculate tsunami force, velocity, inundation distance, and wave effects when the wave hit a tsunami wall or other buildings. We know that the JSCE method does not consider ground subsidence after an earthquake.

We should do the proposed benchmarking pilot project immediately, before we issue the AESJ Standard. Yamaguchi-sensei thinks this exercise might need one year. I think that if we start now, we could have good results by January, 2012.

You might say that 3 months is impossible for the benchmark because we are all too busy. In Japan, everyone is always "too busy".

How can we be "too busy" to do good science, make Japan safe from another radiation accident, make 100% sure that the NPP of Japan are as safe as we can, and insure the good name of Japan and nuclear power all over the world?

Please consider my words. Let your actions as nuclear professionals become a light for the world.

08/24/11

Baggett, Steven

From: Davis, Roger
Sent: Thursday, August 25, 2011 1:41 PM
To: Apostolakis, George; Baggett, Steven; Sosa, Belkys; Gilles, Nanette
Subject: FW: Wall Street Journal article on potassium iodide

fyi

From: Peter Crane [mailto (b)(6)
Sent: Thursday, August 25, 2011 1:22 PM
To: Magwood, William
Cc: Bupp, Margaret
Subject: Wall Street Journal article on potassium iodide

Dear Commissioner Magwood:

I thought that the attached article on potassium iodide in the Wall Street Journal might interest you. It's a further indication of just how entrenched the NRC staff is on the KI issue. A Commissioner may ask serious questions, and the Fukushima Task Force may make ambiguous promises about taking a fresh look at KI as part of its longer-range study, but the public face of the NRC remains as rigid and immovable as ever.

It is, regrettably, an old story at NRC: on this one issue, for some reason, the staff seems not to care what the Commissioners say or do. It has its own agenda and pursues it relentlessly.

Best regards,

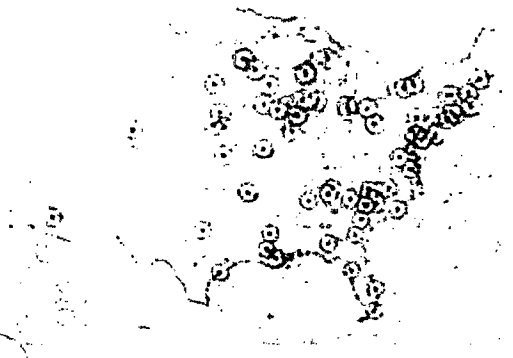
Peter Crane

By REBECCA SMITH

It has been nearly a decade since Congress passed a law promoting distribution of pills to people living near nuclear plants that would minimize one potentially lethal effect of accidental radiation exposure. But the law still hasn't been implemented.

Nuclear Evacuation Zones

View Interactive



ee what 10-mile and 50-mile evacuation zones around U.S. nuclear power plants would look like, and the population that would be affected.

Now, lawmakers and public advocates are once again urging action, citing Tuesday's earthquake in Virginia and the much larger temblor last March in Japan as evidence that more needs to be done because, in each case, nuclear reactors temporarily lost grid power, a condition that poses the threat of radiation release if reactors overheat and can't be sufficiently cooled.

In the case of Japan's quake and tsunami, there was massive damage to reactors, which overheated when electricity was lost for many days, leading to the release of radiation. Virginia's 5.8-magnitude quake caused the North Anna nuclear power station to trip out of service, but generators kicked in and normal connections were restored within 24 hours.

U.S. law requires the president to authorize the distribution of pills to people living within 20 miles of reactors to protect them against a type of cancer caused by radiation exposure. The pills—containing inexpensive potassium iodide, which is the substance used to iodize common table salt—can prevent thyroid cancer by saturating the thyroid gland with a harmless type of iodine, keeping it from absorbing radioactive iodine that might be inhaled or ingested after a radiation release. Each 65mg pill provides about a day's worth of protection.

The law never was implemented because the Bush administration, in early 2008, used a waiver in the law that allowed the president to skip the distribution in an extended area beyond an existing 10-mile emergency planning zone if a "more effective prophylaxis or preventive measures" was identified.

John Marburger, Mr. Bush's science advisor, who died last month of complications from lymphoma, exercised the exemption by ruling then that "avoidance of exposure altogether" was a better prophylaxis than potassium iodide. He said avoidance could be accomplished "through evacuation" and "interdiction of contaminated food."

Thus, the executive branch action, in effect, "wiped the law from the books," said Peter Crane, a retired attorney in Seattle who worked at the U.S. Nuclear Regulatory Commission and strongly supports the law's implementation. He and others, including Rep. Edward Markey (D., Mass.), author of the provision in the 2002 act, now are urging the Obama administration and the NRC to take another look at the issue.

Advocates of the law cite evidence showing that many Japanese citizens, including hundreds of children, were exposed to radiation in March, though the Japanese government says it believes amounts weren't harmful.

Nevertheless, in Fukushima prefecture, where the crippled reactors are located, some 1.51 million potassium iodide pills were distributed, enough to dose 750,000 people living within 30 miles, or 50 kilometers , of the plant. Many of those living closest to the plant already had left the area by the time pills were made available, Japanese officials said last week.

Mr. Markey said this week that the accident in Japan underscores the need to provide pills as a "common-sense measure" to people living within 20 miles of reactors "in recognition of the probability that rapid evacuation during a nuclear meltdown may be difficult and time-consuming."

At least 30 members of Congress have asked the Obama White House to take a fresh look, too, even though President Obama's science adviser said—eight months before the accident in Japan—that no change was warranted. The Science and Technology Office now supports a reassessment, a spokesman said Tuesday.

Currently, it's up to states to decide whether to stockpile or distribute potassium iodide tablets for those living within 10 miles of a reactor. Some 33 states are eligible to receive free pills from the NRC and 23 states have gotten approximately 32 million tablets from the NRC, according to the Department of Homeland Security. Virginia is one of the participating states.

But, according to a 2010 Federal Emergency Management Agency study, 11 states with reactors still have no

distribution program: Arkansas, Georgia, Iowa, Kansas, Louisiana, Michigan, Missouri, Nebraska, Texas, Washington and Wisconsin.

Individuals are not dependent on their states for protection, though. Since 1978, the Food and Drug Administration has permitted people to buy potassium iodide as an inexpensive over-the-counter drug.

The NRC, thus far, has shown little interest in reviving the 2002 law. In fact, Dr. Marburger set aside the law with support from the NRC. At the time, the agency said the public would be notified within 15 minutes of an accident. Thus "evacuation of the public would begin within 15-30 minutes of their notification" so more pills weren't needed.

NRC officials say they do not favor expanded distribution because there's a misconception about potassium iodide's powers and a fear people might delay in heeding evacuation orders, if they have pills. "It doesn't protect against damage to organs other than the thyroid," said Patricia Milligan, a certified health physicist in the NRC's division of preparedness and response. "It's not an anti-radiation pill, as some people seem to think."

—Yuka Hayashi contributed to this article.

Write to Rebecca Smith at rebecca.smith@wsj.com

Rebecca Smith

Staff Reporter

The Wall Street Journal

(415) 765-8212 office

(b)(6) cell

Davis, Roger

From: Peter Crane (b)(6)
Sent: Thursday, August 25, 2011 1:00 PM
To: Davis, Roger
Subject: Fw: Re: WSJ article on potassium iodide

Roger --
Another indication of who really sets KI policy at NRC. It's not the Commissioners, nor the Fukushima Task Force.
-- Peter

--- On **Thu, 8/25/11, Peter Crane** (b)(6) wrote:

From: Peter Crane (b)(6)
Subject: Re: WSJ article on potassium iodide
To: "RebeccaSmith" <Rebecca.Smith@wsj.com>
Date: Thursday, August 25, 2011, 6:21 AM

Thanks, Rebecca. A good article, and one that, at least at this hour of the morning, doesn't have any factual errors that these bleary eyes can see -- a great rarity for me when I read articles that deal with nuclear matters I know something about. (The fact that KI comes in both 65 mg and 130 mg doses is a minor detail.) But it was that quality in an earlier article that caused me to get in touch with you a few months ago.
Milligan's specious arguments are just what I would expect, lacking only her standard "the American diet is already so full of iodine that we don't need it." Nils Diaz, Commissioner and later Chairman, dealt long ago with the one about how KI might delay evacuation: "Pills or no pills, people are going to get the heck out." And the argument about protecting just one organ: no one ever pretended otherwise, and by her rationale, soldiers wouldn't wear helmets and athletes wouldn't use athletic supporters.
Best --
Peter

--- On **Wed, 8/24/11, Smith, Rebecca** ***<Rebecca.Smith@wsj.com>*** wrote:

From: Smith, Rebecca <Rebecca.Smith@wsj.com>
Subject: WSJ article on potassium iodide
To: "'Peter Crane'" (b)(6)
Date: Wednesday, August 24, 2011, 11:35 PM

By **REBECCA SMITH**

It has been nearly a decade since Congress passed a law promoting distribution of pills to people living near nuclear plants that would minimize one potentially lethal effect of accidental radiation exposure. But the law still hasn't been implemented.

Nuclear Evacuation Zones

View Interactive



See what 10-mile and 50-mile evacuation zones around U.S. nuclear power plants would look like, and the population that would be affected.

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—Yuka Hayashi contributed to this article.

Write to Rebecca Smith at rebecca.smith@wsj.com

Rebecca Smith

Staff Reporter

The Wall Street Journal

(415) 765-8212 office

(b)(6) cell

NOT FOR PUBLIC DISCLOSURE

Davis, Roger

From: Gilles, Nanette
Sent: Monday, August 29, 2011 6:16 PM
To: Apostolakis, George
Cc: Sosa, Belkys; Davis, Roger
Subject: Charter for Japan Longer-Term Review
Attachments: SP11-0117enclosure 1.docx; SP11-0117.docx

(b)(5)

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

NOT FOR PUBLIC DISCLOSURE

CHARTER FOR THE NUCLEAR REGULATORY COMMISSION STEERING COMMITTEE TO CONDUCT A LONGER-TERM REVIEW OF THE EVENTS IN JAPAN

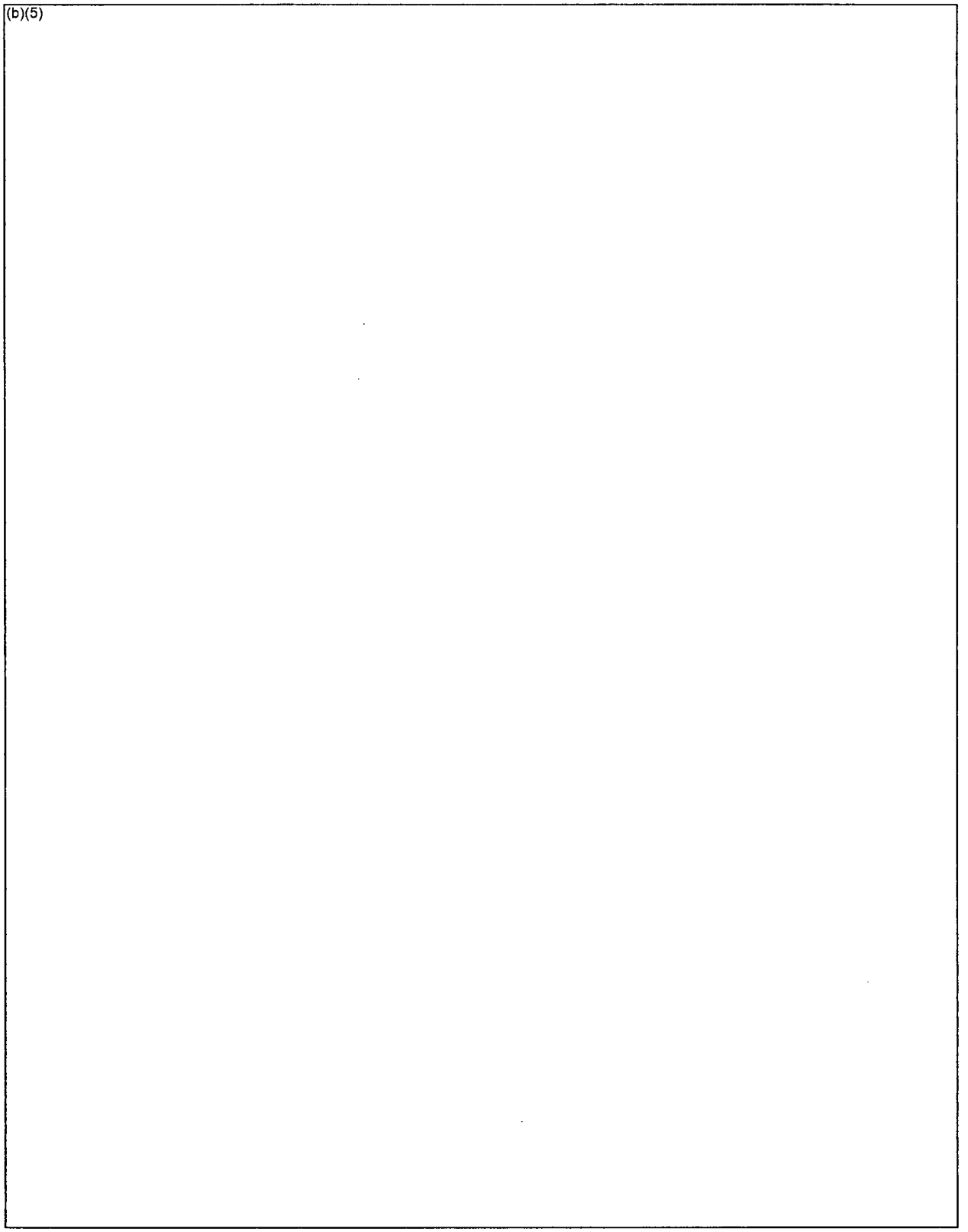
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Enclosure

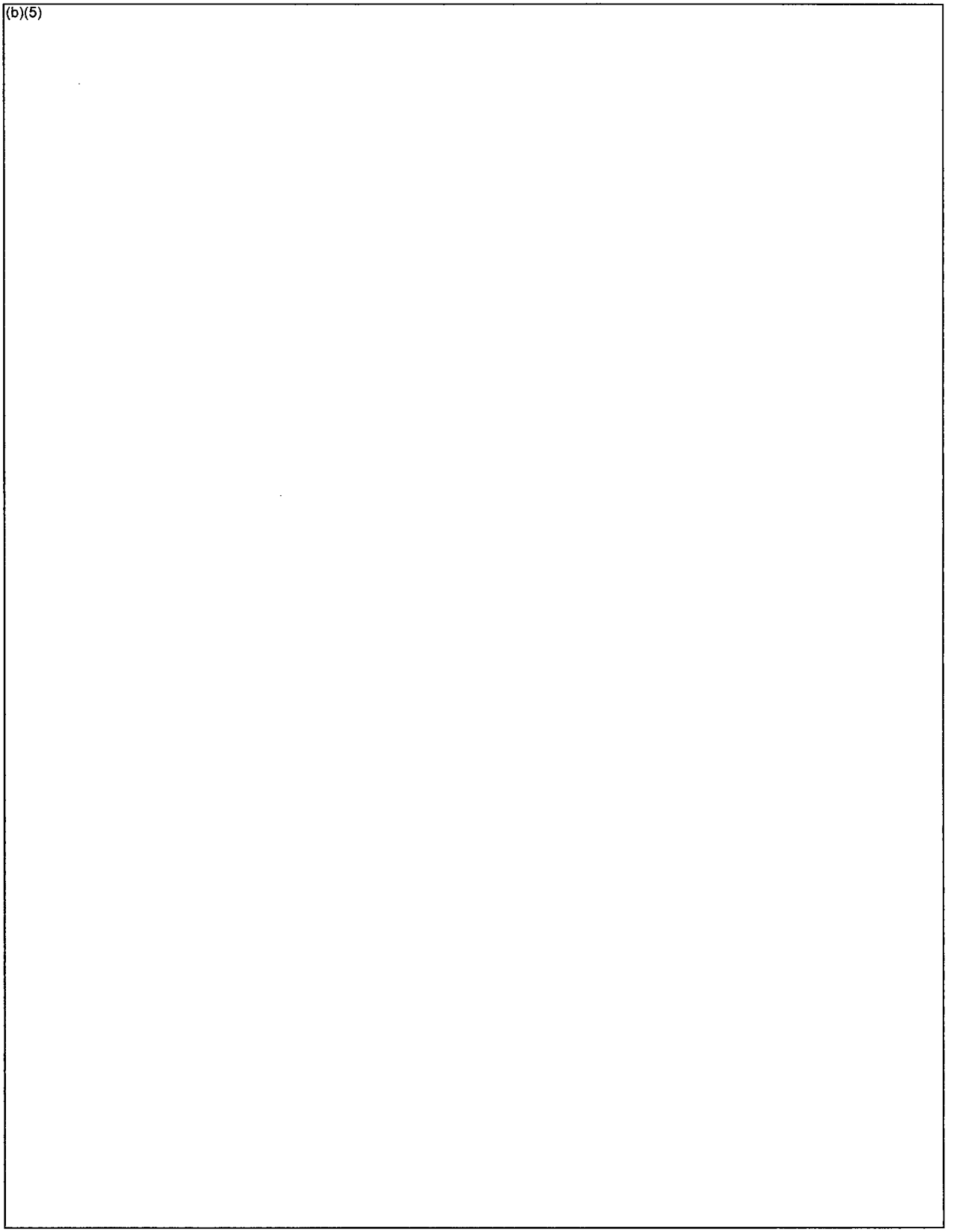
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(b)(5)

POLICY ISSUE

(NOTATION VOTE)

August 26, 2011 SECY-11-0117

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: PROPOSED CHARTER FOR THE LONGER-TERM REVIEW OF LESSONS LEARNED FROM THE MARCH 11, 2011, JAPANESE EARTHQUAKE AND TSUNAMI

(b)(5)

CONTACT: Gregory T. Bowman, OEDO
301-415-2939

(b)(5)

(b)(5)

(b)(5)

/RA/

R. W. Borchardt
Executive Director
for Operations

Enclosure:
Charter for the NRC Steering
Committee to Conduct a Longer-Term
Review of the Events in Japan

(b)(5)

/RA/

R. W. Borchardt
Executive Director
for Operations

Enclosure:
Charter for the NRC Steering
Committee to Conduct a Longer-Term
Review of the Events in Japan

(b)(5)

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8/31/2011

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POLICY ISSUE

(NOTATION VOTE)

August 26, 2011 SECY-11-0117

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: PROPOSED CHARTER FOR THE LONGER-TERM REVIEW OF LESSONS LEARNED FROM THE MARCH 11, 2011, JAPANESE EARTHQUAKE AND TSUNAMI

(b)(5)

CONTACT: Gregory T. Bowman, OEDO
301-415-2939

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NOT FOR PUBLIC DISCLOSURE

(b)(5)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

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NOT FOR PUBLIC DISCLOSURE

(b)(5)

/RA/

R. W. Borchardt
Executive Director
for Operations

Enclosure:
Charter for the NRC Steering
Committee to Conduct a Longer-Term
Review of the Events in Japan

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

(b)(5)

/RA/

R. W. Borchardt
Executive Director
for Operations

Enclosure:
Charter for the NRC Steering
Committee to Conduct a Longer-Term
Review of the Events in Japan

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Commissioner Apostolakis' Comments

CHARTER FOR THE NUCLEAR REGULATORY COMMISSION STEERING COMMITTEE TO CONDUCT A LONGER-TERM REVIEW OF THE EVENTS IN JAPAN

(b)(5)

Enclosure

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

(b)(5)

NOT FOR PUBLIC DISCLOSURE

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NOT FOR PUBLIC DISCLOSURE

(b)(5)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

(b)(5)

NOT FOR PUBLIC DISCLOSURE

(b)(5)

— Original Message —
m: ashok
lars.skanberg@ssm.se ; George.Apostolokus@nrc.gov ; juha.poikolainen@tvo.fi ; jcdelalonde@wanadoo.fr ; De Boeck Benoit
Cc: SCOTT-DE-MARTINVILLE Edouard ; CHEIKH-ALI Ahmad ; (b)(6) ; PASQUINI Hélène
Sent: Thursday, September 01, 2011 11:57 AM
Subject: Eurosafe 2011

Dear Panel members,

It is indeed a great honour to work with you on an important and complex subject of long term operation. The recent tragic events in Japan further emphasize the importance of developing sound scientific bases for safety decisions.

The subject of our discussion is long term safe operation. The issues are how long and how safe? We have approximately 1 hour and 15 minutes to address important points. Some of the points to consider:

1) Many of the existing requirements were developed decades ago. How are the lessons from experience and research used to update safety requirements?

2) Should long term operation approval be based on current rules? Recently approved IAEA NSR-1 revised requirements for new designs?

3) What is the role of safety goals? Qualitative? Quantitative? Combination? What role should PRA play?

4) How long? 40,60 or 80 years? Bases and necessary information from research? Should Safety Authorities/TSOs conduct selected research? What are the operators doing?

Public expectations in granting (or not granting) approval for long term operation?

6) Fukushima implications for long term operation?

The panel is composed of a mix of regulators, operators, TSOs and NGO and, thus, it would be useful to have various perspectives on these and/or other points you consider important. I would very much appreciate a brief bio and your thoughts on these and any other points of interest to you. Given the limited time, your prepared remarks should be brief (8~10 minutes) so we have an opportunity for Q and A session. I plan to make brief opening remrks to introduce you and to context the points for discussion.

Thanks and best regards,

Ashok

Information from ESET NOD32 Antivirus, version of virus signature database 6427 (20110901)

The message was checked by ESET NOD32 Antivirus.

http://www.eset.com

Information from ESET NOD32 Antivirus, version of virus signature database 6537 (20111012)

The message was checked by ESET NOD32 Antivirus.

http://www.eset.com

Information from ESET NOD32 Antivirus, version of virus signature database 6538 (20111012)

The message was checked by ESET NOD32 Antivirus.

http://www.eset.com

Information from ESET NOD32 Antivirus, version of virus signature database 6538 (20111012)

The message was checked by ESET NOD32 Antivirus.

http://www.eset.com

Information from ESET NOD32 Antivirus, version of virus signature database 6569 (20111024)

The message was checked by ESET NOD32 Antivirus.

http://www.eset.com

Apostolakis, George

From: Apostolakis, George
Sent: Thursday, September 01, 2011 1:12 PM
To: Sosa, Belkys; Blake, Kathleen
Subject: FW: Eurosafe 2011

From: ashok [mailto:(b)(6)
Sent: Thursday, September 01, 2011 12:18 PM
To: Apostolakis, George
Subject: Fw: Eurosafe 2011

Used incorrect spelling!

---- Original Message ----
From: ashok
To: lars.skanberg@ssm.se ; George.Apostolokus@nrc.gov ; juha.poikolainen@tvo.fi ; jcdelalonde@wanadoo.fr ; De Boeck Benoit
Cc: SCOTT-DE-MARTINVILLE Edouard ; CHEIKH-ALI Ahmad (b)(6) PASQUINI Hélène
Sent: Thursday, September 01, 2011 11:57 AM
Subject: Eurosafe 2011

Dear Panel members,

It is indeed a great honour to work with you on an important and complex subject of long term operation. The recent tragic events in Japan further emphasize the importance of developing sound scientific bases for safety decisions.

The subject of our discussion is long term safe operation. The issues are how long and how safe? We have approximately 1 hour and 15 minutes to address important points. Some of the points to consider:

1) Many of the existing requirements were developed decades ago. How are the lessons from experience and research used to update safety requirements?

2) Should long term operation approval be based on current rules? Recently approved IAEA NSR-1 revised requirements for new designs?

3) What is the role of safety goals? Qualitative? Quantitative? Combination? What role should PRA play?

4) How long? 40,60 or 80 years? Bases and necessary information from research? Should Safety Authorities/TSOs conduct selected research? What are the operators doing?

5) Public expectations in granting (or not granting) approval for long term operation?

6) Fukushima implications for long term operation?

The panel is composed of a mix of regulators, operators, TSOs and NGO and, thus, it would be useful to have various perspectives on these and/or other points you consider important. I would very much appreciate a brief bio and your thoughts on these and any other points of interest to you. Given the limited time, your prepared remarks should be brief (8~10 minutes) so we have an opportunity for Q and A session. I plan to make brief opening remrks to introduce you and contextthe points for discussion.

Thanks and best regards,

Ashok

Information from ESET NOD32 Antivirus, version of virus signature database 6427 (20110901)

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http://www.eset.com

Information from ESET NOD32 Antivirus, version of virus signature database 6427 (20110901)

The message was checked by ESET NOD32 Antivirus.

http://www.eset.com

Information from ESET NOD32 Antivirus, version of virus signature database 6427 (20110901)

The message was checked by ESET NOD32 Antivirus.

http://www.eset.com

Staff Assessment of Near-Term Task Force Recommendations

(b)(5)

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(b)(5)

(b)(5)

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(b)(5)

(b)(5)

(b)(5)

(b)(5)

(b)(5)

Gilles, Nanette

om: Gilles, Nanette
nt: Monday, September 19, 2011 3:59 PM
To: Lui, Christiana; Sosa, Belkys; Baggett, Steven; Davis, Roger; Apostolakis, George; Cunningham, Mark
Subject: RE: Heads up Questions from Region III during the All Hands Mtg on Wed

(b)(5)

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Lui, Christiana
Sent: Monday, September 19, 2011 12:36 PM
To: Sosa, Belkys; Baggett, Steven; Davis, Roger; Gilles, Nanette; Apostolakis, George; Cunningham, Mark
Subject: Heads up Questions from Region III during the All Hands Mtg on Wed

(b)(5)

(b)(5)

NOT FOR PUBLIC DISCLOSURE

Gilles, Nanette

From: Apostolakis, George
Sent: Sunday, September 25, 2011 12:53 PM
To: Gilles, Nanette
Cc: Sosa, Belkys; Davis, Roger
Subject: SP-11-0124
Attachments: GEA+.SP-11-0124.docx

Nan:

(b)(5)

GA

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

NOTATION VOTE

RESPONSE SHEET

TO: Annette Vietti-Cook, Secretary

FROM: COMMISSIONER APOSTOLAKIS

SUBJECT: SECY-11-0124 – RECOMMENDED ACTIONS TO BE TAKEN WITHOUT DELAY FROM THE NEAR-TERM TASK FORCE REPORT

Approved __X__ Disapproved _____ Abstain _____

Not Participating _____

COMMENTS: Below ___ Attached _X_ None ___

_____
SIGNATURE

_____
DATE

Entered on "STARS" Yes ___ No ___

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Commissioner Apostolakis' Comments on SECY-11-0124
Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report

(b)(5)

NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

om: Gilles, Nanette
ent: Friday, September 30, 2011 10:23 AM
o: Baggett, Steven; Sosa, Belkys; Davis, Roger
Subject: RE: Dr. Philip Watts

(b)(5)

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

From: Baggett, Steven
Sent: Friday, September 30, 2011 6:38 AM
To: Sosa, Belkys; Davis, Roger; Gilles, Nanette
Subject: RE: Dr. Philip Watts

Belkys

(b)(5)

Steve

From: Sosa, Belkys
Sent: Friday, September 30, 2011 2:45 AM
To: Davis, Roger; Gilles, Nanette; Baggett, Steven
Subject: Fw: Dr. Philip Watts

(b)(5)

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Blake, Kathleen
To: Apostolakis, George; Sosa, Belkys
Sent: Thu Sep 29 16:57:51 2011
Subject: Dr. Philip Watts

(b)(5)

Kathleen M. Blake
Administrative Assistant
Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Philip Watts [mailto:(b)(6)
Sent: Thursday, September 29, 2011 4:46 PM
To: Blake, Kathleen
Subject: October 7th Call with the Commissioner

Kathleen,

Thank you for considering scheduling a brief call with Commissioner Apostolakis on October 7 regarding tsunami risks and a report I am writing for the Garrick Foundation involving detailed simulations of the Tohoku tsunami striking Fukushima Daiichi.

Attached is a brief bio of my tsunami credentials for your review. You should find them stellar. These days I tend to have regular tsunami discussions with David Johnson, John Garrick, Woody Epstein, Bob Budnitz, and Peter Yanev. Good company.

The tsunami story as it were is rather alarming regarding Japan. At issue is the US understanding of tsunami risks as well as its regulatory leadership. I'd like to take the pulse of the NRC, find people I can deal with, and formulate an NRC plan of action.

Cheers,

Dr. Philip Watts
Cell: (b)(6)

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applied *fluids* engineering, inc.
6216 E. Pacific Coast Highway, #237
Long Beach, CA 90803
www.appliedfluids.com

Consulting Biography

Dr. Philip Watts earned his PhD in engineering from the California Institute of Technology in 1997. He holds Bachelors and Masters degrees in mechanical engineering from McGill University, with a specialty in aeronautics. Dr. Watts is the author of more than 70 scientific publications on tsunamis during 12 years. Dr. Watts and Prof. Tappin co-founded the scientific field of "landslide tsunamis" through their work on the 1998 Papua New Guinea tsunami. Dr. Watts was the first scientist to study probability distributions for landslide tsunamis, and he is the world leader in Probabilistic Tsunami Hazard Assessment (PTHA), having consulted for years with the insurance, oil & gas, and nuclear industries. Dr. Watts and two colleagues currently distribute the open source tsunami simulation model Geowave for free to tsunami scientists around the world – a veritable community model. Dr. Watts recently designed the tsunami exhibit at the Imaginarium Discovery Center in Anchorage, Alaska. From his geology experience and his work on landslide tsunamis, Dr. Watts has a strong history of tsunami hazard assessment and effective techniques for local tsunami warnings.

Dr. Watts is one of the top tsunami scientists in the world. Dr. Watts and his colleagues distinguished themselves by studying tsunami generation by many possible tsunami sources: earthquakes, underwater landslides, debris flows, pyroclastic flows, etc. This work led to the first tsunami generation software ***TOPICS***, which is designed to enable multiple tsunami sources from a single geological event. Dr. Watts led another team of scientists to develop the first fourth order Boussinesq model of tsunami propagation and inundation, called ***Geowave***, enabling tsunami simulations with fully nonlinear and fully dispersive wave physics for the first time. In 2004, Dr. Watts began performing Probabilistic Tsunami Hazard Assessment for earthquake and landslide tsunamis, and also published the most useful tsunami hazard maps yet devised. These were further developed with Risk Management Solutions, Inc. on behalf of the insurance industry. Dr. Watts distributes the tsunami simulation software ***TOPICS*** (generation) and ***Geowave*** (propagation and inundation) for free to more than 40 tsunami scientists in 12 countries around the world. A list of scientific publications is available upon request.

Applied Fluids Engineering, Inc. is a California Corporation founded in 1999. The founding event was the 1998 Papua New Guinea tsunami, which heralded a new era in tsunami science, with new tools and new techniques. Applied Fluids Engineering, Inc. has been contracted to do tsunami consulting work with many institutions, including: University of Rhode Island, University of Hawaii, University of Southern California, US Geological Survey, US National Science Foundation, as well as corporations in the engineering, insurance, oil & gas, and nuclear industries. Ongoing collaborations exist with the British Geological Survey and the University of Delaware.

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applied *fluids* engineering, inc.
6216 E. Pacific Coast Highway, #237
Long Beach, CA 90803
www.appliedfluids.com

MEDIA PRESENCE

Google "Philip Watts Tsunami" and the first few links you get are scientific papers that were written years ago but are highly relevant to the Japan tsunami.

Here is Dr. Watts' Twitter account: Twitter@DoctorTsunami!

You can find Dr. Watts on LinkedIn under "Phil Watts"

Here is the company web site: http://www.appliedfluids.com/

Here is a video of the tsunami exhibit at the Imaginarium Discovery Center:

http://www.youtube.com/watch?v=M5Vzin7TFxM&feature=player_embedded

Here is an appearance March 11, 2011 on KPCC regarding the Japan tsunami:

http://www.scpr.org/programs/airtalk/2011/03/11/earthquake-and-tsunami/

Here is the PhD thesis of Dr. Watts online at Caltech:

http://thesis.library.caltech.edu/4067/

Here is an article from Science News:

http://www.sciencenews.org/sn_arc99/8_14_99/fob2.htm

Here is an article in the LA Times:

http://articles.latimes.com/2001/jan/28/local/me-17957

Here is an article from New Scientist:

http://www.newscientist.com/article/dn272-underwater-landslides-cause-most-tsunamis.html

Other media articles archived include:

The Press Telegram, Long Beach
Science and Engineering, Caltech

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Sosa, Belkys

om: Sosa, Belkys
nt: Friday, September 30, 2011 4:05 PM
: Baggett, Steven
Subject: Re: 10/6 international activities briefing.

Thks Steve!

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Baggett, Steven
To: Sosa, Belkys
Sent: Fri Sep 30 11:49:33 2011
Subject: 10/6 international activities briefing.

Belkys,

You likely saw that the staff slides are available. I don't think the summary document I gave to GA will need to be change. The staff will go into more detail on emerging foreign policy initiatives, NRC's changing international roll as result of Japan event, bilateral and spend some time on the uranium recover support activities.

teve

~~NOT FOR PUBLIC DISCLOSURE~~

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Sosa, Belkys

om: Sosa, Belkys
nt: Friday, September 30, 2011 4:08 PM
o: Blake, Kathleen
Subject: Re: Is U.S. Nuclear Policy Where It Should Be? RSVP Today for a Discussion With Chairman of U.S. NRC

No action

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

~~NOT FOR PUBLIC DISCLOSURE~~

From: Blake, Kathleen
To: Sosa, Belkys
Sent: Fri Sep 30 08:39:10 2011
Subject: FW: Is U.S. Nuclear Policy Where It Should Be? RSVP Today for a Discussion With Chairman of U.S. NRC

0

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: National Journal LIVE [mailto:rsvp@nationaljournal.com]
Sent: Friday, September 30, 2011 8:37 AM
To: Blake, Kathleen
Subject: Is U.S. Nuclear Policy Where It Should Be? RSVP Today for a Discussion With Chairman of U.S. NRC

NATIONAL JOURNAL LIVE POLICY SUMMIT

LESSONS FROM JAPAN

Global Implications of Nuclear Disaster

As we approach the seven month anniversary of the Great East Japan earthquake and tsunami and the ensuing nuclear crisis, Americans still question what happened, why, and what an event of this magnitude means for U.S. nuclear policy and our relative state of preparedness.

National Journal will convene experts to discuss the latest on the current nuclear situation, the U.S. government's efforts to assist Japan, and the public health and economic lessons learned as a result of the disaster.

RSVP: njsummit100511.eventbrite.com

FEATURE INTERVIEW:
Gregory B. Jaczko, Chairman, U.S. Nuclear Regulatory Commission

MODERATED BY:
James Kitfield, Senior Correspondent, National Journal

PANEL:

- Richard W. Caperton, Senior Policy Analyst, Energy Opportunity, Center for American Progress
- Allison Macfarlane, Associate Professor of Environmental Science and Policy, George Mason University

Wednesday, October 5, 2011
8:00 AM Registration
8:30 – 10:30 AM Program

National Press Club
First Amendment Room
529 14th Street NW
Washington DC

RSVP: njsummit100511.eventbrite.com

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Apostolakis, George

m: Apostolakis, George
t: Monday, October 03, 2011 11:26 AM
o: Baggett, Steven; Gilles, Nanette; Davis, Roger; Sosa, Belkys; Blake, Kathleen; Lui, Christiana; Savoy, Carmel
Subject: Re: October 3 EA Meeting Summary

I just visited UW. I'd rather not go again.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Baggett, Steven
To: Gilles, Nanette; Davis, Roger; Sosa, Belkys; Apostolakis, George; Blake, Kathleen; Lui, Christiana; Savoy, Carmel
Sent: Mon Oct 03 11:20:58 2011
Subject: October 3 EA Meeting Summary

Short meeting -

- Prairie Island and Indian Point both tripped without hiccups - reason tech specs
- Davis Besse head replacement process starts this week
- DOE's Chu and Lyons will be visiting GE-H in Wilmington this week
- USEC's stated that if the DOE loan guarantee was not issued soon it would have to shutter the centrifuge plant
- OPA – staff(Dave Skeen) to brief a EPW subcommittee on Japan status
- Weber testifying at hearing on Uranium mining and its impact on the Navajo nation
- CFO noted we have enough money through October 14, 2011.
- GBJ ask SECY to poll for early release of the 45 day paper, SECY had not seen the paper as of this morning.
- All hands meeting apparently some opposition to the Chairman's proposed agenda. GBJ will make brief intro remarks and each Commissioner will be give a few minutes to make opening remarks and then GBJ would open the meeting to questions from the audience
- 10/6 EA meeting will occur in the afternoon. 3:00 pm is what Baggett floated to align with Belkys' calendar.
- Josh to check on the status of the Chairman's vote on the long term charter
- GBJ would like to know if KLS or GEA could speak at the University of Wisconsin on November 16-17 regarding Nuclear Power Post Fukushima and the Renaissance or Reconsideration. GBJ was invited but has a commitment.

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Sosa, Belkys

From: Sosa, Belkys
Sent: Tuesday, October 04, 2011 12:08 PM
To: Gilles, Nanette
Cc: Blake, Kathleen; Davis, Roger
Subject: Re: GA Calendar & Priorities

Concur

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Gilles, Nanette
To: Sosa, Belkys
Cc: Blake, Kathleen; Davis, Roger
Sent: Tue Oct 04 11:08:50 2011
Subject: GA Calendar & Priorities

Belkys – Looking at GA's schedule for the rest of this week and next week, I think we need to rearrange things a little to ensure he has enough time to prepare for next week's Japan Commission meeting and the Summer hearing. I think we need to make the following changes:

10/6, 10:00-11:30, Read SECY-11-0137, Japan 45-day paper
10/7, 9:00-10:00, Read SECY-11-0115, Summer Mandatory Hearing
10/7, 10:00-11:30, Prep for Japan 45-day Commission Meeting
10/7, 1:30-2:30, Read responses to Summer pre-hearing questions
10/7, 2:30-5:00, Prep for Summer Mandatory Hearing
10/13, 2:00-4:00, Read SECY-11-11-0106, ABWR Amendment Final Rule (Note: time freed up the afternoon of 10/13 because the hearing ends at 1:00.)

Let me know if you have any objections to these changes.

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

NOT FOR PUBLIC DISCLOSURE

Apostolakis, George

From: Apostolakis, George
Sent: Wednesday, October 05, 2011 4:56 PM
To: Blake, Kathleen; Sosa, Belkys
Cc: Baggett, Steven
Subject: Re: Dr. Philip Watts

OK. A short phone call will do.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Blake, Kathleen
To: Sosa, Belkys; Apostolakis, George
Cc: Baggett, Steven
Sent: Wed Oct 05 16:27:30 2011
Subject: RE: Dr. Philip Watts

Cmr: Dr. Philip Watts just called again to tell you that he spent the afternoon with Mr. Garrick and that he told Dr. Watts "to tell George to make sure you talk to him".

kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Sosa, Belkys
Sent: Wednesday, October 05, 2011 4:08 PM
To: Blake, Kathleen
Cc: Baggett, Steven
Subject: Re: Dr. Philip Watts

(b)(5)

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Blake, Kathleen
To: Sosa, Belkys
Cc: Baggett, Steven
Sent: Wed Oct 05 15:30:57 2011
Subject: FW: Dr. Philip Watts

(b)(5)

Kathleen M. Blake
inistrative Assistant
Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Apostolakis, George
Sent: Wednesday, October 05, 2011 3:22 PM
To: Baggett, Steven; Blake, Kathleen; Sosa, Belkys; Davis, Roger; Gilles, Nanette
Subject: Re: Dr. Philip Watts

My schedule is crowded. The staff should take care of him.
PS: just arrived.

George Apostolakis
Commissioner, US NRC
Blackberry (b)(6)

From: Baggett, Steven
To: Blake, Kathleen; Sosa, Belkys; Davis, Roger; Gilles, Nanette; Apostolakis, George
nt: Wed Oct 05 13:57:25 2011
ject: RE: Dr. Philip Watts

KB,

Annie K or B Sheron would be in the best position to explain what actions would be needed.

Steve

From: Blake, Kathleen
Sent: Wednesday, October 05, 2011 1:39 PM
To: Sosa, Belkys; Davis, Roger; Baggett, Steven; Gilles, Nanette; Apostolakis, George
Subject: RE: Dr. Philip Watts

(b)(5)

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
55 Rockville Pike
ockville, Maryland 20852
301-415-1810

NOT FOR PUBLIC DISCLOSURE

From: Sosa, Belkys
Sent: Wednesday, October 05, 2011 1:36 AM
To: Davis, Roger; Baggett, Steven; Gilles, Nanette; Apostolakis, George
Cc: Blake, Kathleen
Subject: Re: Dr. Philip Watts

(b)(5)

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Davis, Roger
To: Baggett, Steven; Sosa, Belkys; Gilles, Nanette
Sent: Tue Oct 04 17:01:11 2011
Subject: RE: Dr. Philip Watts

(b)(5)

To: Sosa, Belkys; Davis, Roger; Gilles, Nanette
Subject: RE: Dr. Philip Watts

Belkys

(b)(5)

Steve

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~~NOT FOR PUBLIC DISCLOSURE~~

From: Sosa, Belkys
Sent: Friday, September 30, 2011 2:45 AM
To: Davis, Roger; Gilles, Nanette; Baggett, Steven
Subject: Fw: Dr. Philip Watts

(b)(5)

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Blake, Kathleen
To: Apostolakis, George; Sosa, Belkys
Sent: Thu Sep 29 16:57:51 2011
Subject: Dr. Philip Watts

(b)(5)

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
555 Rockville Pike
ville, Maryland 20852
-415-1810

From: Philip Watts [mailto:(b)(6)
Sent: Thursday, September 29, 2011 4:46 PM
To: Blake, Kathleen
Subject: October 7th Call with the Commissioner

Kathleen,

Thank you for considering scheduling a brief call with Commissioner Apostolakis on October 7 regarding tsunami risks and a report I am writing for the Garrick Foundation involving detailed simulations of the Tohoku tsunami striking Fukushima Daiichi.

Attached is a brief bio of my tsunami credentials for your review. You should find them stellar. These days I tend to have regular tsunami discussions with David Johnson, John Garrick, Woody Epstein, Bob Budnitz, and Peter Yanev. Good company.

The tsunami story as it were is rather alarming regarding Japan. At issue is the US understanding of tsunami risks as well as its regulatory leadership. I'd like to take the pulse of the NRC, find people I can deal with, and formulate an NRC plan of action.

ers,

~~NOT FOR PUBLIC DISCLOSURE~~

Dr. Philip Watts
Cell: (b)(6)

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Sosa, Belkys

From: Blake, Kathleen
Sent: Wednesday, October 05, 2011 10:06 AM
To: Sosa, Belkys; Davis, Roger; Baggett, Steven; Gilles, Nanette; Apostolakis, George
Subject: RE: Dr. Philip Watts

He called again yesterday wanting to talk to the Cmr. kb

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Sosa, Belkys
Sent: Wednesday, October 05, 2011 1:36 AM
To: Davis, Roger; Baggett, Steven; Gilles, Nanette; Apostolakis, George
Cc: Blake, Kathleen
Subject: Re: Dr. Philip Watts

(b)(5)

ks

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Davis, Roger
To: Baggett, Steven; Sosa, Belkys; Gilles, Nanette
Sent: Tue Oct 04 17:01:11 2011
Subject: RE: Dr. Philip Watts

(b)(5)

~~NOT FOR PUBLIC DISCLOSURE~~

(b)(5)

To: Sosa, Belkys; Davis, Roger; Gilles, Nanette
Subject: RE: Dr. Philip Watts

Belkys

(b)(5)

Steve

From: Sosa, Belkys
Sent: Friday, September 30, 2011 2:45 AM
To: Davis, Roger; Gilles, Nanette; Baggett, Steven
Subject: Fw: Dr. Philip Watts

Any insights on this guy?

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Blake, Kathleen
To: Apostolakis, George; Sosa, Belkys
Sent: Thu Sep 29 16:57:51 2011
Subject: Dr. Philip Watts

(b)(5)

Kathleen M. Blake
Administrative Assistant
to Commissioner Apostolakis
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852
301-415-1810

From: Philip Watts [mailto (b)(6)
Sent: Thursday, September 29, 2011 4:46 PM
To: Blake, Kathleen
Subject: October 7th Call with the Commissioner

~~NOT FOR PUBLIC DISCLOSURE~~

Kathleen,

~~NOT FOR PUBLIC DISCLOSURE~~

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The tsunami story as it were is rather alarming regarding Japan. At issue is the US understanding of tsunami risks as well as its regulatory leadership. I'd like to take the pulse of the NRC, find people I can deal with, and formulate an NRC plan of action.

Cheers,

Dr. Philip Watts
Cell: (b)(6)

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NOT FOR PUBLIC DISCLOSURE

Sosa, Belkys

om: Sosa, Belkys
nt: Wednesday, October 05, 2011 4:37 AM
o: Gilles, Nanette; Baggett, Steven; Davis, Roger
Cc: Blake, Kathleen
Subject: Re: GA Calendar & Priorities

Please note that there is a good chance we may need to meet on Monday for a few hours to finish preparing GA for summer and 45day paper.

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

From: Gilles, Nanette
To: Sosa, Belkys
Cc: Blake, Kathleen; Davis, Roger
Sent: Tue Oct 04 11:08:50 2011
Subject: GA Calendar & Priorities

Belkys – Looking at GA's schedule for the rest of this week and next week, I think we need to rearrange things a little to ensure he has enough time to prepare for next week's Japan Commission meeting and the Summer hearing. I think we need to make the following changes:

10/6, 10:00-11:30, Read SECY-11-0137, Japan 45-day paper
10/7, 9:00-10:00, Read SECY-11-0115, Summer Mandatory Hearing
10/7, 10:00-11:30, Prep for Japan 45-day Commission Meeting
10/7, 1:30-2:30, Read responses to Summer pre-hearing questions
10/7, 2:30-5:00, Prep for Summer Mandatory Hearing
10/13, 2:00-4:00, Read SECY-11-11-0106, ABWR Amendment Final Rule (Note: time freed up the afternoon of 10/13 because the hearing ends at 1:00.)

Let me know if you have any objections to these changes.

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

Gilles, Nanette

om: Gilles, Nanette
nt: Friday, October 07, 2011 9:11 AM
To: Apostolakis, George
Cc: Sosa, Belkys; Davis, Roger
Subject: Questions for Japan Meeting
Attachments: Potential Questions-11Oct 2011.docx

Commissioner – FYI - I drafted some proposed questions for the Japan 45-day meeting on Tuesday (attached and in G:/Japan Event/Commission Meetings. We still do not have slides for some of the external panelist, which is why there are no questions for a few of them yet.

Nan

Nanette V. Gilles
Technical Assistant for Reactors
to Commissoner Apostolakis
U. S. Nuclear Regulatory Commission

Phone: 301-415-1180
Email: nanette.gilles@nrc.gov

NOT FOR PUBLIC DISCLOSURE

SECY-11-0137, PRIORITIZATION OF RECOMMENDED ACTIONS TO BE TAKEN IN RESPONSE TO FUKUSHIMA LESSONS LEARNED

Purpose: To provide the staff's proposed prioritization of the Fukushima Near-Term Task Force (NTTF) recommendations to (1) reflect regulatory actions to be taken by the staff in response to the Fukushima lessons learned; (2) identify implementation challenges; (3) include the technical and regulatory bases for the prioritization; (4) identify additional recommendations, if any; and (5) include a schedule and milestones with recommendations for appropriate stakeholder engagement and involvement of the Advisory Committee on Reactor Safeguards (ACRS).

Potential Questions for October 11th Commission Meeting

(b)(5)

(b)(5)

10/8/2011

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POLICY ISSUE
NOTATION VOTE

October 3, 2011 SECY-11-0137

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: PRIORITIZATION OF RECOMMENDED ACTIONS TO BE TAKEN IN RESPONSE TO FUKUSHIMA LESSONS LEARNED

PURPOSE:

(b)(5)

CONTACT: David L. Skeen, NRR/DE
301-415-3298

~~NOT FOR PUBLIC DISCLOSURE~~

NOT FOR PUBLIC DISCLOSURE

(b)(5)

NOT FOR PUBLIC DISCLOSURE

NOT FOR PUBLIC DISCLOSURE

(b)(5)

NOT FOR PUBLIC DISCLOSURE

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NOT FOR PUBLIC DISCLOSURE

(b)(5)

/RA/

R. W. Borchardt
Executive Director
for Operations

Enclosure:
Staff Assessment and Prioritization
of NTTF Recommendations

NOT FOR PUBLIC DISCLOSURE

(b)(5)

/RA/

R. W. Borchardt
Executive Director
for Operations

Enclosure:
Staff Assessment and Prioritization
of NTTF Recommendations

(b)(5)

OFFICIAL RECORD COPY

Apostolakis, George

From: ashok (b)(6)
Sent: Wednesday, October 12, 2011 2:26 PM
To: lars.skanberg@ssm.se; Apostolakis, George; juha.poikolainen@tvo.fi; jcdelalonde@wanadoo.fr; ute.blohm-hieber@ec.europa.eu
Cc: SCOTT-DE-MARTINVILLE Edouard; CHEIKH-ALI ahmad; PASQUINI Hélène; RUTSCHKOWSKY Nathalie; De Boeck Benoit
Subject: Fw: Eurosafe 2011

Dear Panel Members,

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In response to my email below, I have received Bio from Dr. Apostolakis and Dr. De Beck. I will be on travel from October 29 and will return to the US after the Eurosafe conference. Therefore, I would appreciate receiving Bios and any key points you would make during your planned presentation prior to my departure.

In my introduction of the panelists I was considering noting the issues in my email.

Look forward to your response.

Best regards,

Ashok

—— Original Message ——
From: ashok
To: lars.skanberg@ssm.se ; George.Apostolokus@nrc.gov ; juha.poikolainen@tvo.fi ; jcdelalonde@wanadoo.fr ; De Boeck Benoit
Cc: SCOTT-DE-MARTINVILLE Edouard ; CHEIKH-ALI Ahmad ; (b)(6) ; PASQUINI Hélène
Sent: Thursday, September 01, 2011 11:57 AM
Subject: Eurosafe 2011

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5) Public expectations in granting (or not granting) approval for long term operation?

Fukushima implications for long term operation?

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Thanks and best regards,

Ashok

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message was checked by ESET NOD32 Antivirus.

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The message was checked by ESET NOD32 Antivirus.

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Sosa, Belkys

om: Sosa, Belkys
nt: Saturday, October 22, 2011 10:03 PM
: Gilles, Nanette; Apostolakis, George; Baggett, Steven; Blake, Kathleen
Subject: Fw: Eurosafe 2011

We were originally scheduled to work on this presentation Friday; but didn't get a chance. It looks like we need to put together a presentation focus on "how long and how safe" refer to the message below for more info.

Kathleen, we need to find 1hr in the calendar next week.

Sent from an NRC Blackberry
Belkys Sosa
(b)(6)

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From: ashok (b)(6)
To: Sosa, Belkys
Sent: Fri Oct 21 19:17:48 2011
Subject: Fw: Eurosafe 2011

Hi Belkys,

I expect the panelists to give prepared remarks lasting no more than 10 minutes. In the email below I had suggested some areas they may want to consider for their prepared remarks. There will be a few minutes for questions from the audience and me, if necessary. The participants list has changed and current panel members are as follows:

SSM **M. Lars SKÅNBERG** Head of the Section for Reactor Technology and Structural Integrity Solna strandväg 96 SE-171 16 Stockholm - Sweden
TVO - TEOLLISUUDEN VOIMA OY **M. Juha POIKOLAINEN** Safety Advisor, OL4 licensing manager Olkiluoto FI 27160 Eurajoki - Finland
ANCCLI **M. Jean-Claude DELALONDE** Président 183, rue de l'école maternelle BP 6371 59385 Dunkerque Cedex
NRC **George APOSTOLAKIS** Commissioner One White Flint North

11555 Rockville Pike - Mail Stop O-16G4
ROCKVILLE - MD 20852
UNITED STATES OF AMERICA

EC
Mrs Ute BLOHM-HIEBER
Chef de l'unité énergie nucléaire, transports, démantèlement et gestion des déchets
Euroforum building 04/286
10 rue Robert Stumper
2557 LUXEMBOURG

M. Ashok THADANI
Independent consultant
5109 King Charles Way
BETHSEDA
20814 - MARYLAND
UNITED STATES OF AMERICA

Let me know if I can help further.

Ashok

---- Original Message ----
om: ashok
: lars.skanberg@ssm.se ; George.Apostolakis@nrc.gov ; juha.poikolainen@tvo.fi ; jcdelalonde@wanadoo.fr ; ute.blohm-hieber@ec.europa.eu
Cc: SCOTT-DE-MARTINVILLE Edouard ; CHEIKH-ALI ahmad ; PASQUINI Hélène ; RUTSCHKOWSKY Nathalie ; De Boeck Benoit
Sent: Wednesday, October 12, 2011 2:26 PM
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Look forward to your response.

Best regards,

Ashok

---- Original Message ----

From: ashok
To: lars.skanberg@ssm.se ; George.Apostolokus@nrc.gov ; juha.poikolainen@tvo.fi ; jcdelalonde@wanadoo.fr ; De Boeck Benoit
Cc: SCOTT-DE-MARTINVILLE Edouard ; CHEIKH-ALI Ahmad (b)(6) PASQUINI Hélène
Sent: Thursday, September 01, 2011 11:57 AM
Subject: Eurosafe 2011

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Fukushima implications for long term operation?

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http://www.eset.com

Apostolakis, George

m: Apostolakis, George
t: Monday, October 24, 2011 10:01 AM
o: Sosa, Belkys; Blake, Kathleen
Subject: FW: Eurosafe 2011

From: ashok [mailto (b)(6)
Sent: Monday, October 24, 2011 9:41 AM
To: lars.skanberg@ssm.se; Apostolakis, George; juha.poikolainen@tvo.fi; jcdelalonde@wanadoo.fr; ute.blohm-hieber@ec.europa.eu
Cc: SCOTT-DE-MARTINVILLE Edouard; CHEIKH-ALI ahmad; PASQUINI Hélène; RUTSCHKOWSKY Nathalie; De Boeck Benoit
Subject: Fw: Eurosafe 2011

Dear Panel Members,

I am sure that busy schedules have precented us from further coordinating our efforts for the upcoming Eurosafe panel discussion. I will be leaving the US this Saturday for Korea and plan to come to Paris from Korea for the Panel discussion. IRSN has recommended that we meet on November 7 from 10 AM to 11:30AM in the salon of David Weill to prepare for the meeting. The IRSN journalist Jean-Christophe Hedouin will also be there. I look forward to seeing you there. In the meantime, please send me your Bio, if you have not already done so, and any other relevant information.

Best regards,

hok

—— Original Message ——
From: ashok
To: lars.skanberg@ssm.se ; George.Apostolakis@nrc.gov ; juha.poikolainen@tvo.fi ; jcdelalonde@wanadoo.fr ; ute.blohm-hieber@ec.europa.eu
Cc: SCOTT-DE-MARTINVILLE Edouard ; CHEIKH-ALI ahmad ; PASQUINI Hèlène ; RUTSCHKOWSKY Nathalie ; De Boeck Benoit
Sent: Wednesday, October 12, 2011 2:26 PM
Subject: Fw: Eurosafe 2011

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Ashok

Apostolakis, George

From: Apostolakis, George
Sent: Monday, October 24, 2011 4:32 PM
To: Lui, Christiana
Subject: FW: Eurosafe 2011

---- Original Message ----
From: ashok
To: lars.skanberg@ssm.se ; George.Apostolokus@nrc.gov ; juha.poikolainen@tvo.fi ; jcdelalonde@wanadoo.fr ; De Boeck Benoit
Cc: SCOTT-DE-MARTINVILLE Edouard ; CHEIKH-ALI Ahmad ; (b)(6) PASQUINI Hélène
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Evidence of neutron leakage at the Fukushima nuclear plant from measurements of radioactive ^{35}S in California

Antra Priyadarshi, Gerardo Dominguez, and Mark H. Thiemens[1]

9500 Gilman Drive, University of California, San Diego, La Jolla, CA 92093

Edited* by Karl K. Turekian, Yale University, North Haven, CT, and approved July 18, 2011 (received for review June 10, 2011)

A recent earthquake and the subsequent tsunami have extensively damaged the Fukushima nuclear power plant, releasing harmful radiation into the environment. Despite the obvious implication for human health and the surrounding ecology, there are no quantitative estimates of the neutron flux leakage during the weeks following the earthquake. Here, using measurements of radioactive ^{35}S contained in sulfate aerosols and SO_2 gas at a coastal site in La Jolla, California, we show that nearly 4×10^{11} neutrons per m^2 leaked at the Fukushima nuclear power plant before March 20, 2011. A significantly higher $^{35}SO_4^{2-}$ activity as measured on March 28 is in accord with neutrons escaping the reactor core and being absorbed by the coolant seawater ^{35}Cl to produce ^{35}S by a (*n*, *p*) reaction. Once produced, ^{35}S oxidizes to $^{35}SO_2$ and $^{35}SO_4^{2-}$ and was then transported to Southern California due to the presence of strong prevailing westerly winds at this time. Based on a moving box model, we show that the observed activity enhancement in $^{35}SO_4^{2-}$ is compatible with long-range transport of the radiation plume from Fukushima. Our model predicts that $^{35}SO_4^{2-}$, the concentration in the marine boundary layer at Fukushima, was approximately 2×10^5 atoms per m^3, which is approximately 365 times above expected natural concentrations. These measurements and model calculations imply that approximately 0.7% of the total radioactive sulfate present at the marine boundary layer at Fukushima reached Southern California as a result of the trans-Pacific transport.

gas to particle conversion | radioactive sulfur-35

The Fukushima nuclear power plant, situated in northeastern Japan, is one of the largest nuclear power stations in the world, consisting of six boiling water reactors. A recent massive earthquake (9.0 magnitude) (http://earthquake.usgs.gov/earthquakes/eqinthenews/2011/usc0001xgp/) on March 11, 2011, followed by a deadly tsunami has extensively damaged the power plant by disabling the reactor cooling system, which led to nuclear radiation leaks and activation of a 20-km evacuation zone surrounding the plant (http://www.iaea.org). Three weeks subsequent to the earthquake, evidence surfaced of a partial nuclear meltdown in units 1, 2, and 3, visible explosions in units 1 and 3, and a possible uncovering of spent fuels pool associated with units 1, 3, and 4 (http://www.iaea.org). It is suspected that the explosions at unit 3 may have damaged the primary containment vessel. The events at units 1, 2, and 3 have been rated at level 7 (major release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures) on the International Nuclear Event Scale (http://www.iaea.org). The earthquake triggered the automatic shutdown of the three operating reactors—units 1, 2, and 3—and the control rods were completely inserted to terminate the nuclear fission reaction occurring within the fuel core. The details of a nuclear reactor design and operations are described by ref. 1. Residual heat produced at the reactor core due to the radioactive decay of fission products requires extended time periods to cool. Heat must be removed by cooling the system to prevent the fuel rods from overheating and causing a core meltdown, which results in injection of neutrons and other fission products into the atmosphere. Spent fuel that has been removed from a nuclear reactor generates intense heat and is continuously cooled to provide protection from its radioactivity. As reported, maintaining sufficient cooling to remove the decay heat from the reactor was crucial; consequently, the spent fuel pool was the main challenge at the affected reactor site after the March 11 tsunami.

Because both on- and off-site power to the plant was disabled, seawater mixed with boric acid (to reduce the neutron flux in the core and thus slow down the nuclear reaction) was continuously pumped into the reactor vessels of units 1, 2, and 3 from March 13 to March 26, 2011 (http://www.iaea.org). On March 17, seawater was sprayed by helicopters and by concrete pumps on reactor unit 3 and spent fuel containment. The steam generated due to overheating was released through the relief valve into the atmosphere to avoid explosive hydrogen buildup within the reactor vessel. Approximately a few hundred tons of seawater were used as a coolant before switching to fresh water. A consequence is that salts and minerals present in seawater become radioactive by reaction with thermal neutrons emitted from the reactor. For example, nuclear detonation in seawater produces ^{35}S by slow neutron capture by ^{35}Cl via the (*n*, *p*) reaction (2). As described by ref. 3, mainly two isotopes, ^{1}H and ^{35}Cl, present in seawater absorb the slow neutrons. ^{35}Cl, which is highly abundant in seawater (0.55 mol/kg), absorb neutrons to produce radioactive ^{36}Cl and ^{32}P via $^{35}Cl[n,\gamma]^{36}Cl$ and $^{35}Cl[n,\alpha]^{32}P$ reaction, respectively. ^{35}Cl is also converted to radioactive ^{35}S:

$$^{35}Cl_{17} + (n,p) \rightarrow {}^{35}S_{16} \rightarrow {}^{35}Cl_{17} + \beta.$$

$^{35}Cl[n,p]^{35}S$ has a substantial cross-section of 0.44 ± 0.01b for thermal neutrons (4, 5). ^{35}S is also produced via $^{34}S(n,\gamma)^{35}S$, but approximately 200 times less than $^{35}Cl(n,p)^{35}S$ (2). The chemical state of ^{35}S produced after neutron capture is not known, but it is expected that ^{35}S is oxidized into $^{35}SO_2$ and $^{35}SO_4^{2-}$ (6). We assumed that all ^{35}S produced in seawater is transferred to the atmosphere along with the water steam generated at the reactor core due to excessive heating.

Radioactive ^{35}S (β decay to ^{35}Cl, half-life approximately 87 d) is naturally produced in the atmosphere by cosmic ray spallation of ^{40}Ar (7). Once produced, ^{35}S rapidly oxidizes to $^{35}SO_2$ (approximately 1 s), which is removed from the atmosphere by wet and dry deposition. $^{35}SO_2$ may undergo gas and aqueous phase oxidation to produce $^{35}SO_4^{2-}$ aerosols, which are removed

Author contributions: A.P. and M.H.T. designed research; A.P. performed research; G.D. contributed new reagents/analytic tools; A.P. analyzed data; and A.P., G.D., and M.H.T. wrote the paper.

The authors declare no conflict of interest.

*This Direct Submission article had a prearranged editor.

[1]To whom correspondence should be addressed. E-mail: mthiemens@ucsd.edu.

This article contains supporting information online at www.pnas.org/lookup/suppl/doi:10.1073/pnas.1109449108/-/DCSupplemental.

FM 611 of 2929 438

from the atmosphere. ^{35}S is the only radioactive isotope that simultaneously exists in both gas and aerosol phases and has a suitably short half-life to detect air motions, which renders it a sensitive tracer in understanding boundary layer chemistry and air mass transport on short time scales (8, 9). ^{35}S has recently been measured in sulfate aerosols in the Antarctic atmosphere to understand the boundary layer chemistry and stratospheric-tropospheric air mass exchange (10). ^{35}S measurements in sulfate collected from snow and water samples have been measured to determine the source and age of the ground water and also to understand the melting of glaciers and their contribution to lake and stream water (11).

The simultaneous gas and particle speciation and short half-life render ^{35}S a unique isotope to clock gas to particle transformation and transport. Any ^{35}S produced at the Fukushima nuclear plant as a result of earthquake-related damage and seawater-based cooling, combined with its speciation into both the particle and gas phases, could serve as a point source of artificially made ^{35}S and provides an excellent opportunity to understand gas-to-particle conversion and long-range transport over the Pacific.

Result and Discussion

We report ^{35}S measurements of atmospheric SO_2 and sulfate aerosols collected at Scripps Institution of Oceanography (SIO) Pier, La Jolla (32.8N, 117.3W, 10 m amsl) between March 9 and April 12, 2011. As shown in Fig. 1 (Table 1), $^{35}SO_4^{2-}$ activity typically varies between 180 and 475 atoms m^{-3}. A significant increase in $^{35}SO_4^{2-}$ activity (1,501 atoms m^{-3}) was observed on March 28, which is the highest activity ever recorded at this sampling site. Similarly, $^{35}SO_2$ concentrations increased to 120 atoms m^{-3} on March 28 from its background activity of 30–40 atoms m^{-3}.

We have continuously been measuring $^{35}SO_2$ and $^{35}SO_4^{2-}$ at SIO since February 2009, and thus the background ^{35}S activity is well characterized at the sampling site before the Fukushima nuclear plant tragedy transpired. The annual average activity in $^{35}SO_4^{2-}$ and $^{35}SO_2$ is 458 ± 157 and 72 ± 61 atoms m^{-3}, respectively. Brothers et al. (9) reported a similar background activity at the Scripps Pier during 2008. At SIO, $^{35}SO_4^{2-}$ ($^{35}SO_2$) values fluctuate between 300 and 500 (100–150) atoms m^{-3} throughout the year except a few days when $^{35}SO_4^{2-}$ ($^{35}SO_2$) activity spikes to 950 (430) atoms m^{-3}, respectively. This sudden spike in activity

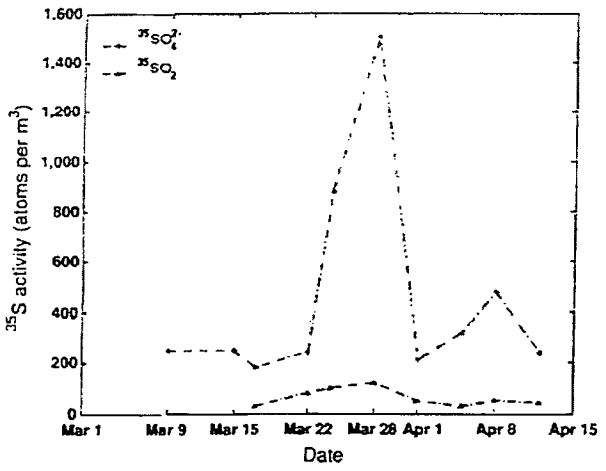


Fig. 1. ^{35}S activity measured in SO_2 gas and sulfate aerosol collected at SIO, La Jolla. A significant increase in $^{35}SO_4^{2-}$ concentration was observed on March 28, 2011, from the natural background $^{35}SO_4^{2-}$ activity. The higher activity observed at SIO is due to the presence of higher concentration of $^{35}SO_4^{2-}$ (365 times higher than the natural abundance) at Fukushima and the radiation plume being transported over the Pacific.

is due to stratospheric intrusion events (spring) and the Santa Ana wind events (easterly high pressure drive winds during late fall–winter) (that lead to the mixing of higher altitude air containing higher ^{35}S activity into the marine boundary layer (MBL). The average $^{35}SO_4^{2-}$ activity observed during spring is 523 ± 190 (Mar–Apr 2009) and 557 ± 156 (Mar–Apr 2010), whereas for $^{35}SO_2$ is 72 ± 30 atoms m^{-3}. The $^{35}SO_4^{2-}$ activity observed on March 28 is higher (>factor of 2) than the spring average, whereas $^{35}SO_2$ values lie within 2σ deviation. Even though the polar region has the highest ^{35}S production rate, the $^{35}SO_4^{2-}$ activity measured at a coastal site in Antarctica (Dumont D'Urville station) is significantly lower (900 atoms m^{-3}) than the activity observed on March 28.

Box Model Calculation

We analyzed two different possible natural scenarios that might cause $^{35}SO_4^{2-}$ concentrations to deviate from the background to the level observed on March 28.

Scenario 1 (Local Stratospheric Intrusion Event). During stratospheric intrusion, stratospheric air masses containing higher $^{35}SO_4^{2-}$ and $^{35}SO_2$ are mixed to the upper free troposphere and are subsequently downward transported to the lower altitude. A 4-Box model, as described by ref. 10, with the model parameters in Table S1 was used to determine the steady state concentration of $^{35}SO_2$ and $^{35}SO_4^{2-}$ at Scripps (Table S2) and to calculate the volume fraction of stratospheric air mass mixing into the free troposphere during the stratospheric intrusion event. The model calculation (see *SI Text*) shows that nearly 40% of stratospheric air mass must mix into the free troposphere to increase the $^{35}SO_4^{2-}$ activity to 1,500 atoms m^{-3} as observed on March 28. This is highly unlikely because most of the stratospheric air mass (90%) returns back to the stratosphere within 6 h of cross-tropopausal exchange (12), and only a small fraction (1–10%) is entrained into the free troposphere (10, 12, 13). In addition, relative humidity and surface ozone concentrations do not exhibit any noticeable change at SIO during the sampling time period typically associated with stratospheric incursions. Consequently, it is regarded as unlikely that a stratospheric intrusion event occurring at Scripps or any region lying in the downwind direction from Fukushima caused the observed enhancement in $^{35}SO_4^{2-}$ and $^{35}SO_2$ on March 28.

Scenario 2 (Long-Range Transport of the Radiation Plume). Long-range transport of gases and aerosol from east Asia to Southern California is most intense during springtime (14, 15) because of strong midlatitude westerly winds (16). The Fukushima nuclear plant served as a point source of $^{35}SO_4^{2-}$ and $^{35}SO_2$ between March 13 and 26, and a radiation plume from Fukushima would be expected to reach Southern California (Scripps) approximately between March 20 and April 1 if the transport time is 6–7 d (17, 18). A 10-d back trajectory for air masses arriving at Scripps on March 28 using a HYSPLIT (19) model reveals that the air mass originated at Japan (Fig. 2) and the long-range transport occurred in the boundary layer with a mean transit altitude of 0.9 km. A moving box model, where a well-mixed box moves along the air mass back trajectory (Fig. 3), was developed to calculate $^{35}SO_4^{2-}$ and $^{35}SO_2$ concentrations at La Jolla due to long-range transport of the radiation plume from Fukushima. The transit time and corresponding transit altitude of the air mass were calculated from a HYSPLIT model for the last 10 d before it arrived at SIO (Table S3). On day 8, the box passes over the region near Fukushima and subsequently spends 4 d in the marine boundary layer before reaching La Jolla on March 28. As shown in Fig. 3, $^{35}SO_4^{2-}$ aerosol and gaseous $^{35}SO_2$ change their concentration through various processes such as dilution due to eddy diffusion, dry deposition over the ocean, oxidation, and the radioactive decay during long-range transport. The model parameters

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Table 1. The measurements of ^{35}S activity contained in SO_2 (gas) and sulfate aerosol collected at Scripps, La Jolla, California, during March–April 2011

Sample					
Start date	End date	Total air flow, m^3	Total disintegration per minute (measured)	^{35}S, atoms/m^3	Total $[SO_4^{2-}]$, ng/m^3
$^{35}SO_4^{2-}$					
3-2-2011	3-9-2011	13,269	18.0 ± 0.4	246 ± 2	3.8
3-9-2011	3-15-2011	9,518	12.9 ± 0.3	246 ± 3	6.6
3-15-2011	3-17-2011	3,338	3.3 ± 0.2	180 ± 6	6.1
3-17-2011	3-22-2011	7,819	10.4 ± 0.3	241 ± 3	18.8
3-22-2011	3-24-2011	3,479	16.8 ± 0.3	876 ± 7	4.8
3-24-2011	3-28-2011	6,502	53.8 ± 0.4	1501 ± 5	3.9
3-28-2011	4-1-2011	6,394	7.4 ± 0.2	210 ± 3	6.5
4-1-2011	4-5-2011	6,511	11.5 ± 0.3	320 ± 4	10.6
4-5-2011	4-8-2011	4,802	12.6 ± 0.3	475 ± 5	9.3
4-8-2011	4-12-2011	6,437	8.4 ± 0.3	237 ± 4	5.5
$^{35}SO_2$					
3-15-2011	3-17-2011	3,338	1.2 ± 0.1	30 ± 6	1.3
3-17-2011	3-22-2011	7,819	3.3 ± 0.1	80 ± 3	1.4
3-22-2011	3-24-2011	3,479	1.7 ± 0.1	100 ± 6	0.9
3-24-2011	3-28-2011	6,502	4.3 ± 0.1	120 ± 3	0.8
3-28-2011	4-1-2011	6,394	1.8 ± 0.1	50 ± 3	1.9
4-1-2011	4-5-2011	6,511	1.0 ± 0.1	28 ± 2	1.0
4-5-2011	4-8-2011	4,802	1.4 ± 0.1	52 ± 3	1.0
4-8-2011	4-12-2011	6,437	1.4 ± 0.1	41 ± 3	1.2

are described in detail (10) (see *SI Text* and Tables S1 and S3). On day 10, the initial concentration of $^{35}SO_4^{2-}$ ($^{35}SO_2$) in the box is taken to be 913 (391) atoms m^{-3}, the same as the average activity in the free troposphere (Table S2). The bidirectional air mass exchange from the box occurs depending on the dilution lifetime (τ_{dil}) of 4.9 d (17). The air mass flux into the box is a ratio of the background concentration of ^{35}S, i.e., $[^{35}SO_2(z)]_b$ and $[^{35}SO_4^{2-}(z)]_b$ present outside the box at that particular altitude (z) to the dilution lifetime. In the model, we assumed that ^{35}S was released mainly in the $^{35}SO_4^{2-}$ phase at the reactor core. The model sensitivity test (Table S4) shows that the model results are not sensitive to the dimension of the moving box but is sensitive to the dilution lifetime (τ_{dil}). Other parameters, such as oxidation lifetime (τ_{ox}) and the initial concentration of $[^{35}SO_2(z)]_b$ and $[^{35}SO_4^{2-}(z)]_b$ in the box had a very small effect on the model results.

The model predicts that a $[^{35}SO_4^{2-}]_f$ concentration of 2×10^5 atoms m^{-3} was present in the buffer layer at Fukushima (Table S5 and Fig. S1). Table S5 shows the effect on the concentration of $^{35}SO_2$ and $^{35}SO_4^{2-}$ arriving at Scripps due to different proportions of $^{35}SO_2$ and $^{35}SO_4^{2-}$ concentrations in the buffer layer (BuL) at Fukushima. Even considering the same concentration of $^{35}SO_2$ and $^{35}SO_4^{2-}$ in the BuL at Fukushima, the model does not show any increase in $^{35}SO_2$ concentrations at La Jolla. This is because the air mass spent 55% of its transit time in the marine boundary layer where $^{35}SO_2$ is rapidly lost due to its oxidation to $^{35}SO_4^{2-}$ with dry deposition over the ocean (18). It is estimated that nearly 24% of $^{35}SO_2$ is oxidized to $^{35}SO_4^{2-}$ in the buffer layer. In the marine boundary layer, 66% of $^{35}SO_2$ is lost due to higher dry deposition over the ocean and oxidation to $^{35}SO_4^{2-}$, which is in agreement with ref. 20. Based on the model calculation and the measurements, it is determined that nearly 0.7% of the total $[^{35}SO_4^{2-}]$ (present at the marine boundary layer at Fukushima) has been transported to the Scripps Pier, La Jolla, California, in a trans-Pacific transport.

The model calculated $^{35}SO_4^{2-}$ concentration in the MBL (2×10^5 atoms m^{-3}) at Fukushima is higher than the stratospheric concentration (Table S2) and suggests an additional source of ^{35}S production due to the $^{35}Cl(n,p)^{35}S$ reaction. We calculated the total number of neutrons that leaked from the reactor core to account for our observations. We use leakage for sea water irradiated by the neutrons produced inside the core. Because the reactor core was melted, the neutron releasing outside is termed as leak. The reaction cross-section of $^{35}Cl(n,p)^{35}S$ was

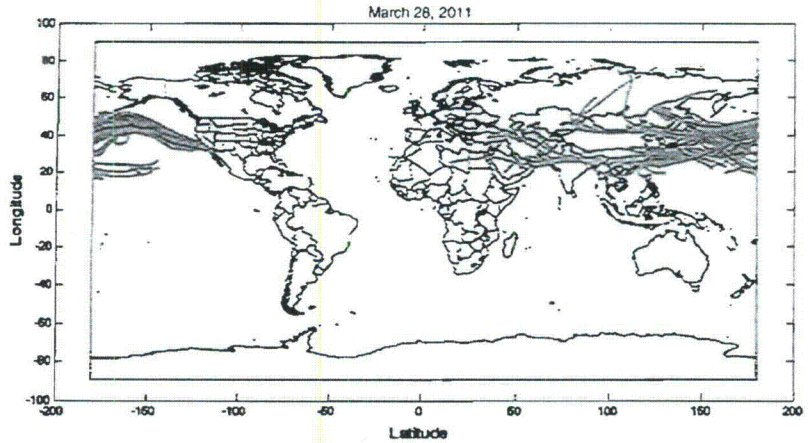


Fig. 2. Ten-day back trajectory obtained for the air mass reaching La Jolla, California, on March 28, 2011, from HYSPLIT model indicates that the air mass originated at Japan.

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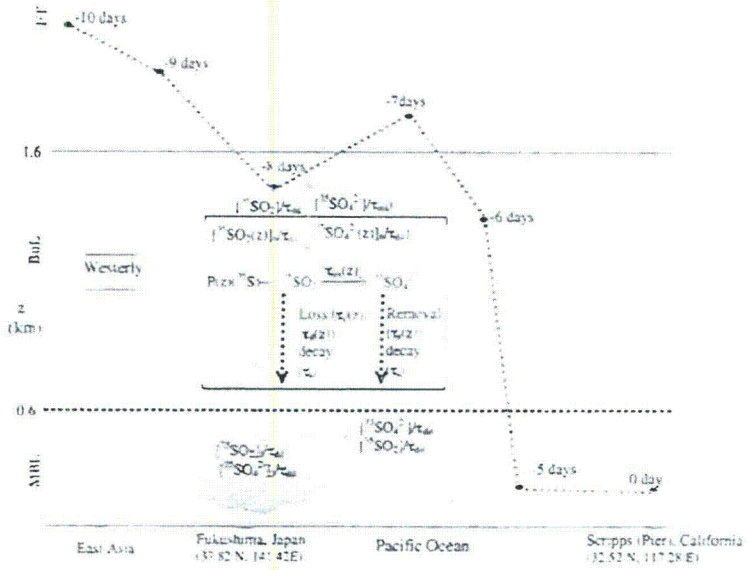


Fig. 3. Schematic description of a moving box model developed to calculate the concentration of $^{35}SO_4^{2-}$ and $^{35}SO_2$ at Scripps pier, La Jolla (California) due to the long-range transport of radiation plume from Fukushima. The atmosphere is divided into four layers: MBL, BuL, free troposphere (FT), and lower stratosphere (LS). τ_{dil} is the dilution lifetime of the radiation plume. τ_{ox} is the oxidation lifetime of $^{35}SO_2$, whereas τ_c and τ_d are the cloud scavenging and dry depositional lifetime of $^{35}SO_2$, respectively. τ_r is the removal lifetime of $^{35}SO_4^{2-}$ (see *SI Text*). The dotted line (red) represents the mean transit altitude at which air mass transport occurred; it was calculated from HYSPLIT model. The model parameters in the box were changed according to its transit altitude (Table S3).

taken from ref. 4. The attenuation length of neutrons in water at room temperature is 2.8 cm and increases at higher temperatures (21). Because of the high absorption cross-section of ^{35}Cl, seawater has more attenuation. The value of the attenuation length of the neutrons in seawater at temperatures higher than 1,000 °C is not known. For simplicity, the attenuation length was taken to be 2.8 cm. The concentration of $^{35}SO_4^{2-}$ at the source (reactor core) was assumed to be 10 times higher than the model-calculated $^{35}SO_4^{2-}$ concentration in the marine boundary layer. Considering all the possible reactions of neutrons with seawater (3), we estimate that a total of 4×10^{11} neutrons per m^2 were released before March 20 in which a fraction of 2×10^8 neutrons per m^2 reacted with ^{35}Cl to make ^{35}S.

Conclusion

We report the observation of radioactive ^{35}S produced by secondary reactions within the reactor core at the Fukushima power plant and estimate the total neutron leakage after the earthquake. The present work also provides a previously undescribed estimate of depositional and oxidation time scales of SO_2 and sulfate during trans-Pacific transport due to a singular strong and well-defined ^{35}S source. The sulfur data are unique because of the coexistence as gas and solid and adds previously undescribed insight into sulfur environmental transformational rates.

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1. Lin CC (1996) *Radiochemistry in Nuclear Power Reactors* (Natl Academy Press, Washington, DC).
2. Love DL, Sam D (1962) Radiochemical determination of sodium-24 and sulfur-35 in seawater. *Anal Chem* 34:336–340.
3. Dryssen D, Nyman PO (1955) Slow-neutron-induced radioactivity of sea-water. *Acta Radiol* 43:421–427.
4. Sims GHE, Juhnke DG (1969) The thermal neutron capture cross section and resonance capture integral of ^{35}Cl for (n, γ) and (n, p) reactions. *J Inorg Nucl Chem* 31:3721–3725.
5. Druyts S, Wagemans C, Geltenbort P (1994) Determination of the $^{35}Cl(n,p)^{35}S$ reaction cross section and its astrophysical implications. *Nucl Phys A* 573:291–305.
6. Giulianelli JL, Willard JE (1974) Chemical states of sulfur-35 formed by the $^{35}Cl(n,p)^{35}S$ process in potassium chloride. *J Phys Chem* 78:372–374.
7. Lal D, Peters B (1967) Cosmic ray produced radioactivity in the earth. *Hand Phys* 46:551–612.
8. Tanaka N, Turekian KK (1991) Use of cosmogenic ^{35}S to determine the rates of removal of atmospheric SO_2. *Nature* 352:226–228.
9. Brothers LA, et al. (2010) Optimized low-level liquid scintillation spectroscopy of ^{35}S for atmospheric and biogeochemical chemistry applications. *Proc Natl Acad Sci USA* 107:5311–5316.
10. Priyadarshi A, Dominguez G, Savarino J, Thiemens M (2011) Cosmogenic ^{35}S: A unique tracer to Antarctic atmospheric chemistry and the polar vortex. *Geophys Res Lett* 38: L13808.
11. Sueker KJ, Turk JT, Michel RL (1999) Use of cosmogenic ^{35}S for comparing ages of water from three alpine-subalpine basins in the Colorado front range. *Geomorphology* 27:61–74.
12. Stohl A, et al. (2003) A new perspective of stratosphere-troposphere exchange. *Bull Am Meteorol Soc* 84:1565–1573.
13. Zanis P, et al. (2003) An estimate of the impact of stratosphere-to-troposphere transport (STT) on the lower free tropospheric ozone over the Alps using ^{10}Be and ^{7}Be measurements. *J Geophys Res* 108:8520.
14. Prospero JM, Savoie DL, Arimoto R (2003) Long-term record of nss-sulfate and nitrate in aerosols on Midway Island, 1981–2000: Evidence of increased (now decreasing?) anthropogenic emissions from Asia. *J Geophys Res* 108:4019.
15. Jaffe D, Price H, Parrish D, Goldstein A, Harris J (2003) Increasing background ozone during spring on the west coast of North America. *Geophys Res Lett* 30:1613.
16. Bey I, Jacob DJ, Logan JA, Yantosca RM (2001) Asian chemical outflow to the Pacific in spring: Origins, pathways, and budgets. *J Geophys Res* 106:23097–23113.
17. Price HU, Jaffe DA, Cooper OR, Doskey PV (2004) Photochemistry, ozone production, and dilution during long-range transport episodes from Eurasia to the northwest United States. *J Geophys Res* 109:D23S13.
18. Tu FH, et al. (2004) Long-range transport of sulfur dioxide in the central Pacific. *J Geophys Res* 109:D15S08.
19. HYSPLIT (Hybrid Single Particle Lagrangian Integrated Trajectory Model (Air Resource Laboratory, NOAA, Silver Spring, MD).
20. Gray B, et al. (2010) Source, transport and sinks of SO_2 over the equatorial Pacific during the Pacific Atmospheric Sulfur Experiment. *J Atmos Chem*, 10.1007/s10874-010-9177-7 (PASE special issue).
21. Reier M, DeJuren JA (1961) Diffusion length of thermal neutrons in water from 23 °C to 244 °C. *Reactor Sci Technol* 14:18–24.

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U.S. Nuclear Power after Fukushima

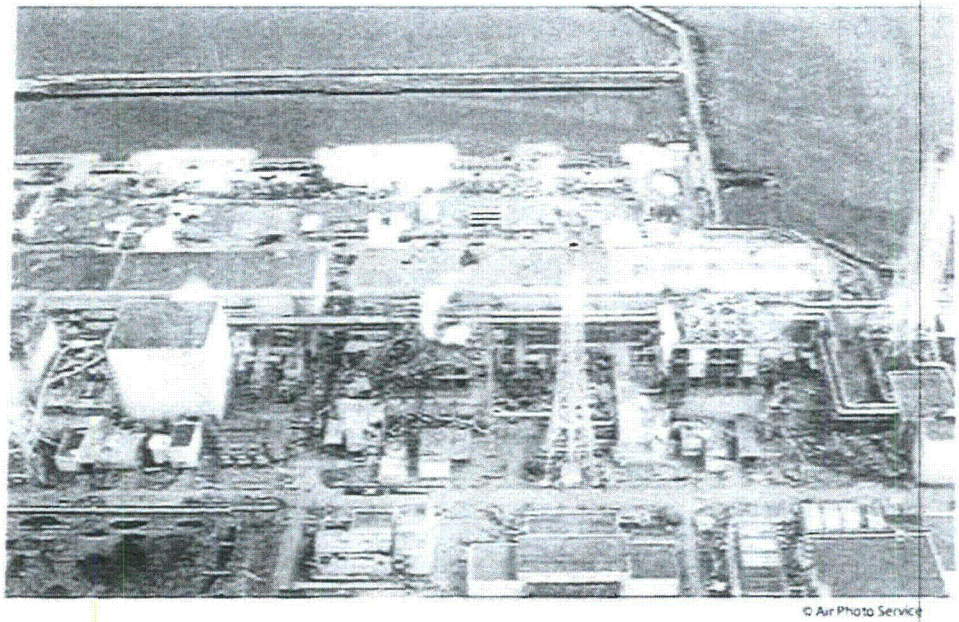
SUMMARY

Common Sense Recommendations for Safety and Security

THE RECENT EVENTS IN Japan remind us that while the likelihood of a nuclear power plant accident is low, its potential consequences are grave. And an accident like Fukushima could happen here. An equipment malfunction, fire, human error, natural disaster or terrorist attack could—separately or in combination—lead to a nuclear crisis.

Our nation will continue to obtain a significant portion of its electricity from nuclear power for many years to come, regardless of how rapidly energy efficiency measures and other sources of electricity are deployed. Nuclear reactors currently account for about 20 percent of U.S. electricity, and the Nuclear Regulatory Commission (NRC) has granted or is in the process of granting 20-year license extensions for most of the country's 104 operating reactors.

Given this reality, the United States must take concrete steps now to address serious shortcomings in nuclear plant safety and security that have been evident for years. No technology can be made perfectly safe, but the United States can and must do more to guard against accidents as well as the threat of terrorist attacks on reactors and spent fuel pools.



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The United States must take concrete steps now to address serious shortcomings in nuclear plant safety and security that have been evident for years.

The Responsible Parties

Nuclear power safety and security must be given the serious attention they deserve—and have not consistently received—from the nuclear industry, the NRC (which oversees the industry), Congress (which oversees the NRC), and the president (who appoints the NRC commissioners and bears ultimate responsibility for ensuring public safety).

The industry must address *known* risks and ensure that adequate safety margins are in place to compensate for *unknown* risks. Doing so is in the industry's self-interest, because nothing would affect public acceptance of nuclear power in the United States as much as a serious accident or terrorist strike. For example, reactor owners could reduce the safety and security risks associated with spent fuel by transferring it from pools to dry casks once it is cool enough. Yet for reasons of cost, they have chosen to fill the pools to maximum capacity rather than use dry casks.

The NRC must strengthen its safety requirements. For example, it does not require U.S. reactor owners to plan for and be able to cope with severe accidents like the one that occurred at the Fukushima Daiichi plant. Nor does it require new reactors to be safer than existing ones. Because additional safety features generally entail additional costs, safer designs may lose out in the marketplace to those that reduce costs by cutting safety features.* If the NRC does not change its regulations, new reactors will not be significantly safer, and as the number of reactors increases so will the chances of a catastrophic event.

The NRC must also consistently enforce its regulations. Even when the agency has imposed strong standards, serious safety problems have continued to arise because of lax enforcement. For example, following a serious fire at an Alabama

* A current example is the Areva EPR (Evolutionary Power Reactor), which has safety systems not required by the NRC and has attracted much less interest in the United States and abroad than the Westinghouse AP1000, which meets but does not exceed NRC requirements.

plant in 1975, the NRC issued fire protection regulations in 1980 and again in 2004. Yet today, more than three dozen reactors still do not comply with either set of regulations (despite the fact that fire remains a dominant risk factor for reactor core damage).

Congress must take its oversight role seriously and ensure that the NRC does its job well. Moreover, Congress should not order the NRC to further "streamline" its regulations and processes, which could result in inadequate technical reviews of complex issues.

If the NRC does not change its regulations, new reactors will not be significantly safer, and as the number of reactors increases so will the chances of a catastrophic event.

The president must appoint people to the Nuclear Regulatory Commission who will make public safety their top priority. This is not the case today. For example, four of the five commissioners recently voted to extend the deadline for nuclear power reactors to comply with fire protection regulations until 2016 at the earliest.

Change Is Needed Now

Since its founding in 1969, the Union of Concerned Scientists has worked to make nuclear power safer and more secure. We have consistently advocated most of the measures listed below to address the serious shortcomings in U.S. nuclear plant safety and security against terrorist attack. So although most of these recommendations are not new, the situation in Japan underscores their importance. We have also developed several new recommendations in response to the Fukushima crisis.

We strongly urge the NRC to make U.S. nuclear power safer and more secure by adopting *all* the following measures, and we urge Congress and the administration to ensure the NRC follows through on its commitments.

Key Recommendations

Below we list our top eight recommendations for changes the NRC should make in its regulations and actions to improve U.S. nuclear power safety and security. The NRC should make these changes its top priority.

A complete list of our recommendations, with additional explanation of each, can be found on the UCS website at *www.ucsusa.org/nuclear_power*. If the NRC does not implement these changes on its own, Congress should exercise its oversight role and require the agency to do so.

Extend Regulations to Cover Severe Accidents

The NRC should extend the scope of its regulations to include the prevention and mitigation of severe accidents.

The NRC defines "severe" accidents as those more serious than the so-called "design-basis" accidents that U.S. reactors are designed to withstand. While unlikely, severe accidents can occur—as in Fukushima—and can cause substantial damage to the reactor core and failure of the containment building, leading to large releases of radiation. However, NRC regulations are focused on design-basis accidents and are far less stringent in addressing severe accidents. For example, the agency does not evaluate or test the severe accident management guidelines that reactor owners have voluntarily developed, so neither the NRC nor the public can be confident these guidelines would be effective. Extending NRC requirements, inspections, and enforcement to cover a wide range of severe accident conditions would ensure that effective plans and the equipment needed to deal with such accidents are put in place.

Strengthen Emergency Planning Requirements

The NRC should ensure that everyone at significant risk from a severe accident—not just people within the arbitrary 10-mile zone currently used for emergency planning—is protected.

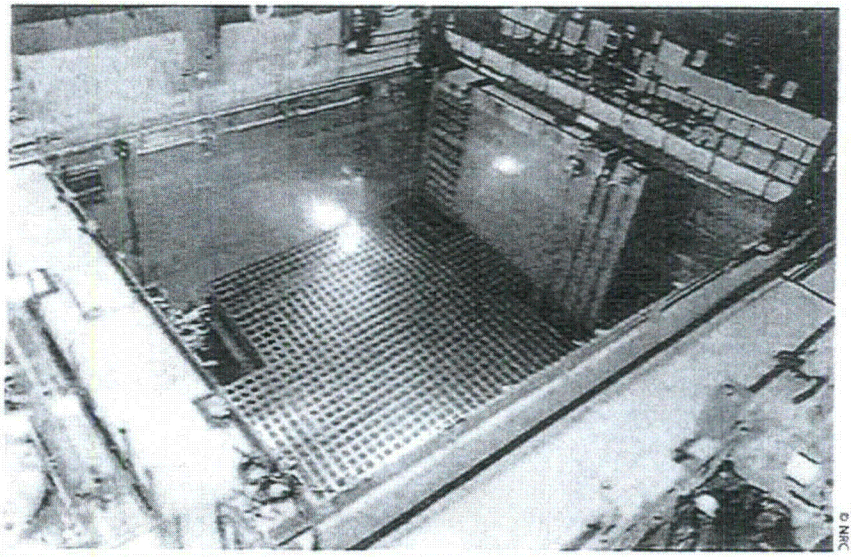
In the United States, emergency planning for a nuclear reactor accident is limited



Following the Fukushima accident, high contamination levels were found well beyond 10 miles from the plant (the distance used for emergency planning in the United States).

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The safety and security risks associated with spent fuel would be reduced by transferring the fuel from pools to dry casks once it is cool enough.



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Spent nuclear fuel stored in pools is more vulnerable to accidents, natural disasters, and attack than fuel in the reactor core, and more likely to release radiation into the atmosphere.

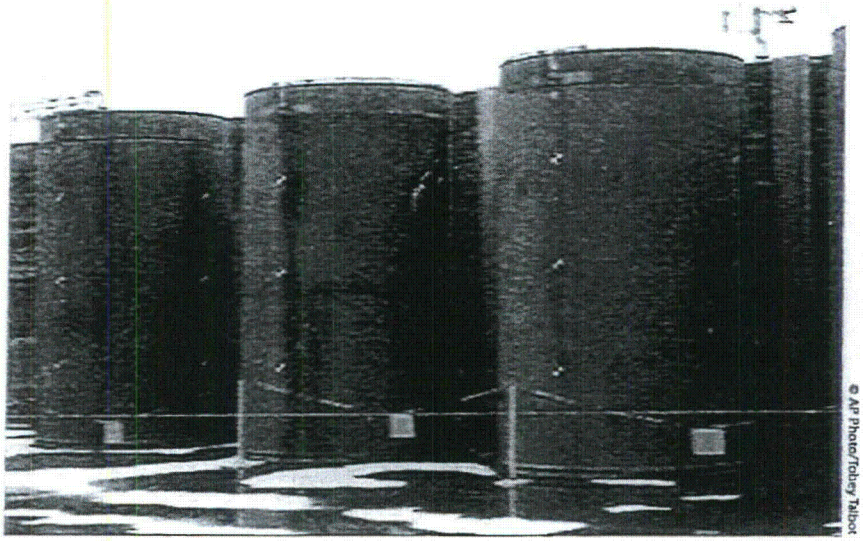
to a 10-mile radius around the reactor. Yet the U.S. government advised Americans within 50 miles of the Fukushima Daiichi reactors to evacuate—a decision validated by the high contamination levels recorded well beyond 10 miles from the plant. A severe accident at a U.S. reactor could similarly require the evacuation of people outside the 10-mile planning zone and other protective measures to avoid high radiation exposures. The NRC should therefore require reactor owners to develop emergency plans for a larger area, based on a scientific assessment of the populations at risk for each reactor site.

Move Spent Fuel to Dry Casks

The NRC should require plant owners to transfer fuel from storage pools to dry casks when the fuel has cooled enough to do so.

The Fukushima crisis illustrated the dangers of keeping spent fuel in storage pools when the plant lost power needed to cool its pools. It is still unclear whether cooling was resumed in time to prevent the spent fuel from overheating and melting, and releasing radiation. However, the spent fuel pools at U.S. reactors could have fared worse, since they are far more densely packed than those at Fukushima and pose even greater hazards.

The safety and security risks associated with spent fuel would be reduced by transferring the fuel from pools to dry casks once it is cool enough (i.e., five years after removal from the reactor). With less fuel in the pools, the remaining fuel would be easier to keep cool if power is lost, and less radiation would be released in the event of an accident or terrorist attack. However, because dry casks are expensive, reactor owners have chosen to fill their pools to maximum capacity, and the NRC has not required owners to transfer their spent fuel to dry casks.



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Dry casks are more secure than spent fuel pools, and with a few modifications could likely be made a viable storage option for at least 50 years.

Enforce Fire Protection Regulations

The NRC should compel the owners of more than three dozen reactors to comply with fire protection regulations they currently violate.

Because a fire can disable both primary and backup emergency systems, it is a leading risk factor for reactor core damage. Following a 1975 fire at the Browns Ferry nuclear plant in Alabama, the NRC issued regulations in 1980 intended to reduce the fire hazard at all reactors, and it amended those regulations in 2004 to provide an alternative option for compliance. However, more than

More than three dozen reactors still do not comply with fire protection regulations, and their owners have made no firm commitments to comply anytime soon.

three dozen reactors still do not comply with these fire protection regulations, and their owners have made no firm commitments to comply anytime soon.

Set Timeliness Goals for Safety Issues

The NRC should apply the same type of timeliness goals to nuclear plant safety that it does for business-related requests from reactor owners.

The NRC has established goals for completing business dealings in a timely manner, but has not done so for resolving outstanding safety issues. By treating safety with the same urgency it gives to business dealings, the agency can provide the robust, timely oversight that is needed.

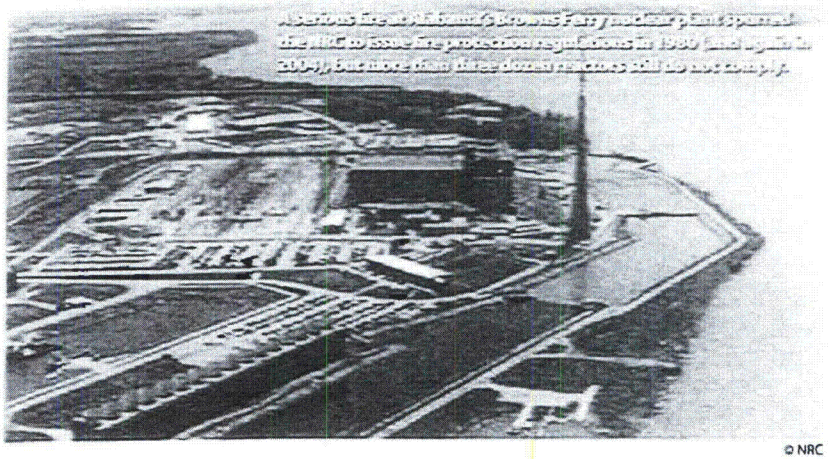
Improve Protection against Terrorist Attacks

The NRC should make more realistic assumptions about the capabilities of terrorists who might attack a nuclear power plant, and these assumptions should be reviewed by U.S. intelligence agencies.

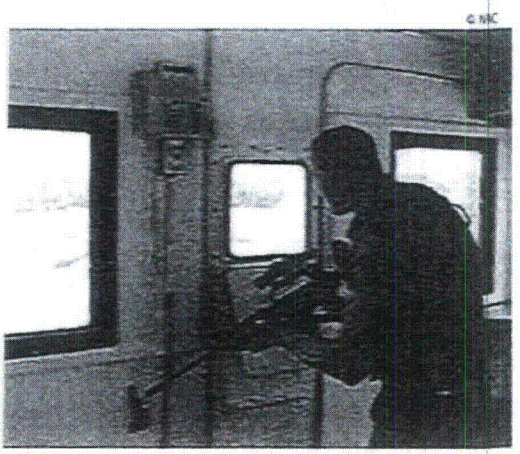
Current assumptions about potential attackers are unrealistically modest and do not reflect real-world threats. For example, they may ignore the possibility that terrorist groups could use rocket-propelled grenades—a weapon widely used by insurgents around the world. New assumptions developed by the NRC should be reviewed by an interagency body that includes the intelligence community, the National Nuclear Security Administration, and the Department of Homeland Security.

Strengthen Safety Standards for New Reactor Designs

The NRC should require any new reactors to be safer than existing reactors.



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Even though plant owners are given advance notice of mock attacks, their security forces too often fail to repel the unrealistically modest threats envisioned by the NRC.

Current policy only requires advanced reactors to provide the same level of protection as existing reactors—most of which were built at least 30 years ago. To ensure that any new nuclear plant is significantly safer than existing ones, the NRC should require features designed to prevent severe accidents and to mitigate such an accident if one occurs.

Assign an Appropriate Value to Human Life in Cost-Benefit Analyses

The NRC should increase the value of human life in its analyses so it is consistent with other government agencies.

The NRC currently uses a dollar value for a human life that is only one-half to one-third the value used by other agencies. Bringing that value in line would have a major effect on nuclear plant license renewals and new reactor approvals: plant owners would have to add safety features that the NRC now considers too expensive (because it underestimates the value of the lives that could be saved).

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Scientists for Environmental Solutions

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The Union of Concerned Scientists is the leading science-based nonprofit working for a healthy environment and a safer world.

The full set of recommendations is available online (in PDF format) at *www.ucsusa.org/nuclear_power.*

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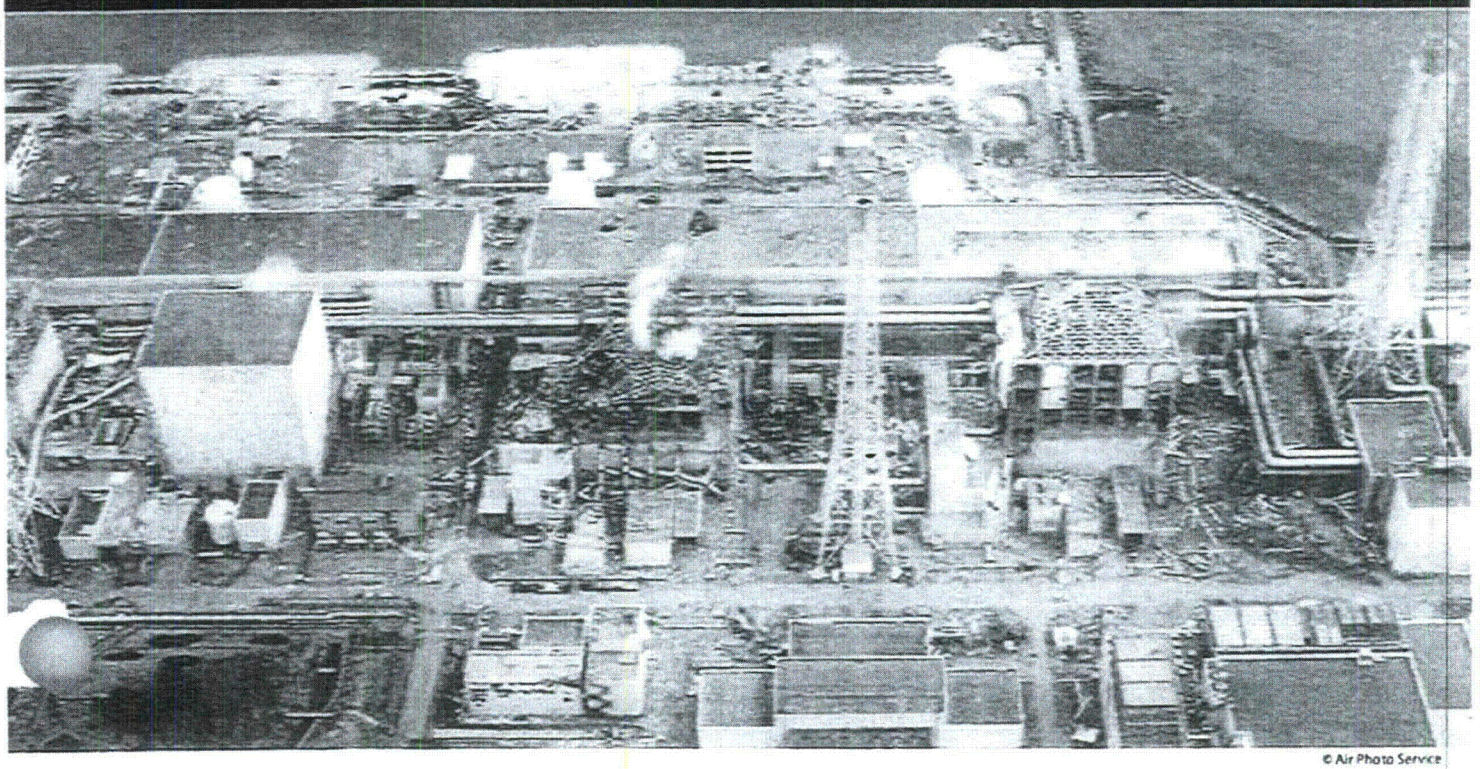
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U.S. Nuclear Power after Fukushima

Common Sense Recommendations for Safety and Security



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THE RECENT EVENTS IN Japan remind us that while the likelihood of a nuclear power plant accident is low, its potential consequences are grave. And an accident like Fukushima could happen here. An equipment malfunction, fire, human error, natural disaster, or terrorist attack could—separately or in combination—lead to a nuclear crisis.

Our nation will continue to obtain a significant portion of its electricity from nuclear power for many years to come, regardless of how rapidly energy efficiency measures and other sources of electricity are deployed. Nuclear reactors currently account for about 20 percent of U.S. electricity, and the Nuclear Regulatory Commission (NRC) has granted or is in the process of granting 20-year license extensions for most of the country's 104 operating reactors.

The United States must take concrete steps now to address serious shortcomings in nuclear plant safety and security that have been evident for years.

Given this reality, the United States must take concrete steps now to address serious shortcomings in nuclear plant safety and security that have been evident for years. No technology can be made perfectly safe, but the United States can and must do more to guard against accidents as well as the threat of terrorist attacks on reactors and spent fuel pools.

The Responsible Parties

Nuclear power safety and security must be given the serious attention they deserve—and have not consistently received—from the nuclear industry, the NRC (which oversees the industry), Congress (which oversees the NRC), and the president (who appoints the NRC commissioners and bears ultimate responsibility for ensuring public safety).

The industry must address *known* risks and ensure that adequate safety margins are in place to compensate for *unknown* risks. Doing so is in the industry's self-interest, because nothing would affect public acceptance of nuclear power in the United States as much as a serious accident or terrorist strike. For example, reactor owners could reduce the safety and security risks associated with spent fuel by transferring it from pools to dry casks once it is cool enough. Yet for reasons of cost, they have chosen to fill

the pools to maximum capacity rather than use dry casks.

The NRC must strengthen its safety requirements. For example, it does not require U.S. reactor owners to plan for and be able to cope with severe accidents like the one that occurred at the Fukushima Daiichi plant. Nor does it require new reactors to be safer than existing ones. Because additional safety features generally entail additional costs, safer designs may lose out in the marketplace to those that reduce costs by cutting safety features.[1] If the NRC does not change its regulations, new reactors will not be significantly safer, and as the number of reactors increases so will the chances of a catastrophic event.

If the NRC does not change its regulations, new reactors will not be significantly safer, and as the number of reactors increases so will the chances of a catastrophic event.

The NRC must also consistently enforce its regulations. Even when the agency has imposed strong standards, serious safety problems have continued to arise because of lax enforcement. For example, following a serious fire at an Alabama plant in 1975, the NRC issued fire protection regulations in 1980 and again in 2004. Yet today, more than three dozen reactors still do not comply with either set of regulations (despite the fact that fire remains a dominant risk factor for reactor core damage).

Congress must take its oversight role seriously and ensure that the NRC does its job well. Moreover, Congress should not order the NRC to further "streamline" its regulations and processes, which could result in inadequate technical reviews of complex issues.

The president must appoint people to the Nuclear Regulatory Commission who will make public safety their top priority. This is not the case today. For example, four of the five commissioners recently voted to extend the deadline for nuclear power reactors to comply with fire protection regulations until 2016 at the earliest.

Change Is Needed Now

Since its founding in 1969, the Union of Concerned Scientists has worked to make nuclear power safer and more secure. We have consistently advocated most of the measures listed below to address the serious shortcomings in U.S. nuclear plant safety and security against terrorist attack. So although most of these recommendations are not new, the situation in Japan underscores their importance. We have also developed several new recommendations in response to the Fukushima crisis.

We strongly urge the NRC to make U.S. nuclear power safer and more secure by adopting *all* the following measures, and we urge Congress and the administration to ensure the NRC follows through on its commitments.

Key Recommendations

Below we list our top eight recommendations for changes the NRC should make in its regulations and actions to improve U.S. nuclear power safety and security. The NRC should make these changes its top priority.

A complete list of our recommendations, with additional explanation of each, follows this overview of the top eight. If the NRC does not implement these changes on its own, Congress should exercise its oversight role and require the agency to do so.

Extend Regulations to Cover Severe Accidents

The NRC should extend the scope of its regulations to include the prevention and mitigation of severe accidents.

The NRC defines "severe" accidents as those more serious than the so-called "design-basis" accidents that U.S. reactors are designed to withstand. While unlikely, severe accidents can occur—as in Fukushima—and can cause substantial damage to the reactor core and failure of the containment building, leading to large releases of radiation. However, NRC regulations are focused on design-basis accidents and are far less stringent in



Following the Fukushima accident, high contamination levels were found well beyond 10 miles from the plant (the distance used for emergency planning in the United States).

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addressing severe accidents. For example, the agency does not evaluate or test the severe accident management guidelines that reactor owners have voluntarily developed, so neither the NRC nor the public can be confident these guidelines would be effective. Extending NRC requirements, inspections, and enforcement to cover a wide range of severe accident conditions would ensure that effective plans and the equipment needed to deal with such accidents are put in place. (See recommendation 1 below.)

Strengthen Emergency Planning Requirements

The NRC should ensure that everyone at significant risk from a severe accident—not just people within the arbitrary 10-mile zone currently used for emergency planning—is protected.

In the United States, emergency planning for a nuclear reactor accident is limited to a 10-mile radius around the reactor. Yet the U.S. government advised Americans within *50* miles of the Fukushima Daiichi reactors to evacuate—a decision validated by the high contamination levels recorded well beyond 10 miles from the plant. A severe accident at a U.S. reactor could similarly require the evacuation of people outside the 10-mile planning zone and other protective measures to avoid high radiation exposures. The NRC should therefore require reactor owners to develop emergency plans for a larger area, based on a scientific assessment of the populations at risk for each reactor site. (See recommendation 3 below.)

Move Spent Fuel to Dry Casks

The NRC should require plant owners to transfer fuel from storage pools to dry casks when the fuel has cooled enough to do so.

The Fukushima crisis illustrated the dangers of keeping spent fuel in storage pools when the plant lost power needed to cool its pools. It is still unclear whether cooling was resumed in time to prevent the spent fuel from overheating and melting, and releasing radiation. However, the spent fuel pools at U.S. reactors could have fared worse, since they are far more densely packed than those at Fukushima and pose even greater hazards.

The safety and security risks associated with spent fuel would be reduced by transferring the fuel from pools to dry casks once it is cool enough.

The safety and security risks associated with spent fuel would be reduced by transferring the fuel from pools to dry casks once it is cool enough (i.e., five years after removal from the reactor). With less fuel in the pools, the remaining fuel would be easier to keep cool if power is lost, and less radiation would be released in the event of an accident or terrorist attack. However, because dry casks are expensive, reactor owners have chosen to fill their pools to maximum capacity, and the NRC has not required owners to transfer their spent fuel to dry casks. (See recommendation 4 below.)

Enforce Fire Protection Regulations

The NRC should compel the owners of more than three dozen reactors to comply with fire protection regulations they currently violate.

Because a fire can disable both primary and backup emergency systems, it is a leading risk factor for reactor core damage. Following a 1975 fire at the Browns Ferry nuclear plant in Alabama, the NRC issued regulations in 1980 intended to reduce the fire hazard at all reactors, and it amended those regulations in 2004 to provide an alternative option for compliance. However, more than three dozen reactors still do not comply with these fire protection regulations, and their owners have made no firm commitments to comply anytime soon. (See recommendation 7 below.)

Set Timeliness Goals for Safety Issues

The NRC should apply the same type of timeliness goals to nuclear plant safety that it does for business-related requests from reactor owners.

The NRC has established goals for completing business dealings in a timely manner, but has not done so for resolving outstanding safety issues. By treating safety with the same urgency it gives to business dealings, the agency can provide the robust, timely oversight that is needed. (See recommendation 8 below.)

Improve Protection against Terrorist Attacks

The NRC should make more realistic assumptions about the capabilities of terrorists who might attack a nuclear power plant, and these assumptions should be reviewed by U.S. intelligence agencies.

Current assumptions about potential attackers are unrealistically modest and do not reflect real-world threats. For example, they may ignore the possibility that terrorist groups could use rocket-propelled grenades—a weapon widely used by insurgents around the world. New assumptions developed by the NRC should be reviewed by an interagency body that includes the intelligence community, the National Nuclear Security Administration, and the Department of Homeland Security. (See recommendation 15 below.)

Strengthen Safety Standards for New Reactor Designs

The NRC should require any new reactors to be safer than existing reactors.

Current policy only requires advanced reactors to provide the same level of protection as existing reactors—most of which were built at least 30 years ago. To ensure that any new nuclear plant is significantly safer than existing ones, the NRC should require features designed to prevent severe accidents and to mitigate such an accident if one occurs. (See recommendation 18 below.)

Assign an Appropriate Value to Human Life in Cost-Benefit Analyses
The NRC should increase the value of human life in its analyses so it is consistent with other government agencies.
The NRC currently uses a dollar value for a human life that is only one-half to one-third the value used by other agencies. Bringing that value in line would have a major effect on nuclear plant license renewals and new reactor approvals: plant owners would have to add safety features that the NRC now considers too expensive (because it underestimates the value of the lives that could be saved). (See recommendation 20 below.)

All Recommendations in Detail

Preventing and Mitigating the Effects of Severe Accidents

The NRC considers some accidents likely enough that a nuclear reactor cannot be licensed unless it has been designed to withstand them; these are termed "design-basis" accidents. The worst such accident—as defined by the NRC—involves the partial melting of the fuel in the reactor core, but not the rupture of the reactor vessel or large releases of radiation from the containment building. Yet reactors that can withstand design-basis accidents are still vulnerable to "beyond-design-basis" or "severe" accidents, which the NRC considers so unlikely that reactors need not be able to withstand them.

While severe accidents are less likely than design-basis accidents, they are still feasible and could result from a wide variety of events, including an extended loss of power, fire, or natural disaster. A severe accident (such as that at Fukushima) will result in substantial damage to the reactor core fuel and could result in failure of the containment building, leading to large releases of radiation.

Because the NRC has addressed severe accident issues on an ad hoc basis, most measures designed to prevent and mitigate them are voluntary. The accident at Fukushima has shown that the NRC must give a higher priority to such measures. Specifically:

1. The NRC should extend the scope of regulations to include the prevention and mitigation of severe accidents.
NRC regulations are focused on design-basis accidents and for the most part do not address severe accidents. For example, because NRC regulations do not require reactor owners to develop severe accident management guidelines, the agency does not evaluate or test guidelines that owners have developed voluntarily. As a consequence, neither the NRC nor the public can be confident such guidelines would be effective.

The NRC requires reactor owners to have plans to cope with the loss of large areas of a plant due to explosion and fire, such as would result from an aircraft attack. However, these plans would not generally protect reactors against *any* severe accident—since the equipment or the area in which it is stored may not be designed to withstand an earthquake or other natural disaster.

Plant owners and the NRC need to re-evaluate these plans in light of Fukushima to judge whether they are realistic. In particular, high levels of radioactive contamination may make it impossible for workers to access key equipment or vital areas of the plant. Both parties must also determine how to safely manage any contaminated water if normal cooling is lost and the reactor cores and spent fuel pools need to be manually cooled with outside water.

Extending NRC requirements, inspections, and enforcement to cover a wide range of severe accident conditions would ensure that effective plans and the equipment needed to deal with such accidents are put in place.

2. The NRC should require reactor owners to develop and test emergency procedures for situations when no AC or DC power is available for an extended period.
While the Fukushima accident was precipitated by an earthquake and tsunami, the direct cause was the loss of both off-site and on-site AC power—a situation known as a station blackout—leaving only DC power from batteries available. The Atomic Energy Commission (the NRC's predecessor) proposed regulations to address station blackouts as early as 1974 but the nuclear industry opposed those requirements, contending that a station blackout simply could not happen. The NRC finally issued a regulation in 1988 aimed at minimizing this risk; nevertheless, the Vogtle nuclear plant in Georgia experienced a station blackout less than two years later.

Most measures designed to prevent and mitigate severe accidents are voluntary. The accident at Fukushima has shown that the NRC must give a higher priority to such measures.

The NRC requires U.S. plants to have a strategy for coping with a station blackout of up to 16 hours, assuming that workers will be able to restore reliable AC power within this time. In developing this requirement, the NRC ignored the possibility of events—such as severe earthquakes—that could disrupt a plant's surrounding infrastructure for an extended period, as was the case at Fukushima. Reactor owners should instead be required to handle events in which AC power remains unavailable for a longer period of time, and in which both AC and DC power are unavailable.

3. The NRC should modify emergency planning requirements to ensure that everyone at significant risk from a severe accident—not just people within the arbitrary 10-mile planning zone—is protected.

In the United States, emergency planning to protect the public from direct exposure to radioactive fallout during a severe nuclear accident is limited to the area within 10 miles of each reactor. People within this zone could be evacuated and receive potassium iodide tablets to help prevent thyroid cancer (to which children are especially vulnerable). Following the Japanese earthquake, however, the U.S. government advised Americans within a 50-mile radius of the Fukushima Daiichi reactors to evacuate—a decision later validated by the high contamination levels found well beyond 10 miles from the plant.

If a severe accident occurred in which radiation was released from the containment structure, some people inside the 10-mile zone could be exposed to immediately life-threatening levels of radiation, while people well outside the zone could be exposed to levels high enough to cause a significant increase in cancer risk. This risk could be minimized by expanding the emergency planning zone so that more people could be evacuated and have access to potassium iodide, which could be important to children more than 100 miles downwind. The NRC should conduct a science-based assessment of every reactor site to determine the populations most at risk from a severe nuclear accident, then revise its emergency planning requirements accordingly.

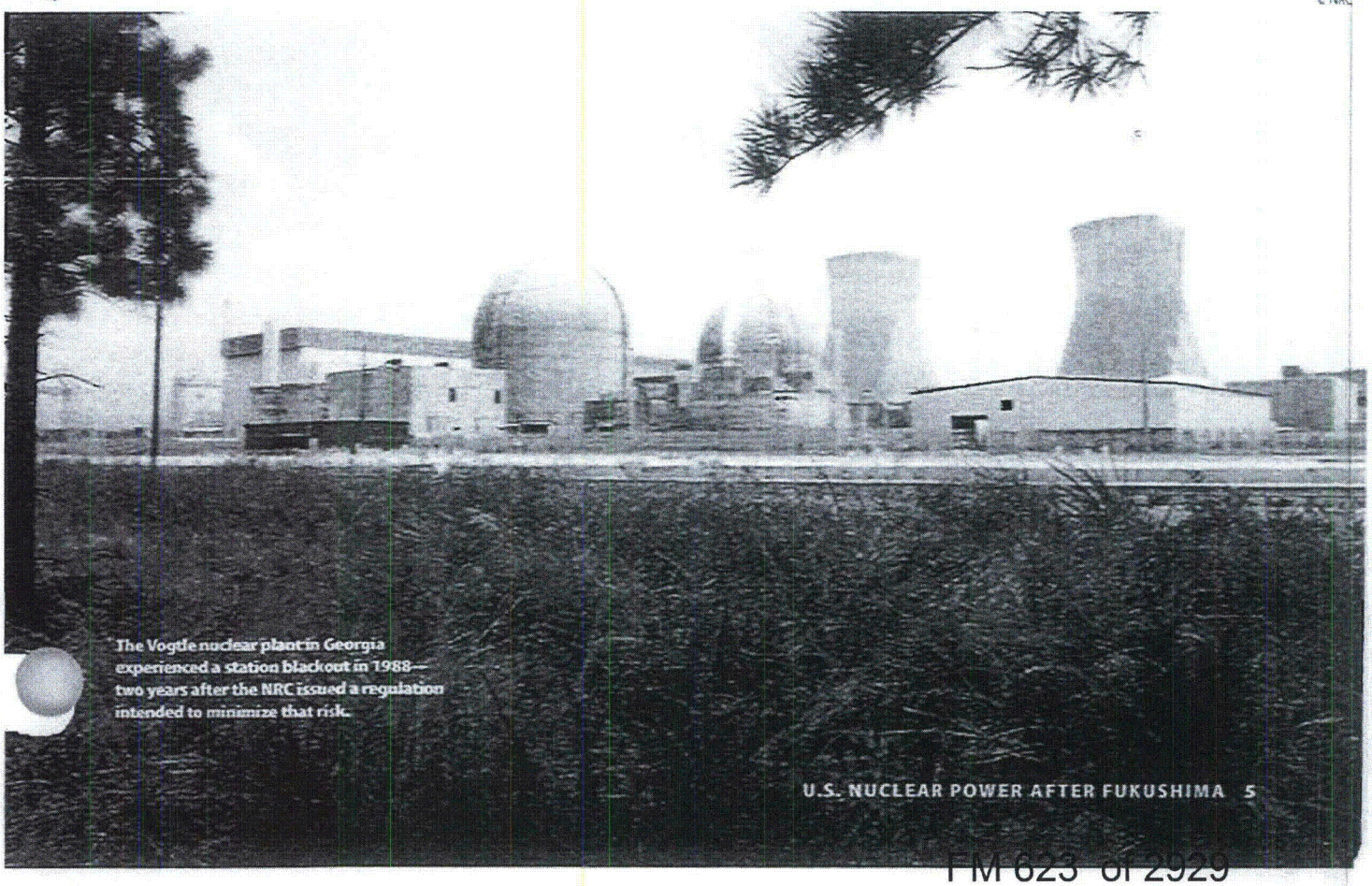
Also, emergency response plans assume that a reactor accident would not be accompanied by another disaster or emergency that would tax emergency response resources, but the scale of the overlapping disasters in Japan overwhelmed those resources. An interagency committee including the NRC and the Department of Homeland Security should therefore revisit federal, state, and local emergency response plans to ensure they account for the possibility of overlapping disasters.

Improving the Safety and Security of Spent Fuel

While concerns about nuclear power safety are often focused on the fuel in the reactor, spent fuel stored in pools can also be a major source of radiation during an accident. If the pool is drained for even a few hours, or the cooling system is interrupted for several days, the spent fuel could overheat and its cladding could break open, leading to the release of radiation.

While concerns about nuclear power safety are often focused on the fuel in the reactor, spent fuel stored in pools can also be a major source of radiation during an accident.

Moreover, spent fuel pools are located outside the robust primary containment structure that surrounds the reactor vessel, so any radiation released from the



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The Vogtle nuclear plant in Georgia experienced a station blackout in 1988—two years after the NRC issued a regulation intended to minimize that risk.

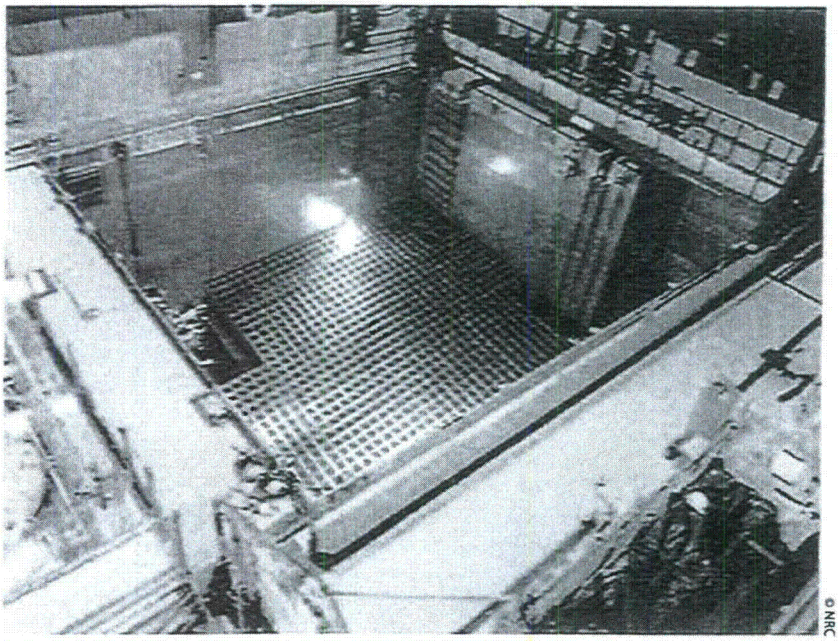
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spent fuel pool is more likely to reach the outside environment than radiation released from the reactor core. Spent fuel pools are also more vulnerable than the reactor core to a terrorist attack.

4. The NRC should require plant owners to move spent fuel at reactor sites from storage pools to dry casks when it has cooled enough to do so.

The risks associated with spent fuel pools can be reduced by placing some of the fuel in dry casks, which are made of steel and concrete and cooled by natural convection. Spent fuel is usually cool enough to be transferred to casks after about five years, but U.S. reactor operators generally leave the fuel in pools until the pools are full. As a result, most pools contain five times as much fuel as the reactors themselves.

The less fuel that remains in the pool, the longer it would take for the water to heat up and boil away if cooling is lost, thus giving workers more time to solve the problem and restore cooling. And if an accident did occur that led to the release of radiation, less would be emitted than if the pool was full.

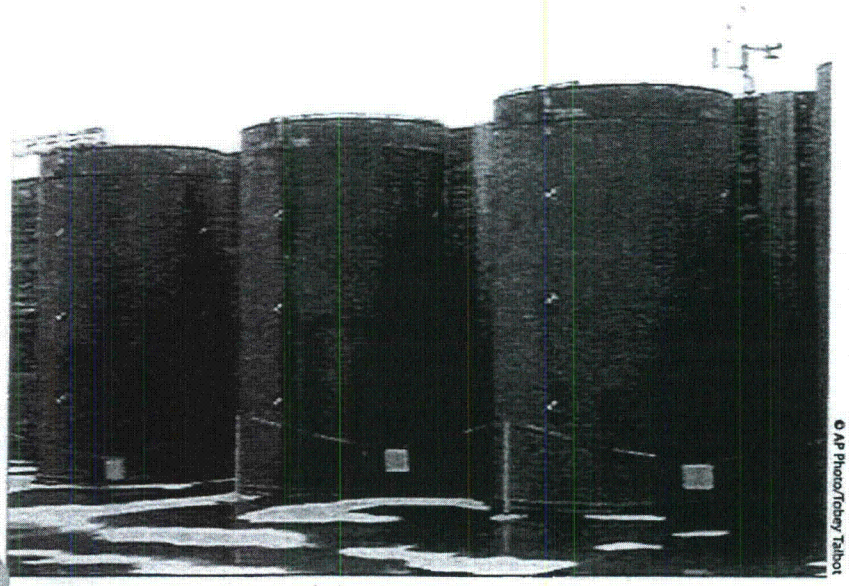


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Spent nuclear fuel stored in pools is more vulnerable to accidents, natural disasters, and attack than fuel in the reactor core, and more likely to release radiation into the atmosphere.

5. The NRC should require reactor owners to improve the security of existing dry cask storage facilities.

Dry casks at reactor sites are stored outdoors on concrete pads. Although they are more secure than spent fuel pools in the event of attack, dry casks remain vulnerable to some types of weapons. According to vulnerability assessments conducted by the NRC following the 9/11 attacks, certain types of explosive weapons could breach some types of casks.[2] However, dry casks can likely be made an acceptably safe and economically viable storage option for at least 50 years with a few relatively simple modifications to security plans and site infrastructure.[3]



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Dry casks are more secure than spent fuel pools, and with a few modifications could likely be made a viable storage option for at least 50 years.

6. The NRC should require plant owners to significantly improve emergency procedures and operator training for spent fuel pool accidents.

Inadequate cooling of spent fuel pools can result in the release of dangerous levels of radiation. The NRC and the U.S. nuclear industry have developed extensive emergency procedures to handle design-basis reactor core accidents, and provide thorough operator training on their implementation (although, as noted in recommendations 1 and 2, these procedures should be improved for severe accidents). In contrast, they have given little thought to spent fuel pool accidents, so response procedures are inadequate and there is virtually no operator training for such accidents.

Upgraded procedures and operator training for emergency events including

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station blackouts should include provisions for:

- Monitoring the condition of the inflatable seals that make the pool gates watertight
- Restoring power in a timely manner to the pool's cooling system and the system providing air to the inflatable seals. This could be done, for example, by connecting these systems to the emergency diesel generators or by providing temporary generators.
- Monitoring pool temperature and water level

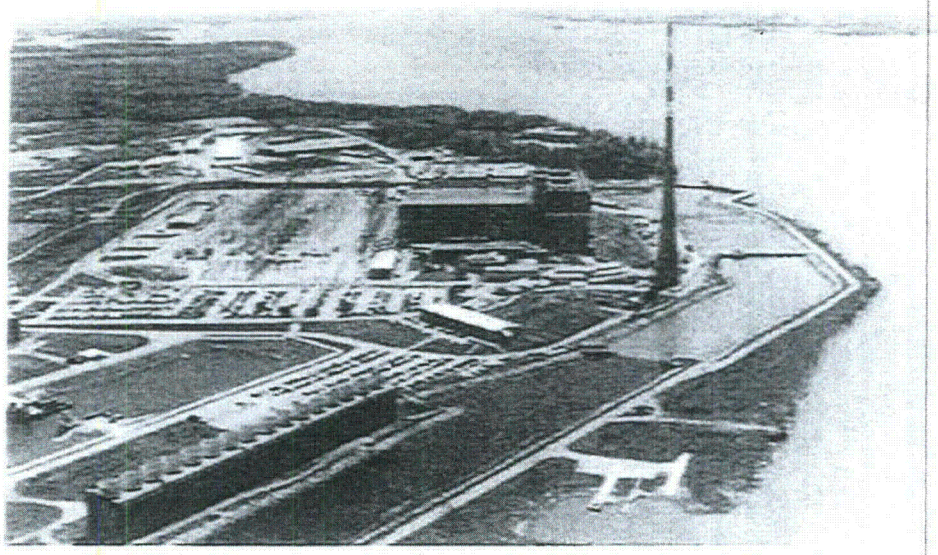
Making Existing Reactors Safer

Although existing reactors are designed to withstand design-basis accidents, many are vulnerable to such accidents because they do not comply with certain important safety regulations. While reactor owners can be faulted for this shortsighted behavior, the NRC is too tolerant of known safety violations. Owners also need to do a better job of identifying safety problems before they occur—including the degradation of aging equipment, which will become more problematic as the NRC extends reactor licenses.

In addition, safety problems can arise when reactors use certain types of fuel: "high burn-up" fuel and plutonium-based mixed-oxide fuel. The former is more vulnerable ro damage during some types of design-basis accidents, and the latter increases the risk of some types of severe accidents as well as the risk to public health from such accidents.

7. The NRC should enforce its fire protection regulations and compel the owners of more than three dozen reactors to comply with regulations they currently violate.

Because a fire can destroy a nuclear plant's main and backup emergency systems, it is one of the most likely ways in which a reactor core can be seriously damaged, resulting in a release of radioactivity. Following a fire at the Browns Ferry nuclear plant in Alabama, the NRC issued regulations in 1980 intended to reduce the fire hazard at all reactors. Twenty years later, the agency discovered that dozens of reactors failed to meet those regulations and were therefore being operated with undue risk of serious damage from fires. The NRC developed an alternative set of fire protection regulations in 2004—the "NFPA 805 option"—and required plant owners to comply with either these or the 1980 regulations. The owners of nearly 40 U.S. reactors announced their intention to comply with the NFPA 805 option, but more than three dozen reactors still do not comply with either set of regulations, and their owners have made no firm commitments to address this fire risk anytime soon.[4] Moreover, in June 2011, four of the five NRC commissioners voted to extend the deadline for compliance until 2016.



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A serious fire at Alabama's Browns Ferry nuclear plant spurred the NRC to issue fire protection regulations in 1980 (and again in 2004), but more than three dozen reactors still do not comply.

Because a fire can destroy a reactor's main and backup emergency systems, it is one of the most likely ways in which a reactor core can be seriously damaged, resulting in a release of radioactivity.

The NFPA 805 option is based on a probabilistic risk assessment (PRA) of various fire hazards and associated protection measures. As we discuss in recommendation 22, however, there are significant flaws in the NRC's PRAs, so reactor owners should not be allowed to choose the NFPA 805 option until the agency has corrected those flaws.

8. The NRC should establish timeliness goals for resolving safety issues while continuing to meet its timeliness goals for business-related requests from reactor owners.

In addition to overseeing the safety and security of U.S. reactors, the NRC is

responsible for business matters such as granting construction and operating licenses for new reactors, extending the licenses of existing reactors, and amending licenses to allow for increased power output.

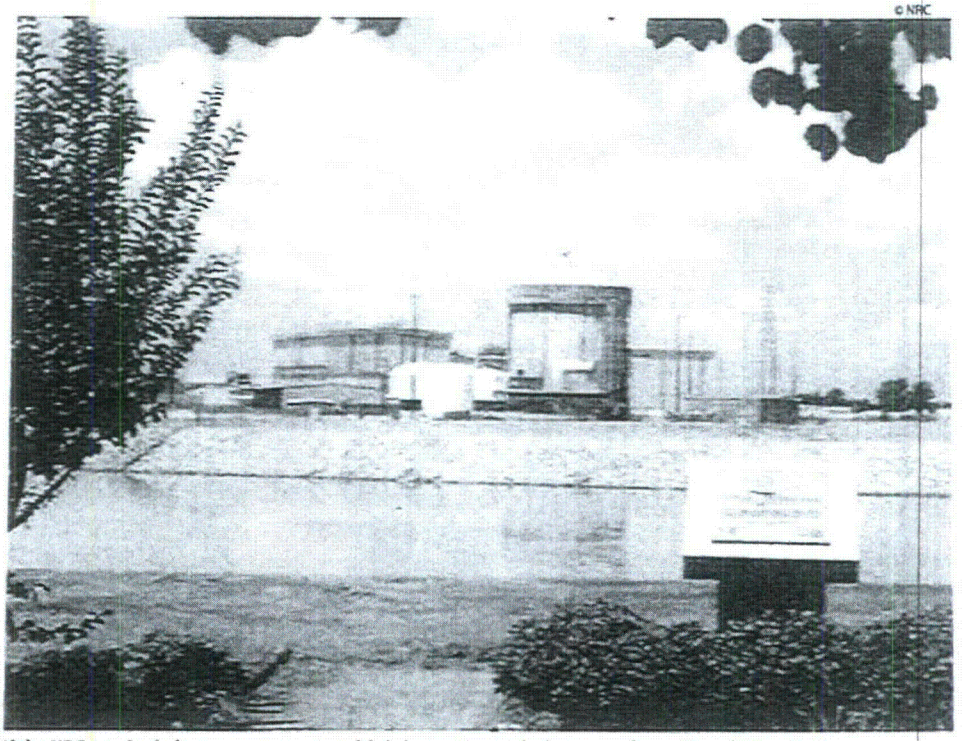
Unfortunately, the NRC often places business ahead of safety. In particular, the agency has established goals for completing business dealings in a timely manner, but has not done so for resolving outstanding safety issues.

The problem is evident in the periodic reports the NRC submits to Congress detailing its progress on both safety and business matters.[5] For example, its November 2010 report indicated that in 2009 and 2010 the agency met its goal of approving 90 percent of new business within one year and 100 percent within two years. Conversely, five "generic" safety issues—unresolved problems affecting numerous operating reactors—had no timetable for resolution, and one of the five—affecting nearly 20 reactors—has been unresolved since 1996.[6]

9. The NRC should treat generic and unique safety issues alike. Until a generic issue is resolved, the NRC should account for it as a potential risk factor in its safety analyses and decision making related to all affected reactors.

When a safety problem affects—or could affect—more than one nuclear plant, the NRC labels it a generic safety issue and treats it separately from problems unique to individual plants. The agency assesses the risk associated with each generic issue by assuming that all other plant systems are fully functional and reliable; it similarly assesses the risk associated with unique problems at individual reactors by assuming that generic issues do not exist. This approach prevents the NRC from accurately assessing the overall risk from a combination of unique and generic problems.

The NRC usually has 6 to 10 generic safety issues open at any given time, and often takes more than a decade to rectify these problems. In the meantime, these unresolved issues may increase the likelihood of an accident or worsen its consequences.



If the NRC required plant owners to use multiple inspection techniques, workers at South Carolina's Summer nuclear plant would have detected a crack in a pipe connected to the reactor vessel earlier.

The NRC often places business ahead of safety. In particular, the agency has established goals for completing business dealings in a timely way, but has not done so for resolving outstanding safety issues.

One example is related to the emergency pumps of the 69 U.S. pressurized-water reactors (PWRs). In 1979 the NRC determined that steam and water jetting from a broken pipe during an accident could dislodge pipe insulation and equipment coatings, which could clog the emergency pumps needed to cool the reactor core. Yet the agency assigned a very low probability to emergency pump failure because it ignored the possibility of an accident involving a broken pipe. Having understated this risk, the agency did not require reactor owners to address the problem until the end of 2007, but even now some 20 reactors are still not in compliance.[7]

10. The NRC should require plant owners to use multiple inspection techniques to ensure detection of any degradation in aging, high-risk equipment.

The periodic inspections and safety equipment tests required by NRC regulations do not use techniques varied enough to detect problems with high confidence, which is especially important for aging equipment that is slowly deteriorating. For example, when one of the largest pipes connected to the reactor vessel at South Carolina's Summer nuclear plant began leaking in 2000, workers discovered a crack in the pipe. Past inspections had missed the crack because the sonar-like probe being used lifted off the outer

surface of the pipe as it moved onto a nozzle with a larger diameter. The resulting air gap masked signs of the crack. Other inspection methods that are not vulnerable to this problem would have detected the crack earlier.

11. The NRC should require plant owners to periodically inspect equipment outside the scope of normal inspections, both to determine whether that scope is appropriate and to detect problems before safety margins are compromised.

Because monitoring every square inch of a nuclear plant would be impractical, inspections target equipment and structures considered most vulnerable to degradation. When workers discover degradation outside the scope of their inspections, the scope is enlarged to include the suspect equipment or plant areas in all future inspections. However, the NRC does not require plant owners to periodically inspect equipment and structures considered less vulnerable.[8]

For example, in 2002 operators shut down Unit 1 at Illinois' Quad Cities nuclear plant when the beam holding down a pump inside the reactor vessel broke apart and pieces of the beam damaged one of the other pumps. Workers had frequently inspected the beam at its two ends, where it was believed cracks were most likely to form, but the beam cracked in its middle. Had the scope of these inspections occasionally extended to the entire beam, the crack would likely have been discovered before the beam broke apart.

12. The NRC should revise its regulations for the licensing of "high burn-up" fuel to ensure public safety, and restrict how this fuel is used until the revisions are complete.

Over the last couple of decades, reactor owners have increasingly used high burn-up fuels that can be left in the reactor for a longer period of time, allowing fuel to be replaced every other year rather than once a year. However, the NRC approved these fuels without fully understanding the problems that can occur by irradiating them for an extended period of time. For example, high burn-up fuels are more vulnerable to damage during certain types of design-basis accidents, including those where coolant is lost or control rods are ejected.[9] The NRC has now known about these problems for more than a decade but is responding slowly due to industry resistance. As a result, a significant quantity of fuel in U.S. reactors today may not be able to withstand design-basis accidents.

The use of mixed-oxide fuel increases the probability of certain types of severe accidents and the magnitude of the environmental and health impacts of such a severe accident.

13. The U.S. government should prohibit the use of plutonium-bearing mixed-oxide (MOX) fuel in reactors, and end the program to produce MOX fuel from excess weapons plutonium.

The United States is currently constructing a facility that would produce MOX fuel for commercial reactors using the plutonium from dismantled nuclear weapons, and the French company Areva has proposed to build a U.S. facility that would reprocess spent fuel and use the resulting plutonium to make MOX fuel. However, the use of such fuel increases the probability of certain types of severe accidents (such as those in which core damage would result from the ejection of control rods) and the magnitude of the health and environmental impacts of such a severe accident.[10]

Because MOX fuel contains greater amounts of highly radiotoxic plutonium and heavier elements than standard low-enriched uranium fuel, it could increase the number of deaths resulting from a severe accident by 25 to 100 percent, depending on whether the plutonium comes from weapons or spent reactor fuel.[11] MOX fuel should therefore be banned, and excess plutonium from weapons should be blended with radioactive waste, encased in glass or a ceramic material, and disposed of in a long-term repository.

Ensuring the Continued Safety of Reactors with Renewed Licenses

When the NRC revises regulations or adopts new ones (as when a generic safety issue has been resolved), it sometimes "grandfathers" (or exempts) existing reactors from these regulations. For example, in 1985 the NRC required new reactors to incorporate design features that would make their sump screens less likely to become clogged with debris during an accident, but exempted existing reactors. Such exemptions continue to apply even when a reactor receives a 20-year license extension, despite the fact that aging

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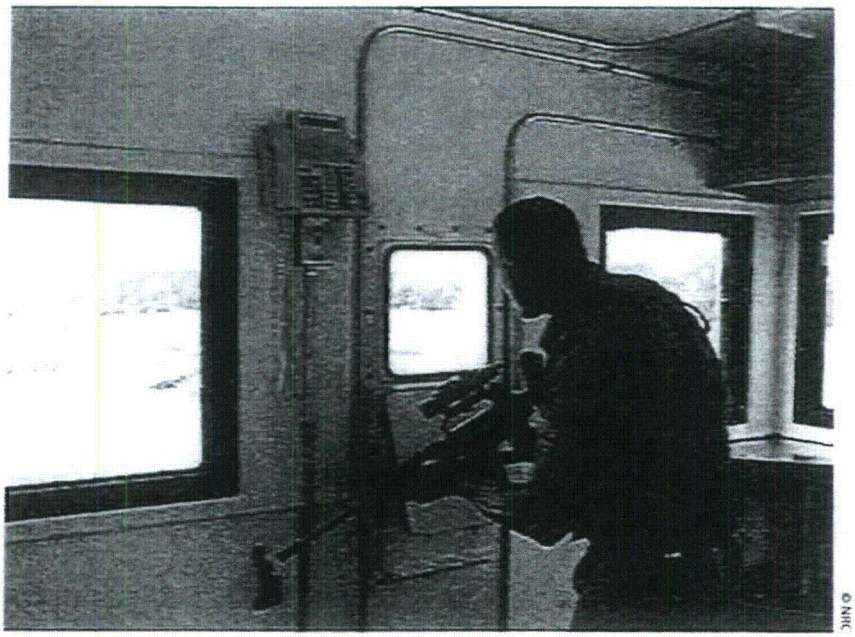


By requiring workers to periodically inspect equipment outside the scope of normal inspections, more problems will be detected before safety margins are compromised.

reactors are more likely to develop some types of safety problems.

14. Before granting a license renewal, the NRC should review all differences between current regulations and any past decisions specific to the aging reactor, to confirm that these differences will not compromise public safety going forward.

When the NRC reviews an application to renew a reactor's operating license, it never revisits its past decisions. Thus, it never considers whether an exemption granted in the past should remain in effect for an additional 20 years of operation. The agency should determine whether requirements that apply to a specific reactor could compromise public health and safety during the next 20 years compared with current regulations, and if that is the case, apply the current regulations instead.



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Even though plant owners are given advance notice of mock attacks, their security forces too often fail to repel the unrealistically modest threats envisioned by the NRC.

Making Existing Reactors More Secure against Terrorist Attacks

Existing reactors are not as secure as they could—and should—be. NRC assumptions about potential attackers are unrealistically modest, so reactor owners are not required to defend against real-world threats. Moreover, in recent "force-on-force" tests the NRC conducts to determine whether security personnel can defend a plant against a mock attack, more than 10 percent of plants failed the NRC's modest scenarios—even though plant owners are given advance notice of the tests.

15. The NRC should revise its assumptions about terrorists' capabilities to ensure nuclear plants are adequately protected against credible threats, and these assumptions should be reviewed by U.S. intelligence agencies.

The NRC's "design-basis threat" (DBT) defines the size and abilities of a terrorist group that a nuclear facility must be able to repel. Before 9/11 the DBT consisted of three attackers armed with nothing more sophisticated than handheld automatic rifles, working with a single insider whose role was limited to providing information about the facility and its defenses. The DBT was upgraded post-9/11, but still does not reflect real-world threats. For example, it may ignore the possibility that terrorists would use rocket-propelled grenades—a weapon used by insurgents around the world.

The assumptions underlying the DBT should be reviewed by an interagency body that includes the intelligence community, the National Nuclear Security Administration, and the Department of Homeland Security.

16. The NRC should modify the way it judges force-on-force security exercises by assessing a plant's "margin to failure," rather than whether the plant merely passes or fails.

The NRC's current approach only recognizes whether or not a plant owner's security force is able to prevent the destruction of an entire "target set" that would result in core damage. No distinction is made between good and barely adequate performance. Several years ago, the NRC proposed to enhance its evaluation system by incorporating margin to failure (i.e., how close the plant came to suffering core damage), but the proposal was opposed by the industry and has not been adopted.

17. The U.S. government should establish a program for licensing private security guards that would require successful completion of a federally supervised training course and periodic recertification.

Given the poor performance demonstrated in force-on-force exercises, there is currently no assurance that reactor owners can defend their reactors against DBT-level attacks. By establishing a rigorous training and licensing program for reactor guards, the federal government would help ensure that adequate security standards are met.

Making New Reactors Safer and More Secure against Terrorist Attacks

Any expansion of nuclear power in the United States would provide an opportunity to build safer, more secure reactors—if mandated by the NRC. In the absence of stronger safety and security standards, the industry will keep its costs

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down by meeting but not exceeding the current standards.

18. The NRC should require new reactor designs to be safer than existing reactors. In 1986, the NRC issued a policy requiring advanced reactors to provide merely the same level of protection as existing reactors. Instead, any new reactors should have additional features designed to prevent severe accidents, to mitigate a severe accident if one should occur, and to reduce reliance on operator interventions during an accident (which are inherently less dependable than built-in measures).

For example, a containment building designed to withstand the high pressures that can occur in a severe accident decreases the risk of radiation escaping into the environment. Yet some reactor types do not have such containment buildings and therefore require electrically powered systems such as hydrogen igniters to maintain the building's structural integrity. Moreover, the trend in new reactor designs is to reduce the size and strength of containment buildings.

19. The NRC should require new reactor designs to be more secure against land- and water-based terrorist attacks. Nine years after 9/11, the NRC required new reactor designs to incorporate features that would enhance the reactor's ability to withstand an airplane attack, either by maintaining the structural integrity of the containment building and spent fuel pool or by maintaining cooling of the core and spent fuel pool if structural integrity is lost. But the NRC rejected a proposal that would also require features designed to reduce vulnerability to land- and water-based attacks. All potential modes of attack need to be addressed.

Improving the NRC's Cost-Benefit and Risk-Informed Analyses

In deciding whether to require reactor owners to undertake a safety retrofit, the NRC often conducts a cost-benefit analysis that compares the costs of the retrofit with the dollar value of the lives that would potentially be saved. However, the results of these analyses are skewed because the NRC uses a much lower figure for the value of a human life than the rest of the U.S. government. Moreover, these analyses only account for potential damage to fuel in the reactor, not in spent fuel pools.

In the absence of stronger safety and security standards, the industry will keep its costs down by meeting but not exceeding the current standards.

There are also serious problems with the way the NRC uses probabilistic analyses to assess the risks of different types of accidents, which may have the effect of underestimating the actual risks. For example, the agency's analyses do not fully account for the risks of earthquakes and extreme weather.

20. The NRC should increase the value it assigns to a human life in its cost-benefit analyses so the value is consistent with other government agencies. U.S. agencies other than the NRC place a value on a human life of between $5 million and $9 million. The NRC—despite the Office of Management and Budget's recent warning that it would be difficult to justify a value below $5 million—has continued to value a human life at $3 million since 1995.[12]

Bringing the NRC's calculations in line with other agencies would have a major effect on nuclear plant license renewals and new reactor approvals: plant owners would have to add safety features that the NRC now considers too expensive (because it underestimates the value of the lives that could be saved).

21. The NRC should require plant owners to calculate the risk of fuel damage in spent fuel pools as well as reactor cores in all safety analyses. Reactor owners' cost-benefit analyses of safety problems do not consider the risks of damage to fuel in spent fuel pools, yet the pools' cooling systems are often coupled to other plant systems. By ignoring these risks, reactor owners underestimate the potential costs of some types of severe accidents.

22. The NRC should not make decisions about reactor safety using probabilistic risk assessments (PRAs) until it has corrected its flawed application of this tool. PRAs, which the NRC and the nuclear industry use for a variety of purposes, can be a valuable tool when used appropriately.[13] For example, because inspecting every inch of pipe in a nuclear plant is not feasible, PRAs can determine which portions of pipe have the greatest risk of failure or would cause the most damage if a failure occurred, and should therefore receive priority during inspections. PRAs are also used to assess the possibility that multiple safety systems might fail and cause a reactor meltdown.

However, UCS, the Government Accountability Office, the NRC inspector general, the NRC Advisory Committee on Reactor Safeguards, and the NRC itself have all documented serious problems with the agency's PRAs, including omission of key data, inconsistent assumptions and methodology, and inadequate quality standards. For example, the NRC does not require that PRAs include a rigorous evaluation of seismic risks, even though earthquakes may be one of the biggest potential contributors to core damage.

To be valid, PRAs must include all internal and external events that could lead to an accident. They must address all modes of operation (including shutdown and low-power modes), incorporate rigorous uncertainty analyses, and meet strict quality assurance standards. The NRC must also account for a wider range of potential accident consequences by

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including more conservative assumptions about weather and other variables (e.g., by using results for the ninety-fifth percentile rather than the average).

Ensuring Public Participation

Public input has long played an important role in the NRC's process for licensing power plants, and the agency has admitted that the public's participation has improved safety on numerous occasions.[14] Nevertheless, the NRC has effectively limited such participation by eliminating the public's right to discovery and cross-examination.

Public input has improved safety on numerous occasions. Nevertheless, the NRC has effectively limited such participation by eliminating the public's right to discovery and cross-examination.

23. The NRC should fully restore the public's right to obtain information and question witnesses in hearings about changes to existing power plant licenses and applications for new licenses.
When the NRC announced in 2004 that it was rejecting the public's right to discovery and cross-examination during licensing hearings, the attorneys general of five states voiced their opposition to the change, but the agency adopted it anyway. Neighbors of existing and proposed reactors deserve to play an active part in the licensing process.

Endnotes

1 A current example is the Areva EPR (Evolutionary Power Reactor), which has safety systems not required by the NRC and has attracted much less interest in the United States and abroad than the Westinghouse AP1000, which meets but does not exceed NRC requirements.

2 See, for example: Lyman, E. 2010. NRC: Taking spent fuel security in the wrong direction. 51st annual meeting of the Institute of Nuclear Materials Management. Baltimore, MD. Online at *www.ucsusa.org/assets/documents/nwgs/Lyman-INMM-2010-paper.pdf.*

3 National Research Council. 2006. *Safety and security of commercial spent nuclear fuel storage.* Washington, DC: The National Academies Press, 68. Online at *www.nap.edu/catalog.php?record_id=11263.*

4 For information on the specific reactors that do not comply with fire regulations, see the UCS Nuclear Power Information Tracker at *www.ucsusa.org/nucleartracker.*

5 The NRC began submitting these reports in 1999; they are available online at *www.nrc.gov/reading-rm/doc-collections/congress-docs/monthly-reports.*

6 For more information on these five generic safety issues, see: Beasley, B.G. 2011. Generic Issue Management Control System report (FY 2011, Q2). Nuclear Regulatory Commission memorandum, April 7. Online at *http://pbadupws.nrc.gov/docs/ML1108/ML110810919.pdf.*

7 For additional information on this problem, see: Lochbaum, D. 2003. *Regulatory malpractice: NRC's "handling" of the PWR containment sump problem.* Cambridge, MA: Union of Concerned Scientists. October 29. Online at *www.ucsusa.org/nuclear_power/nuclear_power_risk/safety/regulatory-malpractice-nrcs.html.*

8 For additional information, see Lochbaum, D. 2004. *U.S. nuclear plants in the 21st century: The risk of a lifetime.* Cambridge, MA: Union of Concerned Scientists. May. Online at *www.ucsusa.org/nuclear_power/nuclear_power_risk/safety/us-nuclear-plants-in-the.html.*

9 Barré, F., C. Grandjean, M. Petit, and F. Arreghini. 2009. *Fuel behaviour under LOCA and RIA and its implication on the current safety criteria.* Institut de Radioprotection et de Sûreté Nucléaire. Online at *www.eurosafe-forum.org/files/Presentations 2009/Seminar2/Abstracts/2.5-Fuel%20behaviour%20under%20LOCA%20and%20RIA-Barre.pdf.*

10 Lyman, E. 2001. Public health consequences of substituting mixed-oxide for uranium fuel in pressurized water reactors. *Science & Global Security* 9:33–79. Online at *www.princeton.edu/sgs/publications/sgs/pdf/9_1lyman.pdf.*

11 Ibid.

12 Appelbaum, B. 2011. A life's value: It may depend on the agency. *New York Times,* February 17.

13 PRA calculations were first developed in the NRC's Reactor Safety Study of 1975 (a.k.a. the Rasmussen report).

14 For examples, see: Union of Concerned Scientists. 1985. The value of public participation. In: *Safety second: A critical evaluation of the NRC's first decade.* Cambridge, MA. February, 77.

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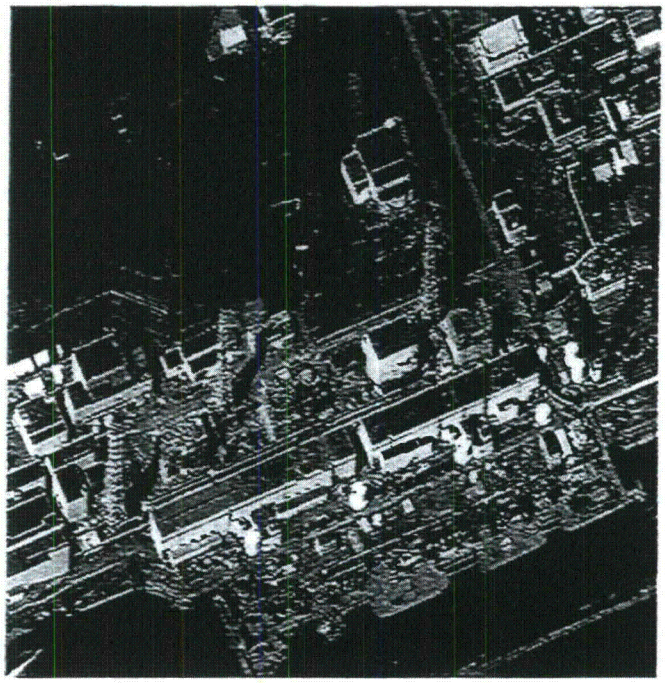
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EDITORIAL

And now, Fukushima



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For the September 2007 issue of *Journal of Radiological Protection* I wrote an editorial to mark the 50th anniversary of the reactor fire at Windscale Pile No 1, Sellafield [1]. Then, for the March 2011 issue I wrote an editorial to review what we have learnt about health effects arising from the accident at the Chernobyl nuclear power station 25 years ago [2]: little did I think at the time that I would be writing an editorial for the June 2011 issue about another serious release of radioactive material from a nuclear reactor. However, on 11 March 2011 a powerful magnitude 9 earthquake occurred off the north-eastern coast of Japan, which generated a substantial tsunami that struck the shore and caused devastating damage over a wide area. The earthquake and, in particular, the tsunami, had a disastrous impact upon the Fukushima Dai-ichi (No 1) nuclear power station (NPS), which was to become the centre of world attention as a consequence.

Fukushima Dai-ichi NPS, operated by the Tokyo Electric Power Company (TEPCO), is situated on the eastern coast of the main Japanese island of Honshu about 225 km north of

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Tokyo, and consists of six boiling water reactors (BWRs)[1], three of which (Units 1 to 3) were operating at the time of the earthquake. No fuel was present in Reactor 4 on 11 March (it was shut down at the end of November 2010 and then completely defuelled), but Reactors 5 and 6 still contained fuel (they were shut down at the beginning of January 2011 and the middle of August 2010, respectively)—Units 5 and 6 are positioned on the Fukushima Dai-ichi site away from Units 1 to 4, which are located together. Reactors 1 (electrical power ~0.5 GW), 2 and 3 (both ~0.8 GW) were designed in the 1960s and commenced operation during 1971–76, and all three reactors shut-down automatically during the earthquake (i.e. the sustained nuclear fission chain reactions ceased on full insertion into the fuel core of the control rods); external electrical power to the site was interrupted by the earthquake and the back-up diesel generators started up to provide continuity of electrical supply to emergency equipment, including the core cooling water pumps.

However, the large tsunami (reportedly ~14 m high at Fukushima Dai-ichi NPS) resulting from the earthquake overwhelmed the site's sea defences (5.7 m in height) and disabled the heat exchangers (where excess heat from fuel is dumped) and also the diesel generators (located in the basements of the turbine buildings), so that the site services were then dependent on back-up batteries, which could only supply limited power for a short period. The operators then faced the dire situation of three BWR cores that were still physically hot from recent fission power and more importantly generating significant heat (a few tens of MW) from the radioactive decay of fission products, without the systems designed to cool the fuel in the relatively compact cores—it is a loss of coolant accident ('LOCA') that the emergency systems of BWRs are primarily designed to meet. These circumstances led to a series of serious events at the Fukushima Dai-ichi NPS. This editorial is based upon my understanding of the situation at and around the Fukushima Dai-ichi site as of the beginning of May[2], but certain aspects are still not clear as I write.

The inability to cool the cores of Reactors 1 to 3 led to increasing temperatures, boiling of water and rising pressures due to steam generation in the cylindrical steel reactor pressure vessels (RPVs) containing the fuel assemblies. To relieve the pressure steam was released from the RPVs, as designed, into the surrounding primary containment vessels (PCVs)—substantial steel-lined concrete structures, flask-like in shape, that are connected to large toroidal water-filled pressure suppression chambers positioned below the PCVs, designed to condense steam, which in turn are surrounded by the concrete reactor building acting as secondary containment. However, the generation of steam was such that pressure in the PCVs increased steadily, which required the venting of gases to prevent PCV pressures becoming excessively high. Meanwhile, water levels in the RPVs were falling and the fuel assemblies were becoming exposed so that steam was reacting with zirconium in the hot fuel cladding to produce hydrogen. Further, exposed fuel pins were reaching a temperature that led to major fuel assembly damage: cracks in the cladding, and probably also melting of the fuel itself. This damage released fission products from the fuel: principally radioisotopes of noble gases (krypton and xenon) and of the volatile elements iodine, tellurium and caesium. As a consequence, the PCV venting operations released not only steam, but also hydrogen and a variety of radionuclides.

Mobile diesel generators were brought to the site to supply electricity for emergency

[1] Basic information on the BWRs at Fukushima Dai-ichi NPS can be found at http://www.oecd-nea.org/press/2011/BWR-basics_Fukushima.pdf.

[2] I have used a number of sources of information available on the web. Particularly informative are the websites of IAEA, WHO, various Japanese government ministries, agencies and other bodies, TEPCO, DOE, GRS, IRSN, ZAMG, and NHK World, although other websites also provide useful information. Prior to a detailed review of the events at Fukushima Dai-ichi NPS, some sources of information have to be treated with circumspection as they are based more upon speculation than fact. I am also grateful to Japanese colleagues who have translated information from Japanese sources, particularly to Professor Suminori Akiba.

equipment, and in an attempt to keep the fuel pins covered with water, borated seawater (boron, a 'neutron poison', was added to prevent re-criticality in the fuel) was injected into the RPVs through hose-pipes using temporary pumps—this was an act of desperation because the salt in the seawater could deposit on valves, possibly inhibiting their proper function, and also present corrosion problems, and it was certainly the end of these reactors as operational Units. However, the primary objective was to provide at least partial cooling of the fuel through the injection of cold water into the RPVs and evaporation of water in the cores, although significant fuel damage had already occurred during the period when cooling was absent. External electricity supplies were partially restored to the site on 20 March, and fresh water became available for cooling towards the end of March.

On 12 March, a dramatic hydrogen explosion blew the panelling off the sides and roof of the operations floor at the top of Unit 1—hydrogen had accumulated in the roof-space above the secondary containment building and reacted explosively with oxygen in the air. This was followed by a similar, but larger, hydrogen explosion in the roof-space of Unit 3 on 14 March. In contrast, no external manifestation of a hydrogen explosion was apparent in Unit 2, but the sound of an internal explosion was heard in the early morning of 15 March, which looks to have ruptured the pressure suppression chamber and breached the containment, releasing significant quantities of radionuclides into the surroundings.

A savage twist in the tale came in the role played by the interim spent fuel storage ponds, situated adjacent to the tops of the reactors on the operations floor. Unit 4 was of particular concern because all the fuel had been discharged from the reactor after shut down at the end of November 2010, so the pond contained more than 1300 spent fuel assemblies. Loss of electrical supply and damage to heat exchangers meant that the pond water could not be cooled so that the temperature of the water in all six interim storage ponds and in the separate common storage pond rose steadily. Water levels fell in the interim storage ponds, although it is not clear at present whether this was solely due to evaporation or if structural damage to the ponds had also contributed. In Unit 4 on 15 March, there was an explosion in the top of the building near the fuel pond, followed by a fire; apparently this was due to the generation of hydrogen by the fuel assemblies in the pond.

Although the activity of the fuel in the interim storage ponds will have fallen substantially since the shut-down of the reactors—for example, in the Unit 4 pond the activity of ^{131}I ($t_{1/2}$ = 8 days) in the fuel that was present in the reactor at shut-down at the end of November will have decreased by a factor of ~5000 by 15 March—it is, nonetheless, highly radioactive, and of some significance is that the surfaces of the interim storage ponds are separated from the environment only by the weatherproofing panels surrounding the operations floors. Further, the water in the ponds provides radiation shielding as well as cooling, so uncovering the fuel produces an intense upward beam of γ-radiation; this could have been one of the factors inhibiting the extraordinary measure of dropping water from helicopters in mid-March. Water has been directed into the storage ponds from hose-pipes positioned at ground level or on extendable booms from 20 March. In Unit 4 in particular, there is continuing concern about the integrity of the structure supporting the pond following the earthquake and explosion, and a series of aftershocks together with the possibility of stronger earthquakes has heightened this concern.

Hundreds of emergency workers battled at the Fukushima Dai-ichi site in an attempt to keep the situation under control. It was a desperate battle, and the workers knew that in the early days after the earthquake on 11 March failure to stabilise the cores could have resulted in a large proportion of the irradiated fuel melting and major releases of radioactive material if reactor containment had failed. The hydrogen explosions were a serious impediment to emergency work, and several workers were injured by them. Dose-rates at the Fukushima Dai-ichi site

spiked three times on 15–16 March, when a dose-rate of 400 mSv h^{-1} was measured at one location on site.

The annual limit on the occupational effective dose of 20 mSv averaged over five years (with, exceptionally, 50 mSv in any one year) was relaxed under the emergency conditions pertaining at the Fukushima Dai-ichi site—initially to 100 mSv and then on 17 March to 250 mSv, as recognised may be justified under such circumstances by ICRP Publication 103 [3]. At an effective dose limit of 250 mSv there should be no early tissue reactions since threshold doses for such deterministic effects are above this limit [3], and the average lifetime risk for a worker of a serious cancer resulting from a whole-body dose of 250 mSv will be 1–2%, depending on the dose-rate [3], which compares with a background lifetime risk of 20–25%.

It seems that the radiological protection regime put in place to manage the exposure of the emergency workers has been generally successful at limiting doses; at present a few tens of workers have received doses exceeding 100 mSv, but less than the 250 mSv limit. An exception was two workers who were wading in highly contaminated water, which came into contact with the skin of their lower legs resulting in skin doses, mainly from β-radiation, of 2–3 Gy, but seemingly with no consequent skin burns or erythema; these workers received effective doses that approached the 250 mSv limit when internal exposures were taken into account. On occasions circumstances at the Fukushima Dai-ichi site were such that workers had to be temporarily evacuated for their safety, for example, when smoke was seen at various times emerging from the damaged reactor buildings. Unmanned robots have been used to investigate areas where high radiation fields have prevented human access. The situation at the site was further complicated by a series of aftershocks—four in the first half of April—although these do not appear to have significantly further damaged emergency equipment. Electricity distribution boards for pump power were moved to high ground on 15 April to ensure that they were not vulnerable to damage from further tsunamis. At the time of writing, the only worker fatalities have been on 11 March when three workers at Fukushima Dai-ichi NPS were killed by non-radiological causes—one as a result of the earthquake and two when the tsunami struck.

The Japanese authorities ordered the evacuation of people around the Fukushima Dai-ichi site, initially on 11 March from an area 2 km and then 3 km in radius, followed on 12 March by an extension to a 10 km radius and then to a 20 km radius later that day. This early evacuation was carried out to remove the public from the area most likely to be affected by a major release of radioactive material. The evacuation (involving nearly 200 000 people) was essentially completed on 15 March. Those in the area 20–30 km from the site were advised to shelter indoors and the authorities distributed stable iodine tablets (or syrup for children) to the evacuation centres; evacuees less than 40 years of age were instructed to take the stable iodine preparations on 16 March. The ingestion of stable iodine floods the thyroid gland and blocks the uptake by the thyroid of ^{131}I, although the timing of the intake of stable iodine in relation to exposure is important to optimise the effect of this protective measure.

Around 15–16 March, foodstuffs contaminated at levels of concern started being reported, particularly from those communities lying to the north-west of the Fukushima site, including from beyond the 20 km evacuation zone, and even beyond the 30 km sheltering zone—activity concentrations of several tens of kBq kg^{-1} for ^{131}I in samples of leafy vegetables (e.g. spinach) were found, significantly in excess of the limit for consumption, and higher levels have been reported. The Japanese authorities ordered a ban on contaminated foodstuffs from a number of prefectures, although the timing of this ban in relation to the deposition of the radioactive material, particularly in the worst affected areas, is presently unclear. However, the thyroids of nearly 1000 children from badly affected areas were monitored for the presence of ^{131}I towards the end of March, and this survey did not reveal thyroid dose-rates in excess of 0.07

μSv h^{-1}, indicating that serious intakes of ^{131}I had not occurred in this group. On 15 March the Japanese government requested assistance from the International Atomic Energy Agency (IAEA) in the fields of environmental monitoring and radiation-induced health effects, and asked for IAEA experts to be sent to Japan—presumably this was a reflection of concern over the levels of contamination that had occurred to the north-west of the Fukushima Dai-ichi NPS and the dose-rates being experienced on-site.

Monitoring of γ-radiation from ground deposition has been made by aircraft from the US Department of Energy and US National Nuclear Security Administration since 17 March and the plots of these measurements show a clear track of radiation from deposited radioactive material to the north-west of the Fukushima Dai-ichi site out to a distance of around 40 km, indicating the release of a plume travelling north-west sometime before or on 17 March (see http://blog.energy.gov/content/situation-japan/). Although patchy ground contamination was apparent elsewhere around the site, notably to the south-west, this was much less severe than that to the north-west. This was the persistent areal pattern of dose-rates as monitoring from aircraft continued, although a clear temporal decrease in dose-rates has occurred as the activities of ^{132}Te ($t_{1/2}$ = 3 days, decaying to ^{132}I, $t_{1/2}$ = 2 hours) and then ^{131}I have decreased, leaving the longer-lived ^{134}Cs and ^{137}Cs to dominate the γ-ray emissions.

Terrestrial dose-rate monitoring data show that for certain locations around 30 km to the north-west of the Fukushima Dai-ichi site, the external dose-rate rose sharply to more than 50 μSv h^{-1} at certain points on 15 March; the community of Iitate was particularly badly affected, although the measured dose-rate was even higher in neighbouring communities (e.g. Namie), where dose-rates in excess of 150 μSv h^{-1} were reported on 15 March. Even in Fukushima city, more than 50 km to the north-west of the plant, the dose-rate would appear to have exceeded 20 μSv h^{-1} on 15 March. Rain and snow are likely to have enhanced ground deposition in certain areas. A month later the dose-rates in the worst affected areas to the north-west had reduced by a factor of about ten, but the level in the area in the vicinity of the community of Iitate was still substantially above the normal background rate for Japan of ~0.1 μSv h^{-1}. Rises in external dose-rates were also observed at various other places and times around Fukushima Dai-ichi NPS, but to a level much less than that found in the north-west sector. Even Tokyo did not escape the drama: on 23 March, with considerable media attention, the concentration of ^{131}I at a Tokyo water purification plant was found to be in excess of the 100 Bq L^{-1} limit for infants, although this level did not persist. The limit is set on the assumption that continued consumption at the limit occurs; more than 50 litres of tap water at the limit would have to be drunk by an infant before an effective dose of 1 mSv was received. Nonetheless, bottled water sold out at a number of stores in the city.

Given the persistence of dose-rates in Iitate and neighbouring communities at around 5 μSv h^{-1} or greater, presumably mainly due to deposited ^{134}Cs and ^{137}Cs, leading to doses accumulated in a year in excess of 20 mSv, the Japanese government decided on 11 April to order the evacuation of Iitate and four other badly contaminated areas beyond the 20 km radius evacuation zone—the evacuation was not to be immediate but over the following month, reflecting the gradual accumulation of dose from external radiation emitted from deposited radionuclides. The government also recommended evacuation in the area lying between 20 and 30 km from the plant, but on a voluntary basis, although schools would be closed.

Although the greatest attention has been rightly paid to the presence of radioisotopes of iodine and caesium in the environment, other radionuclides have been detected. Measurements that attracted some publicity were those of plutonium in soil samples collected from the immediate vicinity of Units 1 and 2, which produced concentrations similar to the residual levels expected from atmospheric nuclear weapons testing, although the activity ratios of ^{238}Pu to $^{239/240}$Pu were indicative of production in a reactor; clarification of these results is required.

(The media drew attention to the possible relevance of the presence in Reactor 3 of 32 mixed uranium-plutonium oxide ('MOX') fuel assemblies, although plutonium is produced when uranium fuel is irradiated.) ^{89}Sr and ^{90}Sr have also been detected in soil and plant samples collected from villages in Fukushima prefecture.

The prevailing wind in Japan is from the west, which would take aerial releases from the Fukushima Dai-ichi site out over the Pacific Ocean. It is now clear that significant fuel damage occurred in the three reactors that were operating on 11 March—the assessment as of the beginning of May is that in Unit 1, 55% of the core has been damaged, in Unit 2, 35%, and in Unit 3, 30%—and that this has led to a substantial release of radioactive material to atmosphere; it will be of interest to determine what proportion of the discharged activity was taken inland to the north-west at the time of the major release on 15–16 March. Radionuclides released to atmosphere from Fukushima Dai-ichi NPS have been detected in North America and Europe at very low concentrations, although their arrival there generated disproportionate media attention—stable iodine tablets were much in demand and there have been reports of iodine poisonings! Deposition in the Pacific Ocean leading to raised radionuclide concentrations in seawater has also been detected.

Of greater impact on the marine environment local to the Fukushima Dai-ichi NPS, however, has been the discharge of highly contaminated water from the site, which appears to be water that has been in contact with irradiated fuel. Measurements of radionuclides in seawater found significantly raised levels towards the end of March, and at the beginning of April concentrations of ~200 kBq L^{-1} of ^{131}I and ~20 kBq L^{-1} of ^{137}Cs were reported. A leak of highly contaminated water to sea from a pit adjacent to Unit 2 was confirmed on 2 April, which was eventually stopped on 5 April. Other measures have been taken to inhibit the flow of highly radioactive water to sea, and a shipping exclusion zone out to a distance of 30 km from the site was imposed. On 4 April, a planned discharge to sea commenced from Fukushima Dai-ichi NPS of 11 500 tonnes of low-level radioactive water that had been stored on site awaiting treatment, to create storage capacity for the highly radioactive water that had collected in various parts of the site. Nearly 70 000 tonnes of heavily contaminated water need to be moved from turbine buildings and trenches so that workers can gain access, and it is intended to transfer this water to steam condensers, temporary storage tanks and other vessels. The consumption of young sea lance, the only species of seafood found to be contaminated above radionuclide limits, was banned on 20 April. The relatively high routine discharges to sea of ^{137}Cs from Sellafield during the 1970s may be a good guide to the short- and long-term behaviour of this radionuclide in the marine environment off the north-east coast of Japan [4].

What is apparent from the Chernobyl accident is that in the circumstances of a significant aerial release of radioactive material from an operating, or recently operating reactor, limiting the uptake of radioisotopes of volatile iodine by the thyroid glands of infants and young children is an immediate priority. In the area around Chernobyl evacuation of the population was delayed, stable iodine tablets were not issued until later, and most importantly young children continued to consume highly contaminated foodstuffs, especially milk. The consequence was that many young children received thyroid doses from radioiodine of up to 1 Sv or more, resulting in several thousand excess cases of thyroid cancer, many of which could have been prevented by banning the consumption of badly contaminated foods, particularly milk [5]. (It is of note that a milk ban was imposed in the worst affected parts of West Cumbria after the much less severe reactor accident at the Windscale Pile No 1 in 1957 because of concerns over doses to the thyroids of children [6].) At least the knowledge of what happened (and did not happen) after the Chernobyl accident provided a clear indication of what needed to be done around Fukushima Dai-ichi NPS: evacuation from the vicinity of the site as soon as the emergency was apparent, sheltering in buildings if there is a major release of radioactive

material, prohibiting the consumption of highly contaminated foodstuffs, and the distribution and appropriately timed intake of stable iodine preparations. (Owing to winter conditions in Fukushima prefecture in March, most farm animals were still indoors feeding on stored uncontaminated food, which was of help under the circumstances.)

^{131}I with a half-life of 8 days is a serious but relatively short-term problem for radiological protection, and after 100 days its activity will have decreased by a factor of ~5000—most of the ^{133}I ($t_{1/2}$ = 21 hours) will have decayed by the time of the major releases on 15–16 March. In the long-term it is the levels of contamination of the radioisotopes of caesium, ^{134}Cs ($t_{1/2}$ = 2 years) and in particular ^{137}Cs ($t_{1/2}$ = 30 years), that will determine what remediation measures might be necessary to reduce public exposure, or indeed whether relocation may be required in the worst affected areas (as, of course, happened after the Chernobyl accident) [7]. It will be in the sector to the north-west of the Fukushima Dai-ichi site that most attention will have to be paid as to whether remediation measures are needed before people are allowed to return to their homes.

It would appear that the Japanese authorities are presently considering an annual effective dose limit of 20 mSv as the criterion for evacuation and return to contaminated areas, and this annual effective dose is at the lower end of the range recommended for emergencies by ICRP Publication 109 [8]—an effective dose of 20 mSv in one year presents an individual lifetime risk of a serious cancer, averaged over the affected population, of around 1 in 1000, which compares with an average background lifetime risk of about 1 in 4. The area encompassed using such a criterion would not be insignificant, and it seems from current information on dose-rates that perhaps up to 500 km^2 could be affected. However, there may well be a demand to decrease this annual effective dose limit of 20 mSv when the period of emergency evacuation is at an end, and ICRP Publication 109 [8] regards an effective dose of 20 mSv per annum as being at the upper end of the acceptable annual dose once an emergency is finished and the rehabilitation phase is entered. Pressure for a reduction in the annual dose limit will be particularly intense where children are concerned because the cancer risk per unit effective dose is higher at younger ages at exposure [3]—areas where children are likely to spend relatively large amounts of time are likely to be remediated to lower dose-rates, and topsoil is already being removed from some school playgrounds. No doubt the return and remediation criteria will be reconsidered as the general situation in Fukushima prefecture improves.

The International Nuclear and Radiological Event Scale (INES) was designed to communicate to the public, via the non-specialist news media, the severity of events at nuclear installations in terms of their actual or potential radiological consequences [9]. Initially, the event at Unit 1 was classified on 12 March as a Level 4 'accident with local consequences'. Then on 18 March, the Fukushima Dai-ichi site events were provisionally assessed as separate INES Level 5 'accidents with wider consequences' for each of Units 1 to 3, and as a Level 3 'serious incident' for the Unit 4 interim fuel storage pond. On 12 April, the Japanese authorities provisionally re-assessed as a single INES Level 7 'major accident' the events at Units 1 to 3 of the Fukushima Dai-ichi NPS, although the provisional rating of a Level 3 event at Unit 4 remained unaltered. This was on the basis of the quantity of radioactive material released to atmosphere to mid-April: ~150 PBq of ^{131}I and ~10 PBq of ^{137}Cs (mainly on 15–16 March), leading to an ^{131}I equivalent activity release of ~500 PBq, which compares to the approximate threshold of a Level 7 event of around 50 PBq; this represents about 10% of the ^{131}I equivalent activity release from Chernobyl. Since Level 7 is the highest rating on INES, there can be no distinction on the scale between the Fukushima and Chernobyl accidents once the Fukushima releases achieved the Level 7 threshold, leading many in the non-specialist media to proclaim the Fukushima accident as 'another Chernobyl', which it is not, a situation that has led to criticism of INES and the nature of the announcement of the re-assessment (see

David Spiegelhalter's comments at http://understandinguncertainty.org/node/1284).

Undoubtedly, there will be epidemiological studies of the emergency workers and of the public living around the Fukushima Dai-ichi site. However, it needs to be appreciated that the statistical power of these studies is likely to be low. Consider by way of example 100 workers each receiving a whole-body dose of 250 mSv during the emergency operations. Taking the average individual lifetime risk of cancer mortality resulting from this dose to an adult as 2% [3] gives an expected excess of two cancer deaths in this group, set against a background predicted number of 20–25 cancer deaths—it will not be possible to detect the expected excess. Even studies of the much greater collective dose received by the Chernobyl 'liquidators' have not produced clear findings [5]. Unless the magnitude and range of doses received by the public living around Fukushima Dai-ichi NPS has been seriously underestimated, the prospect of finding radiation-related effects in studies of those exposed in the environment is unlikely to be better, and it should be borne in mind that studies of large numbers of residents in high background γ-radiation areas have not found significantly raised risks of cancer related to exposure [10, 11]. Possible exceptions may be thyroid cancer and leukaemia among those exposed as children, but this will be very dependent upon the tissue doses received, and the existence of an excess risk of childhood leukaemia is not conclusive even in the heavily contaminated areas around Chernobyl [5]. Epidemiological studies are inevitable—they have been conducted around the Three Mile Island NPS, where releases from the accident were trivial [12]—but statistical power must be carefully assessed at the outset.

In the days following the 11 March earthquake there was a good deal of confusion surrounding the events at Fukushima Dai-ichi NPS. This is understandable given the backdrop of the earthquake and tsunami in the area, and no doubt the Japanese authorities were devoting significant effort to the stabilisation of the situation at the site rather than translating information into English. However, the magnitude of the release on 15–16 March overland towards the north-west and subsequent deposition that was significant in certain localities was not readily apparent for a while, and it seems that the Japanese authorities did not want to alarm the public at the time—the consequences of this lack of information may not have been serious provided instructions to shelter, to avoid the consumption of contaminated foodstuffs, and to take stable iodine preparations were sufficient, but this will not be clear until a detailed dose assessment has been conducted. On the other hand, some pronouncements from those in authority outside Japan have been breathtaking in their extravagance. Günther Oettinger, European Commissioner for Energy, was reported on 15 March as saying of the events at Fukushima Dai-ichi NPS: 'There is talk of an apocalypse and I think the word is particularly well chosen' (http://www.bbc.co.uk/news/world-asia-pacific-12749444). According to the Oxford Dictionaries, apocalypse is 'the complete and final destruction of the world, as described in the biblical book of Revelation'. Such remarks could have triggered panic in Tokyo and flight on the roads south, which would almost certainly have caused accidents and deaths. As David Spiegelhalter has remarked, 'The EU Energy Commissioner may have his own reasons for making extraordinary statements about apocalypse and imminent catastrophe.' (http://www.bbc.co.uk/news/world-asia-pacific-12785274).

As of early May, the emergency phase of operations at Fukushima Dai-ichi NPS is still underway, and it looks as if it will be sometime before the recovery phase of operations is entered. Stabilisation will be indicated when 'cold shutdown' is achieved on all three reactors that were operating on 11 March—with core temperatures below 100 °C at atmospheric pressure—although highly contaminated water will have to be under control and structural integrity of the interim fuel storage ponds assured, among other things. Meanwhile various operations are underway to progress conditions at the site, such as the injection of inert nitrogen into the RPV of Unit 1 where continued hydrogen generation is suspected, and the spraying

of anti-scattering agent around the site to prevent the resuspension of deposited radioactive material. The situation is much improved over that pertaining in the first week after the major earthquake, but there is some way to go yet before full control of the site is achieved.

What can be made of the events at Fukushima Dai-ichi NPS in these early weeks when, at the time of writing, the emergency phase of operations at the site is still underway? Well, certain questions are obvious ones to ask. Why did the Fukushima Dai-ni (No 2) NPS, situated 11 km down the coast, survive the earthquake and tsunami whereas the Fukushima Dai-ichi NPS did not? Was the design of the emergency systems adequate to meet foreseeable circumstances? Were the three affected reactors at the Fukushima Dai-ichi NPS—operational before the accident in 1979 at the Three Mile Island NPS—kept in service for too long, and were the safety upgrades that have taken place at the site over the years sufficiently comprehensive? Even with tsunami protection approaching six metres, should diesel generators and other emergency plants have been positioned where they were less vulnerable to damage by larger tsunamis? Given that pressure relief operations could have released hydrogen, should hydrogen accumulation in the roofs of the reactor buildings have been foreseen and prevented? Has the vulnerability of spent fuel storage ponds, especially those interim storage ponds located adjacent to reactors, been underestimated? Were the protection measures taken in the badly affected communities to the north-west of the Fukushima Dai-ichi NPS timely and adequate? These questions and more will be the subject of the many reviews and inquiries that will be undertaken as a consequence of the events in Japan. As with Chernobyl and other accidents, it will be important to establish the valuable lessons to be learnt from the Fukushima Dai-ichi NPS events. However, I do not wish to be seen as being unduly critical from afar. Given the difficult background circumstances pertaining in Fukushima prefecture as problems mounted at the Fukushima Dai-ichi NPS, the organisational abilities of the Japanese authorities in dealing with the evacuation, monitoring and protection of the public have to be admired. In particular, the heroic efforts of the emergency workers, battling under conditions that were often atrocious, should not pass without respect and praise. I for one bow to their courage.

References

[1] Wakeford R 2007 The Windscale reactor accident—50 years on *J. Radiol. Prot.* **27** 211–5

[2] Wakeford R 2011 The silver anniversary of the Chernobyl accident. Where are we now? *J. Radiol. Prot.* **31** 1–7

[3] International Commission on Radiological Protection 2007 *The 2007 Recommendations of the International Commission on Radiological Protection, ICRP Publication 103*; *Ann. ICRP* **37** (2–4) 1–332

[4] Jackson D, Lambers B and Gray J 2000 Radiation doses to members of the public near to Sellafield, Cumbria, from liquid discharges 1952–98 *J. Radiol. Prot.* **20** 139–67

[5] United Nations Scientific Committee on the Effects of Atomic Radiation 2011 *Sources and Effects of Ionizing Radiation. UNSCEAR 2008 Report to the General Assembly with Scientific Annexes. Volume II. Scientific Annex D: Health Effects due to Radiation from the Chernobyl Accident* (New York: United Nations)

[6] Dunster H J, Howells H and Templeton W L 2007 District surveys following the Windscale incident, October 1957 *J. Radiol. Prot.* **27** 217–30

[7] Smith J 2011 A long shadow over Fukushima *Nature* **472** 7

[8] International Commission on Radiological Protection 2009 Application of the Commission's Recommendations for the protection of people in emergency exposure situations *ICRP Publication 109*; *Ann. ICRP* **39** (1) 1–110

[9] International Atomic Energy Agency and Organisation for Economic Co-operation and Development/Nuclear Energy Agency 2009 *INES The International Nuclear and Radiological Event Scale User's Manual 2008 Edition* (Vienna: International Atomic Energy Agency)

[10] Hendry J H, Simon S L, Wojcik A, Sohrabi M, Burkart W, Cardis E, Laurier D, Tirmarche M and Hayata I 2009 Human exposure to high natural background radiation: what can it teach us about radiation risks? *J. Radiol. Prot.* **29** A29–42

[11] Nair R R, Rajan B, Akiba S, Jayalekshmi P, Nair M K, Gangadharan P, Koga T, Morishima H, Nakamura S and

Sugahara T 2009 Background radiation and cancer incidence in Kerala, India—Karanagappally cohort study *Health Phys.* **96** 55–66

[12] Talbott E O, Youk A O, McHugh-Pemu K P and Zborowski J V 2003 Long-term follow-up of the residents of the Three Mile Island accident area: 1979–1998 *Environ. Health Perspect.* **111** 341–8

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