UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 13, 2015

MEMORANDUM TO: Gregory T. Bowman, Chief
Policy and Support Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

FROM: Joseph M. Sebrosky, Senior Project Manager
Policy and Support Branch
Japan Lessons-Learned Project Division

SUBJECT: SUMMARY OF MARCH 13, 2015, PUBLIC MEETING TO DISCUSS STAFF'S PRELIMINARY ASSESSMENT OF APPLICABILITY OF FUKUSHIMA LESSONS LEARNED TO FACILITIES OTHER THAN OPERATING POWER REACTORS

On March 13, 2015, the U.S. Nuclear Regulatory Commission (NRC) conducted a Category 3 public meeting with interested stakeholders, members of the public, and industry representatives. A list of individuals in attendance at the meeting can be found in Enclosure 1. The purpose of the meeting was to solicit comments on the staff's preliminary assessment of the applicability of Fukushima lessons learned to facilities other than operating power reactors. The staff stated at the beginning of the meeting that it would consider the comments received during the meeting and revise the preliminary assessment as appropriate based on the comments. The staff stated that it intended to provide the revised assessment to the Commission.

The NRC's preliminary assessment was made available coincident with the issuance of the meeting notice on February 23, 2015, to provide the opportunity for interested stakeholders to review the staff's preliminary assessment prior to the meeting. The preliminary assessment can be found in the Agencywide Documents Access and Management System (ADAMS), under Accession No. ML15042A367. The meeting handouts are available in ADAMS under Accession No. ML15070A530.

As the meeting was a Category 3 public meeting, public participation was actively sought to fully engage the public in a discussion of regulatory issues. The staff engaged meeting attendees throughout the presentation to gather feedback and to answer any clarifying questions. Enclosure 2 provides the description of the comments received during the meeting. The meeting was recorded and during the meeting a stakeholder requested a copy of the audio file associated with the meeting. As a result of this request, the staff made the audio file available on the NRC's Japan Lessons-Learned website at: http://www.nrc.gov/reactors/operating/ops-experience/japan/japan-meeting-briefing.html

As discussed in the announcement associated with the meeting, the staff stated that it would also accept comments via email and that such comments would be considered if they were provided by March 13, 2015. During the meeting a stakeholder requested an extension of the date for providing email comments to March 20, 2015. The staff stated in the meeting that it would revise the date for email comments, such that comments received by March 20, 2015, would be considered in the revision to the staff's preliminary assessment. Enclosure 3 provides a listing of the email comments.

The staff intends to address the comments found in Enclosures 2 and 3 as part of the revised assessment that will be provided to the Commission. To this end, the comments found in Enclosure 2 were assigned a number to allow stakeholders to better determine how their comments are addressed in the assessment that will be provided to the Commission at a later date.

Enclosures:
1. List of Attendees
2. Public Comments Received During the Meeting
3. Emails Comments Received Associated with the Staff's Preliminary Assessment on the Applicability of Fukushima Lessons Learned to Facilities Other than Operating Power Reactors

Public Meeting to Discuss Staff's Preliminary Assessment of Applicability of Fukushima Lessons Learned to Facilities Other than Operating Power Reactors
March 13, 2015
Attendance List

Name	Organization	Name	Organization
Michele Sampson	NMSS/DSFM	Mark A. Wolf	Honeywell
Norma Garcia	NMSS/DSFM	George Rudy	Integ Sys Tech
Boby Abu Eid	NMSS/DUWP	Dan Hughes	NIST
Margie Kotzalas	NMSS/FCSE	Paul Brand	NIST
Jonathan Marcano	NMSS/FCSE	Robert Dineo	NIST
Vince Holahan	NMSS/MSTR	Masaki Nakagawa	NDF
Al Adams	NRR/DPR	Hajima	NDF
John Adams	NRR/DPR	Janet Schlueter	NEI
Greg Bowman	NRR/JLD	Kris Cummings	NEI
Joe Sebrosky	NRR/JLD	Duane Hardesty*	NRC
Lauren Gibson	NRR/JLD	Raymond Lutz*	Citizens Oversight
Mirela Gavrilas	NRR/DPR	Marvin Lewis*	
A.H. Hsia	NMSS/DSFM	Jenny Weil*	NRC
JoAnn Ireland	NMSS/DSFM	Donna Gilmore*	San Onofre Safety
Darrell Dunn	NMSS/DSFM	Tom Tramm*	Certrec
Meraj Rahimi	NMSS/DSFM	Robert Sewell*	
Bob Tripathi	NMSS/DSFM	Rhex Edwards*	SCE
Andrew Persinko	NMSS/DUWP	John Brabec*	SCE
Janelle Jessie	NMSS/DUWP	Derek Widmayer*	NRC
Ron Linton	NMSS/DUWP	Nima Ashkeboussi*	NRC
Marissa Bailey	NMSS/FCSE	Jim Dillard*	NASA
Tom Matula	NMSS	Melanie Wong*	NRC
James Rubenstone	NMSS	Douglas Garner*	NRC
William Huffman	NRR/DORL	Susan Stuchell*	NRC
Darani Reddick	Winston & Strawn	Camille Zozula*	Westinghouse
Tetsu Kobayashi	Ashai Shimbun	Ken Wilson*	SCE
Michael Griffin	MDE	Vivian Campbell*	NRC

Name	Organization	Name	Organization
Lisa Witriol	MDE	Mark Ferdas*	NRC
Susan Tucker*	MIT	Edward Lau*	MIT
Anthony Deangelo*	New York State Department of Health	David McLellan*	Canadian Nuclear Safety Commission
Carlotta Chan*	PSEG	Linda Howell*	NRC
Willie Lee*	NRC	Rich Janati*	Bureau of Radiation Protection State of Pennsylvania
Aaron Wallace*		Ace Hoffman*	
Hannah Northey*	E&E Publishing	Al Csontos**	NRC
Ruth Thomas**			

* indicates individual registered for webinar
** indicates individual participate via phone

Public Comments Received During March 13, 2015, Public Meeting to Discuss Staff's Preliminary Assessment of Applicability of Fukushima Lessons Learned to Facilities Other than Operating Power Reactors

This enclosure provides a list of public comments received during the March 13, 2015, public meeting. The public meeting was organized into six major sections. In the first five sessions, the staff described its preliminary assessment of the Fukushima lessons learned for the following facilities:

- **Session 1** - spent fuel storage installations, transportation packages, and decommissioned reactors and complex materials facilities
- **Session 2** - fuel cycle facilities.
- **Session 3** - radioactive materials users and irradiators.
- **Session 4** - low-level waste disposal facilities, uranium recovery facilities, and uranium mill tailings.
- **Session 5** - research and test reactors.

After each of the first five sessions, the staff provided stakeholders the opportunity to ask questions and provide comments on the staff's preliminary assessment. For session 6 the staff did not make any presentations and stakeholders were provided an opportunity to ask questions and provide comments on the topics discussed in the staff's preliminary assessment.

The following table provides a description of the comments received. Each comment has a unique identifier based on the session in which it was received. For example the first comment received in session 1 is provided the identification number S1-1, and the sixth comment in session 5 is provided the identification number S5-6. The staff will address the comments as part of the revised assessment it will provide to the Commission. The unique identifier found in the table below will be used by the staff to address the comment in the revised assessment.

Comment Number	Person Providing Comment and Description of Comment
S1-1	Donna Gilmore - Recommends the staff qualify the conclusion for the independent spent fuel storage installation (ISFSI) such that it is clear that it does not apply to the ISFSI renewal period. Commenter referenced an August 5, 2014, meeting summary associated with potential cracking in dry shielded canisters (DSCs) over time and a concrete workshop that suggests degradation of concrete over time is possible.
S1-2	Donna Gilmore – Consequences of a DSC crack are not addressed. Inspections have not been developed to find such cracking. Paper should address both issues.
S1-3	Marvin Lewis – Paper does not recognize that Fukushima happened and that transportation accidents happen.
S1-4	Marvin Lewis – NUREG 2125 uses optimistic assumptions.
S1-5	Marvin Lewis – Meeting does not have adequate public participation.
S2-1	Bob Link – Paper states that generic letter (GL) for fuel facilities will be issued in March 2015, and during the presentation the staff stated that GL will be issued in April.

Comment Number	Person Providing Comment and Description of Comment
S3-1	George Rudy – Paper does not mention initiators associated with terrorist attacks or aircraft impacts.
S4-1	Donna Gilmore – Does the earthquake map provided on slide 56 of the staff's presentation (ADAMS Accession No. ML15070A530) take into account the new long-term forecast for California from the US Geological Survey issued on March 10, 2015? If the paper does not, should the assessment be changed to reflect the latest seismic information?
S4-2	Donna Gilmore – Paper does not address aging management and recommendation made to add assumptions used in the paper.
S4-3	George Rudy – Should the Department of Energy's (DOE) Waste Isolation Pilot Project be addressed in the paper?
S5-1	George Rudy – Did the research and test reactor assessment assume post-accident monitoring systems?
S5-2	Marvin Lewis – Did the scope of the paper include military and department of energy reactors?
S5-3	Ruth Thomas – Does the staff consider Defense Nuclear Safety Board regulated facilities and DOE facilities?
S5-4	Ruth Thomas – The paper and presentation uses the term "very unlikely." Is the term very unlikely defined in probabilistic terms?
S5-5	George Rudy – Do RTRs have a no fly zone around them?
S5-6	Ray Lutz – Requested that audio file be made available.
S5-7	Ray Lutz – RTRs should be reviewed for effects to the public from terrorist attacks.
S6-1	George Rudy – Does the NRC coordinate Fukushima lessons learned with other Federal agencies so that other Federal agencies can take advantage of NRC's work for reviewing their regulated facilities? For example, is the NRC coordinating with DOE regulated facilities?
S6-2	Ace Hoffman – The NRC staff is exhibiting gratuitous ignorance as it applies to air craft impacts and dry cask storage breaches and is not properly assessing these events.
S6-3	Ace Hoffman - There is an absence of discussion of the need for prompt evacuation or for the impacts to the Price Anderson insurance protection in the event of an accident
S6-4	Donna Gilmore – The Fukushima dry cask storage system is different than U.S. dry cask storage systems. Did the NRC consider what would happen to U.S. cask designs had they been at Fukushima?
S6-5	Donna Gilmore – Humboldt Bay does not have air vents to remove heat because of low heat load. The San Onofre and Callaway underground design have air vents which would let water into the system. The staff should consider this.
S6-6	Donna Gilmore – What is the remediation plan if a DSC fails?
S6-7	Donna Gilmore – The security assessments referenced in response to S6-6 should be provided to the public.
S6-8	Ray Lutz – Presentation does not discuss Fukushima lessons learned.
S6-9	Ray Lutz – Slide 12 from the meeting handouts states that Near Term Task Force Fukushima lessons learned number 2 regarding the need to reevaluate and upgrade design basis flood and seismic design basis events is not applicable. This does not appear to be accurate.
S6-10	Ace Hoffman – Aircraft hazards and terrorist events should be considered by the staff.

Comment Number	Person Providing Comment and Description of Comment
S6-11	George Rudy – A naturally generated missile or seismic event could cause a degraded DSC to fail, therefore, the staff needs a preplanned mitigation plan.
S6-12	Marvin Lewis – Do the spent fuel storage cask designs consider the enrichment of Uranium 235?
S6-13	Marvin Lewis – A 5/8 inch thick DSC is deficient.
S6-14	Donna Gilmore – Commenter expressed concern that San Onofre is in the process of changing the spent fuel pool cooling system to a spent fuel pool island such that ocean cooling will not be needed.
S6-15	Donna Gilmore – In a previous discussion NRC indicated that reactor vessels that experienced cracking in their inner walls did not leak. Commenter is not concerned about water leaking from the DSC but rather gas leaking through DSC cracks.
S6-16	Donna Gilmore – Concerned that environmental monitors are being removed from around ISFSIs. Decommissioned reactors and ISFSIs should have real time environmental monitors.
S6-17	Donna Gilmore – San Onofre ISFSIs are only 100 ft above the sea level. With global warming this is not enough elevation.
S6-18	Donna Gilmore – Commenter concerned that NRC is not reviewing the San Onofre ISFSI before it is installed and will only perform inspections prior to its operation.
S6-19	Donna Gilmore – NRC processes should be changed to require NRC approval prior to installing an ISFSI or making major changes to the spent fuel pool.
S6-20	George Rudy – There is inadequate post-accident consideration for research and test reactors.
S6-21	Ray Lutz – The conclusion for the spent fuel storage section of the paper states that no further regulatory action or study is necessary. This conclusion does not recognize that the staff needs to continuously assess its regulations in light of Fukushima lessons learned.
S6-22	Ray Lutz – ISFSIs should have a regulatory requirement to have emergency planning zones.
S6-23	Ray Lutz – Assessment is deficient and needs to be redone because it does not provide enough of a discussion describing the Fukushima cask designs and compare them against the U.S. designs to identify lessons learned.
S6-24	Donna Gilmore – NRC should require a license amendment for ISFSI changes or for changes to the spent fuel pool.

Email Comments Received Associated with the Staff's Preliminary Assessment on the Applicability of Fukushima Lessons Learned to Facilities Other than Operating Power Reactors

Note that the staff generally removed contact information (e.g., email addresses, and telephone numbers) from the emails which it received and that are documented in this enclosure.

Contents

1. University of Missouri Research Reactor Comments

From: Foyto, Leslie P.
Sent: Thursday, March 12, 2015 1:00 PM
To: Adams, John
Cc: Butler, Ralph
Subject: RE: Your Review and Comments Requested on the Draft Assessment of Fukushima lessons Learned for RTRs

John,

Thanks for providing MURR an opportunity to comment on the Draft White Paper "Applicability of Fukushima Lessons Learned to Facilities Other Than Operating Power Reactors." Sorry for the late response, I was on travel this week assisting in the I&C cyber-security audits at the University of Maryland and Penn State reactors. I have read the document thoroughly and believe that you have done a great job of putting this document together and I agree with the conclusions and recommendations, especially the statement "If it can be shown that pool failure is not credible under these circumstances, then the staff is unlikely to pursue additional actions for these research reactors." I do have a couple of comments that might need clarity:

1. On page 69, the 3rd bullet under Electrical Power, "3-out-of-31 RTRs may require AC power to replenish inventory because of seismic activity or boil-off." I assume by replenishing inventory you mean water inventory for the reactor and/or spent fuel pools? As it currently stands, MURR does not need electrical power to fill the pool in an emergency situation on a lowering of pool level. We have a dedicated water line with a manual isolation valve that will provide virtually an unlimited quantity of water to the pool.
2. On page 71, the 5th bullet under Spent Fuel Pool Cooling, "Typically, spent irradiated and excess fuel is stored dry in the reactor pools, or in dedicated spent fuel pools provided by design." Not sure what is meant by "Stored dry in the reactor pools"? How can you store something dry in a water pool?
3. Page 71, 3rd bullet under Combustible Gas Control, "The higher powered RTRs have dedicated hydrogen control system that are operated during reactor operation; however, upon reactor shutdown, those systems are no longer required to prevent the formation of combustible or explosive concentrations of hydrogen." MURR does not require a hydrogen control system. I have attached our response to a relicensing RAI regarding this subject and it has been accepted by the NRC.

John, please let me know if you have any questions.
Thanks,
Les

5.2 Section 5.2, Primary Coolant System

b. *Describe how oxygen and hydrogen from the radiolysis of primary coolant is controlled.*

BACKGROUND: In radiolysis of pure water, ionizing radiation produces hydrogen atoms (H) and hydroxyl radicals by reaction 1 and hydrated electrons (e^-_{aq}) by reaction 2.[1]

[1] $HOH \rightarrow H + OH$

[2] $2HOH \rightarrow H_3O^+ + OH + e^-_{aq}$

Comparison of the reaction rates of H and e^-_{aq} with hydrogen peroxide (a stable product of hydrolysis) for reactions 3 and 4, results in a ratio of rate constants $k\ e^-_{aq}(H_2O_2)/k_H(H_2O_2) = 500$ demonstrating the hydrated electron to be a much stronger reducing agent than hydrogen atoms.

[3] $H + H_2O_2 \rightarrow H_2O + OH$

[4] $e^-_{aq} + H_2O_2 \rightarrow OH^- + OH$

Depending on the type of ionizing radiation (alpha, beta and/or gamma), the purity of the water, and, to a lesser extent, the pH and temperature, numerous secondary free-radical reactions take place. Thirty-two (32) such reactions have recently been identified by Ershov and Gordeev.[2]

The stable product signatures resulting from the radiolysis of water are hydrogen gas ($H_{2(g)}$) and hydrogen peroxide (H_2O_2) and their respective g-values[3] at 54°C are 0.5 and 0.6.[4] The low g-values for these products are the result of the fast recombination rates of the precursor radicals on timescales of picoseconds to microseconds in water.[5]

RADIOLYSIS POTENTIAL AT THE MURR: The MURR operates at 10 MW approximately 150 hours per week. Consequently, the total gamma-ray activity resulting from neutron capture, fission products and activation products is substantial. Any resulting γ-radiolysis would be maximized in the reactor core and fuel storage areas in the reactor pool. In both locations, the water is continuously purified via ion exchange maintaining a quality standard for purified water that meets ISO 3696 Grades 1 & 2. The water quality data for the MURR pool and primary coolant systems are given in the following table.

MURR Pool and Primary Coolant System Water Quality
(average & s.d. from 2009 weekly data)

System	pH	Conductivity (μS/cm)	TDS (ppm)
Pool	5.5 ± 0.3	1.9 ± 0.9	1.2 ± 0.6
Primary	5.6 ± 0.3	1.2 ± 0.5	0.8 ± 0.3

The 8-element reactor core is cooled by a closed circulating water system (primary coolant system) containing 2,000 gallons (7,571 l) of deionized water with a flow rate of approximately 3,750 gpm (14,195 lpm). At 10 MW, the inlet and outlet temperatures are 120 °F (49 °C) and 136 °F (58 °C), respectively, giving an average operating temperature of 54°C. The primary coolant system also includes two heat exchangers, an anti-siphon tank, and a vent tank having a volume of 3391 in^3. During reactor operation, the vent tank contains water, water vapor, air and any collected gasses resulting from radiolysis.

The fuel-storage areas can accommodate up to 88 irradiated fuel elements at various stages in the fuel cycle. These elements are cooled by the pool water moving through the fuel-storage areas by pool circulation and convection. The pool water volume is 28,000 gallons (105,992 l) and is pumped at a flow rate of approximately 1,200 gpm (5,542 lpm). During 10 MW operation, the pool water temperature is 100 °F (38 °C).

Under routine MURR operating conditions, radiolysis of water in the pool and primary coolant systems will occur; however, given the high water quality, recombination of the initial radiolysis species (H atoms, hydroxyl radicals and hydrated electrons) occurs on picosecond timescales resulting in negligible production of the stable radiolysis products (H_2, H_2O_2 & O_2). Observation of hydrogen (H_2) or oxygen (O_2) gases in the reactor pool or primary coolant system vent tank requires these gases to be present at concentrations exceeding their solubility at the respective temperatures, 38 °C (pool water) and 54 °C (primary water). These solubility values are summarized in the following table.

Hydrogen (H_2) and oxygen (O_2) gas solubility in MURR pool and primary water at atmospheric pressure.

gas	pool water at 38 °C		primary water at 54 °C	
	g/L	g/106,000 L	g/L	g/7571 L
$H_{2(g)}$	0.0014	148.4	0.0012	9.1
$O_{2(g)}$	0.0066	699.6	0.0054	40.9

Supporting evidence exists for the conclusion that radiolysis products are negligible in the MURR pool and primary coolant systems based on unobserved hydrogen gas (H_2), a signature radiolysis product.

1. If radiolysis without recombination, in excess of negligible quantities, were to occur on the surfaces of the irradiated fuel elements stored in the pool, hydrogen gas would be constantly produced beyond its solubility limit and ultimately emanate as a gas, rise to the pool surface and be exhausted from the containment building by the pool-sweep system. However, the routine emanation (continuous or intermittent) of gas from the irradiated fuel elements stored in the MURR pool is NOT observed supporting the conclusion that radiolysis, without recombination, of MURR pool water is negligible.

2. If radiolysis without recombination, in excess of negligible quantities, were to occur in the primary coolant system, hydrogen gas would be constantly produced beyond its solubility limit and ultimately be collected in the primary coolant system vent tank causing it to pressurize and sporadically off-gas to the pool and be exhausted from the containment building by the pool-sweep system. However, off-gassing of the vent tank is NOT observed supporting the conclusion that radiolysis, without recombination, of primary coolant system water is negligible.

3. The same arguments apply for O_2 gas produced through radiolysis in the pool and primary coolant systems. However, some O_2 will already be present in pool and primary water from dissolved air. Consequently any O_2 produced by radiolysis would be additive and induce gas emanation at that point when the sum of O_2 from the two sources (dissolved air and radiolysis) exceed the solubility limit for O_2. As stated in the previous paragraphs (1 & 2),

off-gassing in the pool or the primary coolant system vent tank is NOT observed supporting the conclusion that radiolysis, without recombination, in these systems is negligible.

SUMMARY: Neither hydrogen or oxygen gas emanation is observed in the irradiated fuel-storage areas in the MURR pool nor from the primary coolant system vent tank indicating that radiolysis, without recombination, of MURR pool and primary water is negligible. Furthermore, any gasses emanating from the pool and primary coolant systems are captured by the pool sweep system and exhausted from the MURR containment building without being re-circulated and with large dilution factors.

REFERENCES:

[1]Hart, EJ. , "The Hydrated Electron" (1964) Science 146, p19-25.
[2]Ershov, BG, Gordeev, AV. "A model for radiolysis of water and aqueous solutions."
[3]The g-value is the number of molecules, ions, atoms or radicals formed per 100eV absorbed energy.
[4]Elliot, AJ. "Rate constants and G-values for the simulation of the radiolysis of light water over the range 0 to 300 °C" (1994) AECL-11073.
[5]Janik, D, Janik I, Bartels, M. "Neutron and β/γ radiolysis of water up to supercritical conditions. 1. β/γ yields for H_2, H atom, and hydrated electron" (2007) J.Phys.Chem A, 111, p7777-7786.

2. National Institute of Standards and Technology Comments

From: Brand, Paul C.
Sent: Friday, March 13, 2015 9:56 AM
To: Adams, John
Cc: Rowe, J Michael; Myers, Thomas J.; Hughes, Dan; Dimeo, Robert M
Subject: Comments from NCNR

Hi John:

NIST Center for Neutron Research (610)

- Because of their low power, NRC-licensed RTRs do not rely on large sources of water for makeup and heat sinks which allows siting of RTR facilities a significant distance from potential sources of flooding
- Each research reactor licensee has demonstrated through various analyses that the radiological consequences associated with the maximum predicted seismic event at the facility site meets accident analysis acceptance criteria which have been based on highly conservative public and occupational dose limits.
- Similar to power reactors, the one test reactor currently licensed by the NRC must meet 10 CFR, Part 100 seismic requirements and radiological limits

Electrical Power

On March 11, 2011, the magnitude 9.0 earthquake caused the automatic shutdown of all the operating units at the Fukushima Dai-ichi site and resulted in the loss of off-site power to all six units. The emergency diesel generators at all the six units started and were providing emergency alternating current (AC) power for decay heat removal and other critical systems. Approximately 40 to 50 minutes following the earthquake, the site experienced a tsunami initiated by the earthquake. The tsunami height exceeded the site's designed tsunami protection by an estimated 27 feet. The inundation of sea water caused extensive damage to important plant structures, systems and components resulting in the loss of emergency AC power to five of the six units, a condition known as a station blackout.

Given the Fukushima scenario, the staff included a review of an extended loss electrical power on the safety of NRC-licensed RTRs as part of their immediate assessment. The staff reached the following conclusions related to the NRC-licensed RTRs' reliance on electrical power and sensitivity to its loss.

- Most RTRs have some level of emergency power, typically to power area radiation monitors, evacuation alarms and lighting, and security systems. None require electrical power (normal or emergency) to safely shutdown the reactor
- 28-out-of-31 RTRs are air-coolable and thus do not require electric power for decay heat removal.
- 3-out-of-31 RTRs may require AC power to replenish inventory lost because of seismic activity or boil-off.

Decay Heat Removal

At Fukushima it was ultimately the inability to remove the decay heat[37] from the reactor cores that resulted in catastrophic failures. The generated decay heat is not unique to power reactors and is also generated in the cores of RTRs. The major differences between power reactors and RTRs are the magnitude of their maximum operating power, the duration of operation, and the smaller quantities of spent or irradiated fuel onsite. These qualities equate to a significantly

[37] The majority of the decay heat generated is attributable to the decay of the radioactive fission products. After reactor shutdown, decay heat is about 6.5 percent of the previous operating power and decrease over time, 1.5 percent after 1 hour, 0.4 percent after 24 hours, and 0.2 percent after one week. Ref. DOE-HDBK-1019 "DOE Fundamentals Handbook – Nuclear Physics and Reactor Theory, January 1993

Summary of Comments on DRAFT WHITE PAPER Fukushima Lessons Learned to Facilities Other than Operating Power Reactors.

Page: 1

Number: 1 Author: pbrand Subject: Sticky Note Date: 3/13/2015 9:43:58 AM

The NCNR has AC from in-house Diesel Generators and a UPS.

smaller fission product inventory and a significantly reduced decay heat generation rate at RTRs. These along with other factors make RTRs much less susceptible to core damage from overheating when compared to power reactors and generally eliminate the need for highly complex, diverse, and redundant active decay heat removal systems typical of those found at power reactors. For example, for the NRC-licensed RTRs that are less than 2 MWt, decay heat can be adequately removed through air cooling of the core[38]

Given the Fukushima scenario, the staff included a review of the decay heat removal capability as part of the immediate assessment. The staff reached the following conclusions related to the decay heat removal at NRC-licensed RTRs

- Natural convection of primary coolant provides adequate decay heat removal for all RTR designs in the short-term (0.5 to 2.5 hours)
- The one test reactor licensed by the NRC requires active systems for adequate long-term decay heat removal
- In cases of loss of coolant scenarios, air cooling is sufficient to remove decay heat for all RTRs with maximum licensed power levels of less than 2 MWs (26 of the 31 RTRs)
- Loss of coolant scenarios in the 2 megawatt and greater reactors (5 of the 31 RTRs) rely on designs that:
  - maintain floodable volume that maintains the core covered with water at three of those facilities
  - provide the capability to spray the core with diverse sources of water via active (pumped) and/or passive (gravity drain)
  - are equipped with emergency power systems or batteries sufficient to power cooling and makeup systems for the limited time required following reactor shutdown

Spent Fuel Pool Cooling

Given the public interest in spent fuel pools following the Fukushima accident, the staff included a review of the storage of irradiated and spent fuel at RTRs. The staff reached the following conclusion

- All RTRs have very small inventories of spent or irradiated fuel
- At all but the three largest RTRs, spent fuel is not routinely discharged due to low power and limited operational duration and frequency (practically speaking, the majority of the less than 2MW RTR reactor cores can be considered lifetime cores)
- The Department of Energy (DOE) recovers spent and/or unwanted irradiated fuel from 28 of 31 RTRs owned by government or academic institutions which includes the largest generators of spent fuel preventing the accumulation of large on-site spent fuel inventories

[38] S. Hawley and R. Kathren, Pacific Northwest Laboratory, 1982, "NUREG/CR-2387, Credible Accident Analyses for TRIGA and TRIGA Fueled Reactors."

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Number: 1	Author: pbrand	Subject: Sticky Note	Date: 3/10/2015 4:27:40 PM

Longer if we can recover the water and pump it back to the emergency tank

Number: 2	Author: pbrand	Subject: Sticky Note	Date: 3/13/2015 9:44:40 AM

Correct: Diesels and UPS

External Event	Potential Impact on the Facility	Assessment
High Wind/Tornado/Missiles	• Loss of all electrical power and active heat removal systems • Challenge to reactor structures including confinements or containments	• Below grade design or above grade reinforced concrete biological shield prevents impact damage to ~~pool liner~~ and fuel. • Staff to continue assessment to ensure that there is not an event-specific vulnerability
Lightning	• Loss of all electrical power and active heat removal systems	• Decay heat is adequately removed by natural convection of pool water. Active decay heat removal systems and electrical power are not needed.
Snow and ice loads	• Loss of all electrical power and active heat removal systems • Challenge to reactor structures including confinements or containments	• Bounded by Seismic and high winds assessment • Staff will continue assessment to ensure there is not an event-specific vulnerability
Drought/ Temperature Extremes	It may be necessary to shut down the reactors based on an inability to continue to meet Technical Specification.	• Active decay heat removal systems and electrical power are not needed.
Fire	• Loss of all electrical power and active heat removal systems • Challenge to reactor structures including confinements or containments	• Low combustible loading and compliance with fire codes at the reactor facility • Fire-induced LOCA highly unlikely. In the event of a fire the biological shield and water in reactor core ~~and reactor pool~~ will cool these components such that fire-induced LOCA is not credible
Loss of Power	• Loss of all electrical power and active heat removal systems	• Active decay heat removal systems and electrical power are not need
Loss of Heat Sink	• Require a reactor shutdown at most RTRs to prevent exceeding temperature limits	• Active decay heat removal systems and electrical power are not needed

20 MWt Test Reactor

The test reactor is protected initially from fuel cladding failure via a passive coolant makeup system combined with natural convection cooling following the loss of active decay heat removal capability. Specifically, the ~~emergency cooling tank~~ will make-up the inventory boiled-off during the first 0.5 hour. The heavy water ~~cooling~~ will continue to replenish the inventory for an additional 2 hours. As the inventory of coolant contained in the passive makeup system becomes depleted, fuel temperatures start to increase to a point where fuel cladding can fail if the facility's light water makeup water source to the core or electrical power and a means of decay heat removal are not restored to operation or otherwise provided via portable equipment in a timely manner. In severe accidents (beyond design basis accidents), domestic light water can be supplied to the reactor through a spool-piece and double isolation valves. Emergency power to the active decay heat removal system can be supplied by the 125 VDC station batteries for a limited time or from one of the two on-site emergency diesel generators

Page: 3

+ Number: 1 Author: pbrand Subject: Cross-Out Date: 3/13/2015 9:50:21 AM

Number: 2 Author: pbrand Subject: Sticky Note Date: 3/13/2015 9:51:49 AM
should read "reactor vessel"

Number: 3 Author: pbrand Subject: Sticky Note Date: 3/13/2015 9:51:32 AM
Reactor confinement building provides first line of defence against wind carried missiles.

+ Number: 4 Author: pbrand Subject: Cross-Out Date: 3/13/2015 9:53:38 AM

+ Number: 5 Author: pbrand Subject: Cross-Out Date: 3/13/2015 9:53:45 AM

Number: 6 Author: pbrand Subject: Sticky Note Date: 3/13/2015 9:54:09 AM
should read "vessel"

+ Number: 7 Author: pbrand Subject: Cross-Out Date: 3/13/2015 9:53:04 AM

+ Number: 8 Author: pbrand Subject: Cross-Out Date: 3/10/2015 4:31:09 PM

Number: 9 Author: pbrand Subject: Sticky Note Date: 3/10/2015 4:32:06 PM
Should be "inner reserve tank"

+ Number: 10 Author: pbrand Subject: Cross-Out Date: 3/10/2015 4:31:37 PM

Number: 11 Author: pbrand Subject: Sticky Note Date: 3/10/2015 4:32:03 PM
should be "emergency tank"

Table 3

External Event	Impact on the Facility	Assessment
Flood	• Loss of all electrical power and any active heat removal systems • Challenge to facility equipment and reactor structures including confinements or containments	• Passive coolant makeup system removes decay heat for 2.5 hours. • City-water backup can supplement makeup coolant inventory after 2.5 hours.
Seismic	• Loss of all electrical power and any active heat removal systems • Challenge to reactor structures including confinements or containments • Physical damage to reactor components (e.g., pool integrity, passive cooling features or structural components)	• Test reactor meets 10 CFR Part 100 seismic criteria. • The test reactor decay heat is adequately removed by natural convection of pool water for at least 3 days. Continued adequate decay heat removal will require either a source of makeup water or active decay heat removal. • Staff will continue assessment to ensure there is not an event-specific vulnerability
High Wind/Tornado/Missiles	• Loss of all electrical power and active heat removal systems • Challenge to reactor structures including confinements or containments	• Reinforced concrete biological shield prevents impact damage to pool liner and fuel. • Test reactor decay heat is adequately removed by natural convection of pool water initially. Continued adequate decay heat removal will require either a source of makeup water or active decay heat removal systems for the long-term. • Staff will continue assessment to ensure there is not an event-specific vulnerability
Lightning	• Loss of all electrical power and active heat removal systems	• Test reactor decay heat is adequately removed by natural convection of pool water initially. Continued adequate decay heat removal will require active decay heat removal systems in the long-term. • Staff will continue assessment to ensure there is not an event-specific vulnerability
Snow and ice loads	• Loss of all electrical power and active heat removal systems • Challenge to reactor structures including confinements or containments	• Test reactor decay heat is adequately removed by natural convection of pool water initially. Continued adequate decay heat removal will require active decay heat removal systems in the long-term. • Staff will continue assessment to ensure there is not an event-specific vulnerability.
Drought/ Temperature Extremes	It may be necessary to shut down the reactors based on an inability to continue to meet Technical Specification.	• Test reactor decay heat is adequately removed by natural convection of pool water initially. Continued adequate decay heat removal will require active decay heat removal systems in the long-term.

Page: 4

Number: 1 Author: pbrand Subject: Cross-Out Date: 3/10/2015 4:33:51 PM

Number: 2 Author: pbrand Subject: Sticky Note Date: 3/10/2015 4:46:48 PM
should read "reactor vessel"

Number: 3 Author: pbrand Subject: Cross-Out Date: 3/10/2015 4:36:21 PM

Number: 4 Author: pbrand Subject: Sticky Note Date: 3/10/2015 4:36:45 PM
Should read "2.5 hours"

Number: 5 Author: pbrand Subject: Cross-Out Date: 3/13/2015 9:46:14 AM

Number: 6 Author: pbrand Subject: Sticky Note Date: 3/13/2015 9:46:58 AM
Should read: "reactor vessel"

Number: 7 Author: pbrand Subject: Sticky Note Date: 3/13/2015 9:48:16 AM
The (concrete) confinement building provides a first line of defence to wind carried missiles

Number: 8 Author: pbrand Subject: Cross-Out Date: 3/10/2015 4:34:00 PM

Number: 9 Author: pbrand Subject: Sticky Note Date: 3/13/2015 9:47:13 AM
Should read "reactor vessel"

Number: 10 Author: pbrand Subject: Cross-Out Date: 3/10/2015 4:34:07 PM

Number: 11 Author: pbrand Subject: Sticky Note Date: 3/10/2015 4:47:04 PM
Should read "reactor vessel"

Number: 12 Author: pbrand Subject: Cross-Out Date: 3/10/2015 4:34:14 PM

Number: 13 Author: pbrand Subject: Sticky Note Date: 3/10/2015 4:47:12 PM
Should read "reactor vessel"

Number: 14 Author: pbrand Subject: Cross-Out Date: 3/10/2015 4:34:20 PM

Number: 15 Author: pbrand Subject: Sticky Note Date: 3/10/2015 4:47:20 PM
Should read "reactor vessel"

External Event	Impact on the Facility	Assessment
		• Long-term coolant makeup requirements very minimal for this reactor because of low decay heat. • Staff will continue assessment to ensure there is not an event-specific vulnerability
Fire	• Loss of all electrical power and active heat removal systems • Challenge to reactor structures including confinements or containments	• Low combustible loading and compliance with fire codes at the reactor facility. • Below grade design or above grade reinforced concrete biological shield prevents direct heating of the [1] [2]her and fuel • Test reactor decay heat is adequately removed by natural convection of [3]~~pool~~ [4] water initially. Continued adequate decay heat removal will require active decay heat removal systems in the long-term. • Staff will continue assessment to ensure there is not an event-specific vulnerability
Loss of Power	• Loss of all electrical power and active heat removal systems • Challenge to reactor confinement	• Test reactor decay heat is adequately removed by natural convection of [5]~~pool~~ [6] water initially. Continued adequate decay heat removal will require active decay heat removal systems in the long-term. • Staff will continue assessment to ensure there is not an event-specific vulnerability
Loss of Heat Sink	• Require a reactor shutdown at most RTRs to prevent exceeding temperature limits	• Test reactor decay heat is adequately removed by natural convection of [7]~~pool~~ [8] water initially. Continued adequate decay heat removal will require active decay heat removal systems in the long-term. • Staff will continue assessment to ensure there is not an event-specific vulnerability

Assessment of NTTF Recommendations

The Fukushima Dai-ichi accident resulted from an external event that exceeded the design of the facility. The external event overwhelmed all levels of the facility's defense-in-depth eliminating plant equipment and barriers relied upon to prevent the release of radioactive material as well as presenting significant challenges to their emergency preparedness preparations.

The NTTF focused on the Fukushima Dai-ichi accident lessons learned and made recommendations to enhance the defense-in-depth associated with U.S. power reactors. The RTR staff conducted an assessment of the 12 NTTF recommendations and considered the

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Number: 1	Author: pbrand	Subject: Cross-Out	Date: 3/10/2015 4:37:14 PM
Number: 2	Author: pbrand	Subject: Sticky Note	Date: 3/10/2015 4:47:31 PM
Should read "reactor vessel"			
Number: 3	Author: pbrand	Subject: Cross-Out	Date: 3/10/2015 4:37:19 PM
Number: 4	Author: pbrand	Subject: Sticky Note	Date: 3/10/2015 4:47:39 PM
Should read "reactor vessel"			
Number: 5	Author: pbrand	Subject: Cross-Out	Date: 3/10/2015 4:37:50 PM
Number: 6	Author: pbrand	Subject: Sticky Note	Date: 3/10/2015 4:47:47 PM
Should read "reactor vessel"			
Number: 7	Author: pbrand	Subject: Cross-Out	Date: 3/10/2015 4:37:56 PM
Number: 8	Author: pbrand	Subject: Sticky Note	Date: 3/10/2015 4:47:54 PM
Should read "reactor vessel"			

3. Massachusetts Institute of Technology Comments

From: Thomas H Newton
Sent: Monday, March 09, 2015 2:34 PM
To: Adams, John; paul.brand@nist.gov; ButlerRa@missouri.edu
Cc: Gavrilas, Mirela; Adams, Alexander; Hsueh, Kevin; Edward Lau; Guy Steingass; Jere Jenkins; Jim Costedio; Leo Bobek; Mark Trump; Melinda Krahenbuhl; Mike Flagg; Sean O'Kelly; Steve Miller; Steve Reese
Subject: RE: Your Review and Comments Requested on the Draft Assessment of Fukushima lessons Learned for RTRs

John,

Thank you for engaging us in discussions on the Fukushima lessons learned. I have received a couple of comments on the draft assessment.

The first, and major one concerns the use of part 20 limits as a criteria for accident events at research reactors (p.64). Although most of our facilities are able to meet this criteria, the part 20 limits were not specifically written to be applied to accident scenarios. Thus, we would urge caution when referring to MHA analyses needing to meet 10CFR20.

The other comment concerns the reference of facility effective power to determine radiological consequences. Although we agree with the approach in this instance, there is a concern that this could be seen as precedence for using values other than license limits for other regulatory activities. Again, thank you for keeping us updated and we look forward to further discussions on Friday.

Tom

Thomas H. Newton, Jr., Ph.D
Director of Reactor Operations
MIT Nuclear Reactor Laboratory

4. Patricia Borchmann Comments

From: Patricia Borchmann
To: JLD_Public Resource
Cc: Sebrosky, Joseph; kotzalas.margie@nrc.gov; Benney, Kristen; majeed.fajr@nrc.gov; Patricia Borchmann; Donna Gilmore
Subject: Re: Public Opposition - NRC White Paper - Fukishima Lessons Learned
Date: Friday, March 20, 2015 8:42:49 AM

To: JLD_Public Resource - NRC Japan Lessons-Learned Division

Thank you for your prompt email reply this morning, responding to my email from last night. Your email indicates that the White Paper considered at the NRC meeting on March 13, 2015, and in my comments had no non-concurrences.

In the event non-concurrences were initially filed, then later withdrawn, or are still pending, I imagine those should be publicly accessible, and within NRC public domain, as part of internal NRC steps taken, to build the public record and provide the basis upon which senior staff's recommendations were based.

So, if this sequence of events took place, and if two non-concurrences were filed but were later withdrawn, or are still pending, then that information is highly relevant, and should not be withheld from the public.

So, another response from your section is requested immediately, responding to this second email here, regarding public comments on the referenced White Paper. Please provide additional confirmation regarding any Nonconcurrences pertaining to this White Paper, which may have been filed, but withdrawn, or may be still pending, at your earliest opportunity.

Thank you in advance. p

On Fri, Mar 20, 2015 at 4:34 AM, JLD_Public Resource <JLD_Public.Resource@nrc.gov> wrote:

Hello;

The NRC has received your comments. The white paper discussed at the meeting on March 13 and in your comments has no nonconcurrences.

Thank you.

Japan Lessons-Learned Division Office of Nuclear Reactor Regulation Nuclear Regulatory Commission

From: Patricia Borchmann
Sent: Thursday, March 19, 2015 11:18 PM
To: JLD_Public Resource
Cc: Sebrosky, Joseph; Kotzalas, Margie; Benney, Kristen; Majeed, Fajr

Subject: Public Opposition - NRC White Paper - Fukishima Lessons Learned

Extended Public Comment deadline - 03 20 15

fyi. my personal comments on NRC's draft White Paper are attached.
I have so far, been unable to access a copy of the two NRC NonConcurrences, filed by two NRC groups with dissenting opinions.

If possible, I would like to ask NRC to send me an email with digital copies of both NonConcurrences, and allow me the opportunity to make one additional comment which is limited to the two Nonconcurrences.

fyi - I tried to contact your designated staff earlier today, however was unable to do so during office hours on east coast. I sent an email earlier to designated NRC contacts , with these public opposition comments.

I received 2 REPLIES, from designated staff members who indicated they are out of the office on 03 20 15. Therefore, so far I have been unable to access a digital copy of the two Nonconcurrences filed by NRC groups with dissenting opinions.
Due to this hardship of not being able to access these two vital documents, I feel that an additional single comment opportunity for supplemental comments pertaining to this is appropriate, since I also could not locate them on NRC's website.

Thank you for consideration
If possible, please send email confirmation when you receive this email, and confirm my comments have been received.

P

March 19, 2015 Patricia Borchmann

email to:
joseph.sebrosky@nrc.gov
Margie.kotzalas@nrc.gov
Kristen.benney@nrc.gov
JLDRulemaking@nrc.gov

Re: Fukishima Lessons Learned at Facilities Other Than Operating U.S. Nuclear Power Plants - Public Opposition to NRC's proposed draft White Paper
At NRC's March 13, 2015 Commission Meeting last week (in Rockville, MD), the Commission agreed to extend Public Comment deadline one additional week until March 20, 2015. I appreciate the Commission's courtesy to extend public comments one additional week, to allow more public stakeholders in reactor communities in United States this opportunity to participate in reaching a fair, and reasonable outcome. I am strongly opposed to the extensive fundamental regulatory changes proposed by NRC senior staff, which are reflected in this draft White Paper.

In this letter, I will demonstrate to NRC Commissioners, and NRC senior management staff specifically how the analysis, and methodology applied by staff to produce this document

contain so many serious flaws, inconsistencies, and fundamental assumption errors. The resulting safety degradations which would occur if these new SUPER FLEX equipment features, and WHITE Paper findings are implemented are so significant, and so severe that I see no public benefit whatsoever in developing new regulations. After having evaluated and compared them, it appears obvious that senior staff's analysis, methodology, and conclusions in the White Paper are identical to the industry preferences, for cheaper, and less extensive site safety upgrades for earthquake, and flood protection purposes, which ONLY derives an economic benefit to utility (Licensees), but at the same time, how these new standards would become a substantial safety degradation, when compared to existing NRC regulations. The White Paper's conclusions (that there are no relevant Fukishima lessons that need to be applied to reactors in United States), is a ludicrous position, based on gross over-simplification, plus faulty, inconsistent analysis, unsupported assumptions, and scoping deficiencies.

I strongly believe that the extent of errors and safety deficiencies reflected in White Paper are so extreme, and are such a significant departure from NRC's existing regulations, the statutory mandates for protection of public health and safety, and reasonable expectations of function are completely threatened. For these reasons, I strongly feel that the proposed regulatory changes described in this White Paper are grossly unacceptable, and that minor refinements alone would be unlikely to reach an equivalent level of public health and safety, or even a near equivalent.

Based on extensive new data, and objective risk analysis pertaining to reactor sites, public stakeholders in America's reactor communities deserve no less than the fully mandated public health and safety assurances, plant upgrades, and infrastructure, as reflected in NRC's current, but largely outdated regulations. While it is recognized that updated regulation(s) are rapidly becoming a necessity to keep pace with rapid technological changes and industry practices, there is absolutely no obvious public need or benefit, (and instead quite likely a substantial safety degradation), the Commission's duty here is to act in the PUBLIC interest, (as opposed to utility, or pro-nuclear industry preferences). The proposed changes reflected in this White Paper are contrary to the public interest, and are therefore unacceptable. Additionally, I find it extremely disturbing, that senior NRC staff has forwarded this Agenda item to Commissioners for action, with very few changes.

I strongly support the conclusions reached in the article by Ed Lyman (dated March 11, 2015) titled "Four Years After Fukishima: The NRC At A Tipping Point", (published in All Things Nuclear). For the convenience of Commissioners and NRC staff, I have enclosed a digital file containing this article.

In this article, Mr. Lyman's analysis (as a qualified expert in the field) led him to conclusions that I strongly agree with. "The White Paper reflects NRC senior management staff's assertions that rather than requiring plant upgrades to prevent earthquakes and floods from damaging nuclear plant system that could lead to meltdown, it instead wants to mitigate the effects of damage after beyond design basis earthquakes, or flood events occur."

Despite NRC senior staff's apparent endorsement of SUPER Flex strategy, NRC Commissioners STILL HAVE THIS OPPORTUNITY TO RECONSIDER YOUR SUPPORT. Based on public testimony and opinions by independent experts both inside and outside the nuclear industry, I must implore Commissioners to REJECT the proposed regulatory changes described in this current White Paper. It is obvious, from the Nonconcurrences filed by two

groups within NRC itself there is even internal disagreement within NRC itself, especially since one of the two NRC Nonconcurrences was also signed by senior NRC Managers, which is extremely rare. Based on the totality of public comments, and Nonconcurrences by two groups under NRC, it is imperative that Commissioners more FULLY consider the extensive analytical shortcomings of analysis performed by senior staff in these studies, and more FULLY RECOGNIZE there are important, and highly relevant lessons of Fukishima that DO need to be applied to America's domestic reactors. Stakeholders in southern CA are especially concerned about the White Paper section 7, on Decommissioning Reactors and Complex Materials Facilities.

So instead of acting exclusively in the utility interest, I remind, and urge Commissioners to act on this item in the PUBLIC interest, by REJECTING THIS WHITE PAPER analysis, and it's recommendation that no plant upgrades are necessary. It is imperative that NRC Commissioners today act in a way to more fully protect the public stakeholders in America's reactor communities, than the manner in which these changes have been considered by NRC Commission so far.
Thank you for consideration.

Patricia Borchmann

5. Environmental Coalition, Alliance for a Green Economy, and Nuclear Information and Resource Service Comments

Alliance for a Green Economy
Citizens' Environmental Coalition
Nuclear Information and Resource Service

March 20, 2015

Nuclear Regulatory Commission
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Sent via Email JLD_Public.Resource@nrc.gov

Re: Staff White Paper:
APPLICABILITY OF FUKUSHIMA LESSONS LEARNED TO
FACILITIES OTHER THAN OPERATING POWER REACTORS

Dear NRC Commissioners and Staff,

This white paper is an extremely weak effort to provide support for discharging NRC responsibility related to a specific Fukushima Near Term Task Force recommendation.

The tasking memorandum, issued shortly after the Fukushima accident, included as one of the longer term activities that the staff should assess the applicability of the lessons learned to non-operating reactors and non-reactor facilities. We are focusing our comments on Section 7 of the white paper, Decommissioning Reactors and Complex Materials Facilities, particularly on the West Valley nuclear waste site in Western New York. This facility is a complex material facility used for reprocessing that is upstream of the Seneca Nation of Indians Cattaraugus Territory, Cattaraugus Creek, Lakes Erie and Ontario and the Niagara River.

Decommissioning of Reactors is an extremely long, complex and expensive process that can take more than a decade to complete and can include decades of storage. It involves large quantities of the most highly radioactive material known. In fact, NRC has allowed long term delay in decommissioning to provide for some attenuation of the health dangers for workers that will do the work. Yet in just 7 pages, NRC dismisses the risks not only of Reactor Decommissioning but also the Decommissioning of Complex Materials Facilities.

A serious white paper needs much more specific information to deal with the many complex hazards for each of these topics. It is obvious that NRC is attempting to discharge its responsibilities in a very careless manner.

Since we have the most knowledge of the West Valley nuclear waste site in NY which was thoroughly contaminated after just 6 years of nuclear fuel reprocessing, we will be focusing on it. However, there are many other complex material facilities that pose enormous challenges, such as Hanford and Savannah River sites.

We have been provided with a series of very rosy statements in this White Paper, to which we provide our responses below.

1. **NRC:** "The decommissioning program ensures that NRC-licensed sites are decommissioned in a safe, timely, and effective manner so that they can be returned to beneficial uses." p.55

Response: The question of timeliness is at the crux of many of the stories concerning decommissioning. Are decades timely? Are budgets that must be reauthorized annually adequate to keep projects moving so that cleanup can occur in a timely manner—thus preventing spreading plumes of contamination or releases of radioactivity to waterways?

Nuclear Fuel Services stopped reprocessing at West Valley in 1972 eventually abandoning the project, partly due to earthquake concerns. Forty- three years later it seems more likely than not that the site will never be fully decommissioned. NRC has left open the option that it might never be.

At how many sites can NRC claim that the statement, in quotes above, is true?

2. **NRC:** "In general, most decommissioning facilities, or sites, present low hazard/risk because radioactive sources, including spent fuel, are typically removed after operations cease when entering into the decommissioning mode. Decommissioning involves subsequent decontamination and remedial actions to reduce residual radioactivity to a level corresponding to the dose criteria of 10 CFR Part 20, Subpart E. The potential radiological hazard at decommissioning facilities is normally low, as it is typically associated with residual radioactivity on equipment, surfaces, and surface/subsurface soil." p. 55.

Response: NRC has provided that fuel at closed nuclear reactors can be stored in fuel pools for decades before decommissioning begins. At West Valley reprocessing ceased in 1972. Millions of curies had to be converted from liquid high level radioactive waste into glass logs for storage. Hundreds of thousands of curies including damaged irradiated fuel and plutonium still lie buried in holes and trenches in the ground with no liners. These burial grounds lie near a slope that is undergoing rapid erosion. Extreme rainfall in 2009 caused an enormous landslide – moving the slope nearer to the burial grounds. A major release of radioactive contents would be dumped in Cattaraugus Creek and be carried to Lake Erie. Yet DOE as site manager is not adequately considering the impacts of climate change on these NRC licensed facilities. There has already been a 74% increase in severe rainfall events in the Northeast according to the National Climate Assessment.

Therefore, NRC should not talk about "most decommissioning facilities or sites" but exactly how many have removed radioactive sources immediately when operations cease. How many sites have large quantities of radioactive material that poses the potential for release because it is not in a secure facility or condition? How many have radioactive material awaiting disposition for disposal because there is no available repository for high level waste or non-defense transuranics? How many of the sites have actually been characterized for their risk by a sampling and monitoring program? How many of the sites are actually low risk, based on real data? How many actually pose moderate or high risks? At West Valley the site has still not been fully characterized for its radioactive contamination.

At West Valley there is a strontium plume of contamination across the entire North Plateau heading to creeks that drain into Lake Erie. At the center of the plume the levels are over 100,000 pCi/l. (A permeable treatment wall built to pull some of the strontium out is a temporary fix, made even more questionable in light of likely climate change impacts.) Does NRC consider West Valley to be a Low Risk site? In 2002 NRC concluded that flexibility would be needed to meet NRC decommissioning requirements—that does not support the idea of the site being "low risk."

The NRC should have taken the time to name the facilities it was talking about and identifying as Low Risk. Are Savannah River, Los Alamos and Hanford Low Risk Sites?

3. **NRC:** "Radionuclides remaining after cessation of operation are typically contained on surfaces of equipment or buildings, or in the soil. The potential for a release of the radioactive materials requires severe environmental or climate conditions such as flooding, tornado, or earthquake."p.55

Response: The first sentence above implies limited surface contamination, not burial grounds that contain major quantities of radionuclides. The reality is that at West Valley and many other complex material facilities, there are interred materials that are anything but securely contained. West Valley was a poor site to select for handling dangerous radioactive materials, processing them and burying significant quantities as it is located on a high plateau with slopes, very susceptible to erosion and crisscrossed by streams and wetlands. We agree that severe environmental or climate conditions increase the potential for release as West Valley clearly shows. The primary question for NRC is what are you going to do about it? The sentences above are followed by nothing else on the topic. Radioactive release from the West Valley nuclear waste site could also occur with extreme rainfall events, and conditions which result from climate change will inevitably increase the risks and consequences at the site.

Severe conditions have already been occurring associated with climate change. Federal directives from the President around climate change seem to require vulnerability assessments of facilities owned, managed or regulated by the federal government. We have already experienced fires, flooding, and hurricanes at nuclear facilities and these outcomes may be influenced by climate change. So a good place to begin addressing these conditions would be in the context of climate change and vulnerability assessments.

Earthquakes have also impacted nuclear facilities and have the potential to cause different impacts depending on the specific site or facility. A vulnerability assessment for earthquakes should be done for all complex sites.

4. **NRC:** "For complex material sites, a decommissioning plan is required to be developed within one year of site shutdown."

Response: West Valley still does not have a final decommissioning plan or even a final agreed- upon end state. Instead, the involved state and federal agencies decided on a phased decision-making approach that has pushed final decisions far into the future. Two phases-1 & 2- have now morphed into 2 phases just for the original phase one with questionable funding for completion of that. If the West Valley site is not yet fully characterized related to radionuclide contamination, how can a decommissioning plan be produced? How many complex material sites (at which NRC has some role) produced a decommissioning plan within one year of site shutdown as stated by NRC?

5. **NRC:** "The current assessment reviewed various external events to determine if a failure of safety barrier(s) at decommissioning facilities could cause significant release of radioactive materials to harm workers or the public or cause any significant damage to the environment. The nature of events assessed and initial evaluation are summarized in the table below." p. 59-60. The table (*not reproduced here*) includes the following events: Flood, seismic, high winds and missiles, lightning, snow and ice loads, drought, temperature extremes, fire, loss of power.

Response: For every single event listed the NRC has assigned low risk – none are moderate or high risk. ***The White Paper provided by NRC contains no data, no facts and no science for what should be a scientific assessment.*** The Fukushima Near Term Task Force Report was a serious and credible effort but unfortunately that report has not received appropriate implementation of its recommendations.

6. **NRC:** "As indicated above, risk or hazard would be greatly reduced for facilities undergoing decommissioning shortly after cessation of operations and upon entering into the decommissioning mode (e.g. after removal of spent fuel and/or radioactive sources). For facilities transitioning into defueling, dismantling, decontamination, and decommissioning; emergency preparedness would overlap with decommissioning planning in order to assess and evaluate additional safety issues and hazards. Under such conditions, site-specific emergency preparedness would be developed." P.57

Response: Since radioactive sources have not been removed at West Valley for decades, we would like to have the site-specific emergency preparedness document that evaluates the safety issues and hazards present.

7. **NRC:** Under a section titled, External Events:
   "Significant events, as either design-basis external human induced events or design-basis external natural events, are typically identified and evaluated particularly in the preliminary phases of the site evaluation process."p.58

Response: Poor site selection for the West Valley Nuclear Facility has been repeatedly noted by consultants and state and federal agencies. We question whether a site evaluation has ever been completed for this site.

8. **NRC:** "External events such as flooding, earthquakes, tornados, volcanic eruptions, or severe climate conditions are usually addressed in the design of the facility and in the decommissioning plan. In the unlikely event that such external events were to occur, the status of the site is reported and a site-specific

assessment of any significant safety impacts is conducted to identify immediate actions that need to be taken to mitigate any significant radiological releases....

Under 10 CFR 20.1406, licensees must describe how the facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, in order to facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste....

For materials decommissioning sites, staff's assessment of the risk from external events is low, due to low activity sources and the unlikely event of the potential movement of such sources from external events. If such movement of sources at decommissioning materials facilities occurred, there will be dilution of such sources (e.g. from surface water or ground water, or mixing with clean soil) and potential dose impacts would be less than public dose limits under 10 CFR Part 20. Under extreme external event conditions, staff determined that the potential dose impacts to members of the public would not exceed EPA protective action guidelines." p.58

Response: We do not believe that these external events were ever considered in the design of the facilities at West Valley or that severe external events are unlikely. We also do not believe that DOE or NRC would be able to mitigate the release of the radioactive contents in the burial grounds or other poorly contained areas at West Valley by immediate actions. Instead it would be a disaster that would require extraordinary means to avoid public health impacts. Finally dilution is not a solution to highly toxic pollution. And given the absence of any data related to specific facilities in this white paper how on earth did NRC determine that doses to the public would not exceed EPA protective action guidelines?

Conclusion

The staff White Paper in fact includes no scientific assessment. No specific facilities or sites are discussed and no evidence supporting NRC conclusions has been presented. We have only documented a few of the problems with the NRC's assessment, focusing primarily on our experience at West Valley. We deliberately chose not to engage on irradiated fuel as we already experienced a travesty of a regulatory process in the totally unacceptable Waste Confidence rulemaking and EIS, which failed to address requirements of a Court order.

We seriously hoped that a post Fukushima NRC would reinvigorate its limited safety efforts. Instead the NRC is apparently mired in a serious state of denial. No credible scientist can identify all of the events in the table on p. 60, as being of low risk for reactors and complex radiological facilities undergoing decommissioning. We have witnessed a tornado tear apart an entire new school building in Oklahoma. Yet NRC is telling us that hazardous radionuclides stored in light weight sheds would be at low risk. Fires have also come dangerously close to radiological materials storage. In 2014, the nation's only deep geological repository and only transuranic disposal facility, the Waste Isolation Pilot Plant or WIPP, experienced an explosion. It has been forced to remain closed due to the radioactive release and contamination. None of this would have happened except for a series of management decisions that weakened regulatory oversight and safety measures.

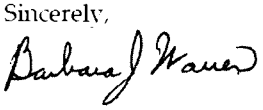
Our nation's future depends on our government having a realistic view of hazards. A realistic view enables proper preparation, employee training and installation of safety measures. Denial helps no one.

This white paper is not worth the paper it was written on. It forms no basis for a future decommissioning rulemaking. We recommend that the Agency analyze actual facilities and sites and document the facts on the ground with site visits. If the Agency cannot turn out a fact-based white paper, there is no purpose in writing one.

Based on the superficial and clearly inadequate review presented in Section 7of the White Paper, we disagree with the staff determination that no additional analysis or regulation is needed. NRC must begin to cope with the serious hazards that radioactive materials pose in a realistic manner or the public will not be protected. Denial is not an option.

We would appreciate follow-up that addresses the concerns expressed in this letter.

Sincerely,



Barbara J. Warren, Executive Director
Citizens' Environmental Coalition
33 Central Ave.
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Jessica Azulay-Chasnoff
Project Director
Alliance for a Green Economy
2013 E. Genesee St.
Syracuse, NY 13210

Diane D'Arrigo
Director, Radioactive Waste Project
Nuclear Information and Resource Service
6930 Carroll Avenue, Suite 340
Takoma Park, MD 20912

6. Donna Gilmore, SanOnofreSatey.org, Comments

To: JLD_Public.Resource@nrc.gov

Re: Comments on NRC Draft White Paper, *Applicability of Fukushima Lessons Learned to Facilities other than Operating Power Reactors* (ML15042A367), revised March 2, 2015.

I disagree with the NRC's staff's overall conclusion "that the existing regulatory processes are sufficient to ensure protection of public health and safety for the eight classes of licensees discussed in the draft white paper." Reference NRC white paper: http://pbadupws.nrc.gov/docs/ML1504/ML15042A367.pdf

I am only addressing the area of spent fuel dry storage and transportation in my comments below, due to limited time available to evaluate this white paper. Reference slide: NRC position on ISFSI spent fuel storage and transportation Fukushima Lesson Recommendations (NRC Slide 8) https://sanonofresafety.files.wordpress.com/2014/10/isfsiapplicabilityrec2015-03-13slide12.jpg Reference NRC slide presentation, March 13, 2015. https://sanonofresafety.files.wordpress.com/2014/10/ml15070a530slides.pdf

DETAILED COMMENTS

Fukushima Lesson #1. Establishing a logical, systematic, and coherent regulatory framework for adequate protection that appropriately balances defense-in-depth and risk considerations.

This NRC white paper does not address aging management of dry cask storage and transportation. Now that the NRC has acknowledged in the August 26, 2014 NRC continued storage decision that fuel may need to be stored at existing sites beyond the licensed operating life of reactors over three timeframes: for 60 years (short-term), 160 years (long-term) and indefinitely, the NRC needs regulations to address this in order to provide "adequate protection that appropriately balances defense-in-depth and risk considerations" (Fukushima Lesson #1).

Current NRC approved general license dry storage systems do not require consideration of aging requirements in the initial 20-year license, even though these systems are expected to last for decades. The thick forged steel casks used at Fukushima are superior to current NRC approved thin-walled (1/2" to 5/8") steel canister systems. The Fukushima casks meet most or all of the following requirements. The NRC goal should be to meet or, preferably, exceed Fukushima dry cask storage standards. The NRC should be the leader of dry storage standards in the world. Instead we have inferior dry storage standards. NRC dry cask storage and transportation regulations should be upgraded to include these requirements. This is not intended to be an all-inclusive list:

1. Ability to inspect all critical systems for corrosion and cracks prior to a breach of containment. This includes all canisters and casks, not just a sample.
2. An early warning continuous monitoring system that warns prior to a radiation leak.
3. Materials that will not prematurely degrade and require replacement.
4. Components that will not fail from stress corrosion cracking.
5. On-site facilities and procedures for replacement of failed canisters.
6. Ability to relocate fuel to another container without destroying the original container.

7. Ability of aging materials to withstand seismic and tsunami events
8. Continuous and remote radiation-monitoring
9. Additional environmental and external protection (e.g., enclose dry storage casks inside a reinforced building, such as was done at Fukushima).
10. Ability to repair or replace critical parts. (e.g., replace seals and bolts, repair container)
11. Before new fuel types and burnup levels are approved reactors, dry storage licenses must be amended to reflect ability to safely contain these without causing degradation to containers or cladding or fuel assemblies.
12. Meets American Society of Mechanical Engineers (ASME) certification for containers.
13. Defense-in-depth: Suspected or damaged fuel assemblies should be sealed in replacement cans – cans with no holes.
14. Storage and transport containers should be approved as a unit, and not separately.
15. Reactor systems and fuels should not be approved (such as allowing higher fuel burnup or power uprates) unless licensed storage and transport containers are approved that are affected by these changes.
16. Aging management must be built into a dry system design. For example, creating an underground Holtec UMAX system that does not allow for inspection of exterior walls and introduces additional and unnecessary risks of flooding, drainage, and ground chemical degradations should not be allowed.
17. Safety Analysis Report should be performed and certified for the needed life of the system (e.g., 80 to 100 years). Licenses should continue to be granted for 20-year periods in order to verify conditions expected have been met. An example of why of this is important is the recent approval of the Holtec UMAX system where current regulations allow the NRC to ignore all aging management conditions and approve a system for 20 years that needs to last for decades, without any consideration of degradation or aging management capabilities for after the initial 20 years.
    http://www.gpo.gov/fdsys/pkg/FR-2015-03-06/html/2015-05238.htm
18. Replacement and maintenance costs should be a consideration along with safety. The ratepayers and utilities are responsible for paying for this system. To certify a system for only 20 years without including an evaluation of repairability, maintenance and lifespan creates a burden on the states, requiring them to fund a multi-million dollar or multi-billion dollar system that has no assurance from the NRC that it will be usable for more than 20 years. For example, the NRC in the August 5, 2015 stress corrosion cracking and aging management meeting stated they do not expect to see through-wall cracks in these thin stainless steel containers until at least 16 years after crack initiation. In that meeting, they estimated it would be at least 30 years before the canisters would be cool enough for moisture to stay on the canisters and dissolve any corrosive salts, triggering the corrosion and crack initiation process. However, in January 2014, an inspection of a two-year old Diablo Canyon Holtec ½" thick canister found corrosive magnesium chloride salts and temperatures low enough for moisture to dissolve the salts (85 degrees C). This issue is not addressed in the Holtec UMAX approval referenced above.
    References:
    Summary of August 5, 2014, Public Meeting with the Nuclear Energy Institute on Chloride Induced Stress Corrosion Cracking Regulatory Issue Resolution Protocol
    http://pbadupws.nrc.gov/docs/ML1425/ML14258A081.pdf
    Chloride-Induced Stress Corrosion Cracking Tests and Example Aging Management Program, August 5, 2014, NRC Darrell Dunn presentation
    http://pbadupws.nrc.gov/docs/ML1425/ML14258A082.pdf

19. Reduce the ability of the nuclear industry and utilities to label information proprietary, giving more weight to the right of the public and independent experts to review systems and information that may affect safety. For example, the NRC approved transport of high burnup fuel for the NUHOMS-MP197HB Transport Cask in spite of all their concerns about storage and transport of high burnup fuel. See Spent Fuel Project Office Interim Staff Guidance - 11, Revision 3, Cladding Considerations for the Transportation and Storage of Spent Fuel.
http://www.nrc.gov/reading-rm/doc-collections/isg/isg-11R3.pdf

They made all the information about high burnup fuel and damaged fuel proprietary. See NUHOMS-MP197HB Transport Cask Safety Evaluation Report.
http://pbadupws.nrc.gov/docs/ML1411/ML14114A132.pdf
2.2.2.1 Degradation of the DSC's [Dry Storage Canister] during storage and unloading from storage. THIS SECTION IS PROPRIETARY
2.2.2.2 Degradation of the internal components of the canister important to safety- basket and neutron absorber. THIS SECTION IS PROPRIETARY
2.2.2.3.1. Damaged Fuel Definition. The definitions of damaged fuel in canisters previously loaded for storage are consistent with the definitions used in this amendment for transportation. The damaged fuel is canned and assumed to be in one of a number of modified configurations for criticality, thermal, and shielding calculations. Thus, the definition of damaged fuel is consistent with the definition, based on functionality, as specified in ISG-1, Rev. 2. The ability of the fuel in modified configurations to meet the criticality, shielding, and thermal requirements is evaluated in the thermal, criticality and shielding sections of the application. Since all damaged fuel is canned, and there are no mechanisms for degradation of the cans during storage, the physical and chemical condition of initial damaged fuel is in a known condition for transport after storage. [My comment: This assumes no degradation after dry storage, which is not true. Also the cans are not sealed, so the defense-in-depth normally provided by undamaged Zircaloy fuel cladding has not been replaced by these cans. In addition, it is not possible to inspect all fuel rods for damage, due to limitations in technology].
2.2.2.3.2 Uncanned Fuel. THIS SECTION IS PROPRIETARY

Fukushima Lesson #2. The Task Force recommends that the NRC require licensees to reevaluate and upgrade as necessary the design-basis seismic and flooding protection of structures, systems and components (SSCs).

1. Aging materials: Currently, aging materials are not considered in this evaluation. For example, the NRC plans to allow up to a 75% crack in the thin steel dry storage canisters, even though there is no seismic data to support this.
2. New seismic science: The USGS recently announced, based on their lessons learned from Fukushima, that earthquake faults can jump up to 9 feet from one fault to another. There is a direct correlation between magnitude and length of a fault, so this should trigger a reevaluation of all currently approved system seismic evaluations. Where is the process and regulations that support the NRC taking proactive action on this?
3. Climate change: Where is the process and regulations that support the NRC taking proactive action to ensure utilities address climate change that has occurred and that is expected to

occur? Where are the regulations and process that would require new ISFSI facilities to be located or relocated away from Tsunami zones and high seismic zones? Example: Southern California Edison plans to locate the Holtec UMAX underground storage system for San Onofre dry storage within 100 miles from the edge of the Pacific coastline, in a high seismic and earthquake zone and in an area with known coastal erosion.

Fukushima Lesson #8. The Task Force recommends strengthening and integrating onsite emergency response capabilities such as EOPs [emergency operating procedures], SAMGs [severe accident management guidelines], and EDMGs [extensive damage mitigation guidelines].

See Fukushima Lesson #1 for recommendations that will support this.

Fukushima Lesson 11. The Task Force recommends, as part of the longer term review, that the NRC should pursue EP topics related to decision making, radiation monitoring, and public education.

At Fukushima, citizens and even the government did not have timely accurate knowledge of where the radiation plume was and ended up going into the plume. What has the NRC done to address this? Recommendations:

1. Continuous and remote radiation monitoring for dry casks systems should be required, instead of the current requirement of once every 3 months a person walks around with a radiation monitor on a stick.
2. Continuous and remote radiation monitoring information should be available to the public on-line while the reactors are in operation and should continue as long as nuclear waste is stored at the site. Instead, decommissioning sites are allowed to remove radiation monitors and no longer need to notify the communities of radiation leaks.
3. Likelihood and consequences of a dry storage canister breach have not adequately been addressed given need for longer storage requirements.

Fukushima Lesson 12. The Task Force recommends that the NRC strengthen regulatory oversight of licensee safety performance (i.e., the Reactor Oversight Process) by focusing more attention on defense-in-depth requirements consistent with the recommended defense-in-depth framework.

1. There is a lack of defense in depth in dry storage and transport, partly due to the problems of potential fuel cladding damage from use of high burnup fuel and from aging materials that may crack and cause a canister failure. Some details of this were addressed in my comments to the other lessons.

2. NRC oversight should be increased for those utilities that have shown a pattern of mismanagement. They should be restricted from receiving exemptions to the license amendment process for critical system. These regulations need to be revised accordingly:
   10 CFR.50.59
   http://www.nrc.gov/reading-rm/doc-collections/cfr/part050/part050-0059.html
   10 CFR 72.48
   http://www.nrc.gov/reading-rm/doc-collections/cfr/part072/part072-0048.html

An example of this is the ability of Southern California Edison to bypass the license amendment process for their redesigned steam generators by using the 10 CFR 50.59 process. This resulted in the permanent premature shutdown of San Onofre Unit 2 and 3 and a radiation leak into the environment. In addition, the time and expense to regulatory agencies, elected officials, the public and other entities would not have been wasted. No one has calculated the cost in time and money over this multi-billion dollar boondoggle. Edison should not be allowed to use the 10 CFR 50.59 and 10 CFR 72.48 process.

The NRC cited Edison for mismanaging this project. There should be consequences for their actions. See NRC San Onofre Nuclear Generating Station Final Significance Determination of White Finding and Notice of Violation, NRC Inspection Report 05000361/2012009 and l05000362/20o12009.
https://sanonofresafety.files.wordpress.com/2014/01/ml13357a058-2013-12-23nrc-unit3-songs-white-finding-letter-final-131223.pdf

Thank you for extending the deadline for comments for one week. I was not aware of this draft document. I recommend another draft for comments be provided before this goes final.

Sincerely,

Donna Gilmore
SanOnofreSafety.org

7. Joe Holtzman Comments

From:	Joe Holtzman
To:	Donna Gilmore
Cc:	JLD_Public Resource; Sebrosky, Joseph; Kotzalas, Margie; Mary Olson
Subject:	Re: Comments on DRAFT WHITE PAPER,APPLICABILITY OF FUKUSHIMA LESSONS LEARNED TO FACILITIES OTHER THAN,OPERATING POWER REACTORS
Date:	Friday, March 20, 2015 5:38:04 PM

I would only change one thing – – – from that I disagree – – – I would say I totally disagree

"The world is a dangerous place, not because of those who do evil, but because of those who look on and do nothing." –Albert Einstein

On Mar 20, 2015, at 2:33 PM, Donna Gilmore <dgilmore@cox.net> wrote:

See attached comments. Thanks for the one week extension.
Donna Gilmore
SanOnofreSafety.org

<Comments on Draft Fukushima Lessons White Paper.pdf>

8. Marv Lewis Comments

-----Original Message-----
From: Marv Lewis
Sent: Thursday, March 19, 2015 9:57 AM
To: Lombard, Mark
Subject: Fw: Comments on 85 pages re facilities other than NPP

---------- Forwarded Message ----------
From: "Marv Lewis"
Subject: Comments on 85 pages re facilities other than NPP
Date: Wed, 18 Mar 2015 22:36:14 GMT

Nuclear Regulatory Commission
Dear Commissioners and Staff,
Please accept this email as my comments on the 85 page white paper re non power reactors. The most significant lesson learned from the Fukushima accident, TMI#2, chalk River, sodium cooled fast breeder reactor, and too many others is that the World has learned nothing. We tweek the rules and regulations in the mistaken belief that we can cure our own unwillingness to see.

We store wastes in thinner casks, more corrosive sites, and believe that they will last indefinitely. We transport radwastes without a thought of explosive Bachen crude on the same tracks and roads without a worry about what interactions will cause criticalities in cans open on both ends. We ship highly enriched, liquid uranium over lakes that contain a fifth of this world's drinkable water, and we build waste sites in places that are serviced by volunteers without proper gear and training.

The list of our follies is endless. Carlsbad site suffered drums exploding because organic packing was used instead of bentonite or sand. Mill tailings pond have streamed into rivers. Even in this paper, pages 62 thru 86 were added months after original white paper issued.

We know that the one in a million chance flippingly cited in the PRAs is plain wrong. Fukushima happened and the frequency of beyond design basis accidents is one in 5 years. Instead, I plead that G-d have mercy.

respectfully submitted,

Marvin I. Lewis

9. Ruth Thomas Comments

From: Ellen Thomas
Sent: Sunday, March 22, 2015 11:41 AM
To: Lombard, Mark
Subject: Ruth Thomas comments re NRC "non-power' nuclear facilities meeting 3/19/15

To: Mark Lombard <mark.lombard@nrc.gov>

NRC Office of Nuclear Materials, Safety and Safeguards (NMSS)
NRC Office of Nuclear Reactor Regulation (NRR)

Dear Mr. Lombard,

Environmentalists, Inc. (EI) was founded in February, 1972. Our main goal has been and continues to be helping members of the public understand nuclear power. The past year we have focused on observing the relationship which exists between the Nuclear Regulatory Commission (NRC) and representatives of the nuclear power industry.

This email is a formal submittal of my observations of the March 13, 2015, meeting of the nuclear industry with NRC staff members from the Office of NMSS and NRR, who met to discuss licensing, regulation, and rulemaking related to "non-power reactors."

There are a wide variety of "non-power" facilities (meaning that none of them produce electricity). These include:

* nuclear fuel cycle plants (enrichment, fabrication, uranium recovery, etc.)
* decommissioning
* transportation casks, and transportation by truck and rail
* management of all waste resulting from the hundreds of operations.

These operations are known to leak and release radioactivity to the environment. These facilities have the capability to cause nuclear accidents.

There are 24 test and research reactors listed in the U.S. NRC Information Digest as being located at universities, one at the Armed Services Research Institute, one at the US Geological Survey, and three at nuclear industry offices. All are identified as being regulated by the NRC.

Additional reactors were spoken of as being regulated by the Department of Energy (DOE) -- this may include submarines and reactors at army, navy or air force bases. There was mention as well that certain states regulate radioactive operations.

Among the subjects discussed:

1. The DOE was mentioned; however, it wasn't clear to us how the DOE fits into the regulation and oversight process.

2. Degradation reviews were identified as "needing to be done" in order to comply with the regulations based on lessons learned from Fukushima.

3. Statements were made regarding "very low risk" when discussing earthquakes and other possible causes of accidents. As Coordinator and researcher for EI, I asked, "How do you define 'very low risk'? What data supports this conclusion?" Neither question was answered.

4. Someone at the meeting asked, "How do you know the status of the cooling?" The answer was, "There is no requirement for a regulation on cooling."

5. Testing at Oak Ridge was discussed, including drying out the reactor core, removing coolant.

6. There was a discussion of the need for human action to take place under certain conditions such as loss of fluid.

7. Remarks made by people present at the meeting: "Don't worry about it." Response: "You have to worry about it." "You have to know what is going on."

8. Someone at the meeting said, talking about the DOE test reactor: "There's always some level of risk." /
"You try to figure out from testing studies at research reactors." It was unclear what was the basis was for these statements.

9. Questions were raised about there not being consideration of an airplane hitting a reactor on purpose. Reason given was that such a happening was "low-risk."

10. Very little was said about the vulnerability of the non-power reactors, the lack of equipment, the lack of trained personnel, proximity to people, and the problem of recovery, for example, if it was on the campus of a university..

11. In 2012 there were 46 "significant enforcement actions" in non-power reactors (US NRC 2013-2014 Information Digest, Appendix X, pp. 166-168.) In 2013, there were 24 "significant enforcement actions" in non-power reactors (US NRC 2014-2015 Information Digest, Appendix X, pp. 166-168.) In both digests, some of the violations were identified by an individual's name instead of giving the organization.

12. Approximately 30 errors in radiation treatment were identified in a separate (March 19, 2015)(NRC meeting. It was unclear the dates these errors occurred.

Our request for information in hard copy, which was to be sent to the address below, has not yet arrived.

Please be sure to send me a full transcript of the March 13, 2015 NRC meeting and the 85-page NRC White Paper on non-power reactors.

We will send additional input after reviewing these reports.

Thank you,

Ruth Thomas
Environmentalists, Inc.

10. Paul Frey Comments

From: Paul Frey
Sent: Friday, March 20, 2015 1:25 PM
To: JLD_Public Resource
Subject: comments

Attached Please Find Comments In Powerpoint Presentation

Paul Frey
Frey Vineyards, Ltd.

"We regard as the best wine any kind which can keep without preservatives."
"Nor should anything at all be mixed with it by which its natural flavor would be obscured."
"For that wine which is most excellent which has given pleasure by its own natural quality."
Columella AD 65 - Famed Roman Agricultural Writer

Potential Economic Damages To California After Diablo Canyon Nuclear Power Plant Meltdown And Fuel Pool Fires Using Chernobyl Damages And Fallout Pattern As A Reference Base

Chernobyl Radioactive Cesium -137 Ground Deposition and Fallout Pattern Over Europe After Nuclear Meltdown. Source: International Atomic Energy Agency (IAEA) Map 2006. Areas Affected From England, Norway, Italy to Greece. IAEA States Economic Costs, " Two Decades at Hundreds of Billions of Dollars".

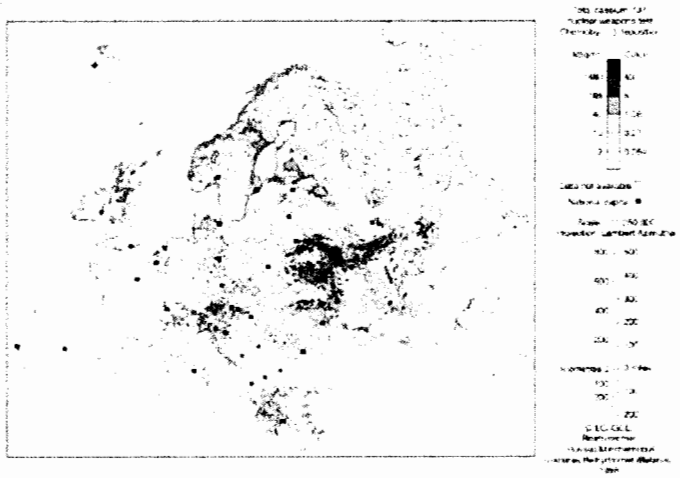
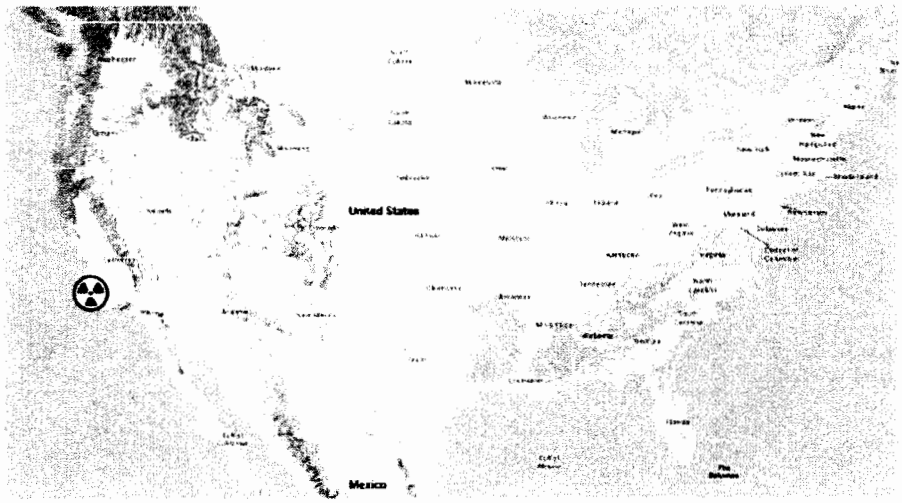


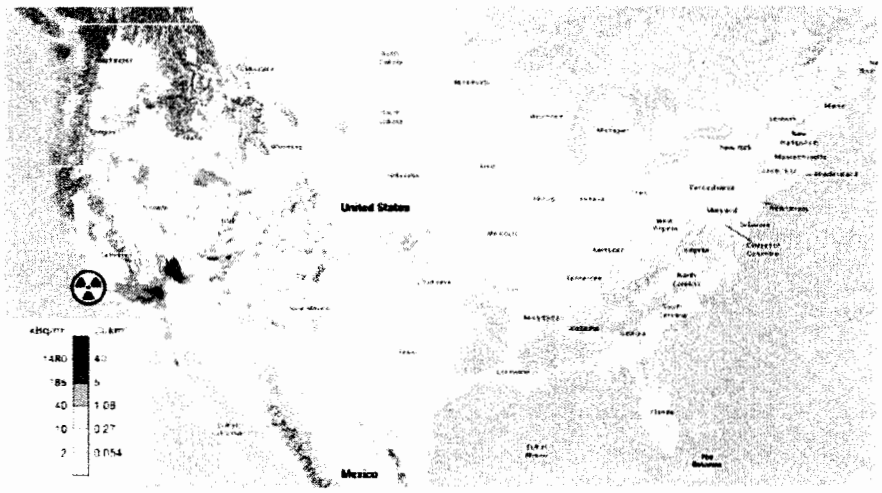
FIG. 3.5. Surface ground deposition of ^{137}Cs throughout Europe as a result of the Chernobyl accident [3,13].

Chernobyl Radioactive Cesium-137 Ground Deposition Fallout Pattern Pulled From International Atomic Energy Agency (IAEA) 2006 Map

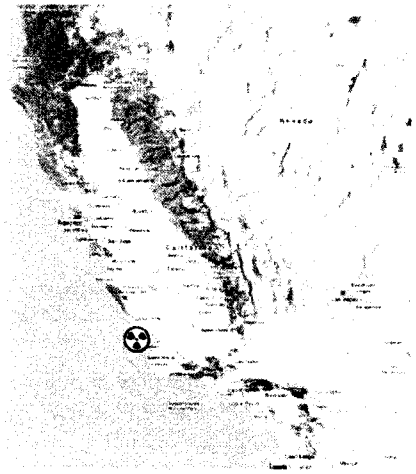
United States Before Diablo Canyon Nuclear Power Plant Meltdown And Fuel Pool Fires.



Areas Potentially Affected Economically After Meltdown And Fuel Pool Fires At Diablo Canyon Nuclear Plant Using Chernobyl Fallout Pattern At Same Scale. ***Worst Case Is Much Worse***. If The Fuel Pools Burned Completely, **Multiply Fallout Concentration Or Fallout Area Below By 40 Times.**

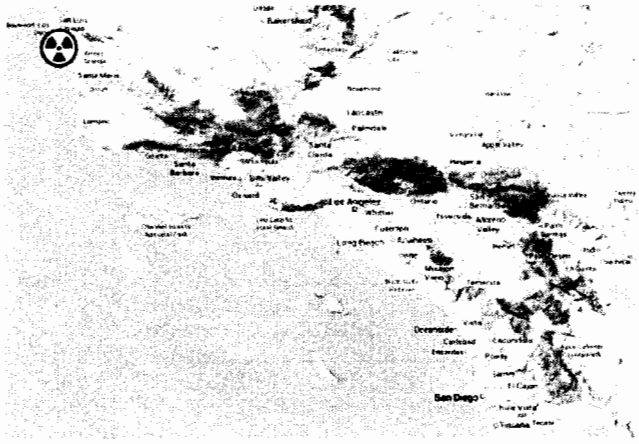


California Before Diablo Canyon Nuclear Meltdown And Fuel Pool Fires.

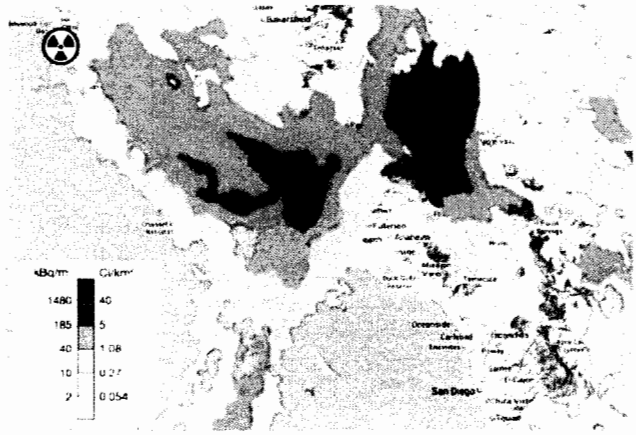


Potential California Areas That Could Suffer Economically After Meltdown And Fuel Pool Fires At Diablo Canyon Nuclear Plant, Using Chernobyl Fallout Pattern At Same Scale. ***Worst Case Is Much Worse.*** If the Fuel Pools Burned Completely, **Multiply Fallout Concentration Or Fallout Area Below By 40 Times.**

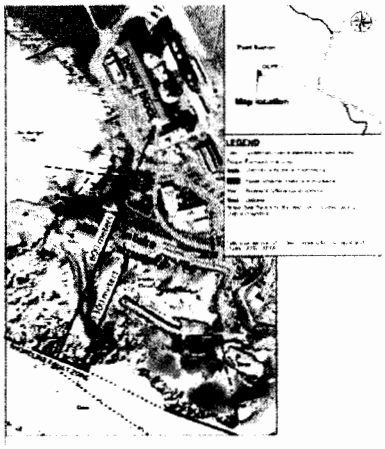
Southern California Before Diablo Canyon Nuclear Meltdown And Fuel Pool Fires.



Areas Potentially Affected Economically In Southern California After Nuclear Meltdown And Fuel Pool Fires At Diablo Canyon Nuclear Plant Using Chernobyl Fallout At Same Scale. ***Worst Case Is Much Worse***. If the Fuel Pools Burned Completely, **Multiply Concentration Or Fallout Area Below By 40 Times.**



PG & E Map Clearly Showing Diablo Canyon Nuclear Plant Cold Water Intake Only 300 Paces From Active Shoreline Earthquake Fault. Source From PG & E Website.



Potential Economic Damages After Diablo Canyon Nuclear Meltdown and Fuel Pool Fires.

- The radioactive ground deposition in the fallout patterns from Chernobyl were equivalent to about 400 Hiroshima bombs or about 2 Mega Curies(Mci) according to IAEA. These were clearly superimposed over the previous maps.
- ***Worst Case Is Much Worse.*** If both Diablo Canyon reactors and ***all*** 1000 tons of spent-fuel completely burned, the fallout released could be as high as 82 Mega Curies(Mci) or about 40 Chernobyls worth of fallout which is about 16,000 Hiroshima bombs worth of fallout onto California. Fallout patterns will vary based on wind, rain and fog conditions.
- As a general rule of thumb, every 100 tons of spent-fuel when completely burned in a fire contains about 9 Mci of cesium 137 which equates to about 5 Chernobyls or about 2000 Hiroshima bombs worth of radioactive fallout. See *Reducing the Hazards from Stored Spent Power Reactor Fuel in the United States*, Robert Alvarez, Allison Macfarlane et al, Science and Global Security, 2003. The report showed the average US fuel pool at the time contained about 400 tons of spent-fuel with an average age about 15 years contains about 35 Mci of cesium 137 which translates to about 9 Mci per 100 tons of spent-fuel.
- The unique geography of California's Central Valley and LA Basin create a natural trap for radioactive fallout and in a worst case costs could exceed California's GDP or over a trillion dollars. The Central Valley of California grows much of the nations fruits and vegetables.
- Exclusion Zones are defined as contaminated by Cesium 137 at levels of 15Ci/square kilometer or 555 kBq/ square meter according to IRSN. Much of California would become an Exclusion Zone according to this definition after worst case meltdown and fuel pool fires at Diablo Canyon after earthquake, mechanical failure, or human error.

Conclusion: California Exclusion Zones, **Estimates of Economic Losses, Health Impacts, Liability and Sources**

- A Radioactive Exclusion Zone is generally defined as an area over 555KBq/square meter of cesium 137. Information from the sources below can show that if fog, wind and rain carried all the fallout from a worst case meltdown of 1000 ton fuel pool fire onto an area the size of California, MANY PARTS OF CALIFORNIA WOULD BE DEFINED AS AN EXCLUSION ZONE and would suffer economically for many years to come. Independent and government studies shown below estimate worst case losses in different areas and scenarios from 500 billion to trillions of dollars.
- No insurance company will insure against a nuclear disaster. In a 1 trillion dollar nuclear accident the utilities would only have to pay about 1 percent of damages whereas the taxpayers would have to try and cover the other 99 percent via the Price Anderson Act which limits the liability to 12 billion dollars for any nuclear plant accident. Health effects from radiation would depend on how quickly the population in the fallout areas could evacuate.
- [1] ***Radiological Terrorism. Sabotage of Spent Fuel Pools*** Author. Hui Zhang, Journal Article, INESAP issue 22 pages 75-78. For calculating burning tons of spent fuel and resulting fallout using Chernobyl as a base reference to multiply. Showed worst case fuel pool fires in France would equal 6 Chernobyls.
- [2] ***A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants***, Brookhaven National Laboratories, NUREG/CR-6451, BNL NUREG-52498, 1997. Shows shutdown reactors with fuel pools are capable of massive radiological releases. Estimates 546 billion dollars economic loss excluding health effects, 138,000 latent fatalities, and 2100 square miles of land condemned in worst case fuel pool fire. This studies modeling was not done using the geography of California, which would lead to higher numbers if all the radiation was trapped in the LA Basin population centers or the California Central Valley Basin agricultural area.
- [3] ***Environmental Consequences of the Chernobyl Accident and their Remediation – Twenty Years of Experience. International Atomic Energy Agency (IAEA) 2006***, for Chernobyl European fallout map. According to IAEA "Over two decades Chernobyl has cost hundreds of billions of dollars" See IAEA "*In Focus. Chernobyl*". The IAEA says they do not know how many hundred billions it really was due to the breakup of the Soviet Union.
- [4] ***Massive Radiological Releases Profoundly Differ From Controlled Releases*** Author, Patrick Momal, IRSN, Institute De Radioprotection Et De Surete Nucleaire, Eurosafe Forum 2012 that showed cost for a meltdown would exceed half a trillion dollars. Unreleased leaked version of this report from *Le Journal de Dimanche* showed worst case costs from French nuclear reactor would be three time the GDP of France or over 4 trillion dollars. The study was done in 2007 and partly released at the Eurosafe Forum in 2012.
- [5] ***The Health and Economic Impacts of a Terrorist Attack at the Indian Point Nuclear Power Plant***. Author, Edwin S. Lyman, Union of Concerned Scientists, 2004. Costs to the New York area would exceed 1 Trillion Dollars in worst case.

11. Bruce Campbell Comments

From: Bruce Campbell
Sent: Friday, March 20, 2015 4:59 PM
To: JLD_Public Resource
Subject: Re: NRC Fukushima lessons for nuclear waste storage / Draft White Paper

March 20, 2015
Bruce Campbell

To whom it may concern at the N.R.C. and elsewhere:

These are comments on lessons that need to be learned from the ongoing Fukushima disaster.

First, I have strong disagreements with the apparent NRC staff conclusion that existing regulatory processes are sufficient to ensure protection of public health and safety for eight classes of licensees discussed in the Draft White Paper.

A case in point is "1. Spent Fuel Storage and Transportation". Clearly, this is a dangerous task (largely delayed since no place to take the commercial spent fuel). No regulatory processes are adequate without: 1. Assuring the best quality casks (likely a German or other European model); 2. Assuring a reputable transport company; 3. Assuring a place to take the waste – preferably to not be transported again (this means a permanent repository that is

better than the ridiculously insufficient Yucca Mtn. site – it does not mean stick some poor area with a permanent waste which is originally claimed to be temporary; and 4. Adequately contending with the complications of handling and storing (in facilities not designed to handle such a concentration of radwaste) HIGH BURN-UP FUEL !

Since there is no safe level of radiation, it is rather cavalier to assure us that all regulations are sufficient – despite many recommendations of the Fukushima Task Force which has had no action taken on them, or else declared them to not be applicable.

For instance in regards to the so-called "low-level" radwaste dumps, remember that if high-level waste leaks from its pool or container, it magically becomes "low-level" radwaste! Often little thought is put into low-level radwaste dumps – since some were proposed with (and another may even have) unlined trench disposal. Clearly, there will be leakage of tritium and other radioactive materials from so-called low-level radwaste dumpsites.

There are such a huge amount of uranium tailings around the Southwest and some other parts of the USA that this radioactive dust (some uranium has a 4.5 billion year half-life!) is blowing all around the region. Please convince us in a response that dust bearing uranium has been alleviated as a problem in the Southwest and elsewhere.

I furthermore disagree that there are adequate regulations of Non power research and test reactors. I am not sure of the megawattage involved, but the recent new plutonium experiments at Lawrence Livermore Labs (where there will be admitted plutonium release into the California air) need further regulation for sure (not pretending that the problems do not exist).

I note that NRC staff will issue a generic letter this month in regards to treatment of natural phenomena hazards at nuclear fuel facilities. Since we are talking about natural phenomena and discussing particular sites, I OBJECT TO A GENERIC LETTER ON THIS MATTER. There needs to be specific site analysis for true safety. But if the goal is to pander to the industry, then who cares you are going through a charade as if it is safe.

What is the use of a task force to make recommendations if nearly all are ignored?!

Why was a more coherent framework regarding defense and risk ignored and not acted upon? WHY IS IT NOT APPLICABLE TO EVALUATE AND UPGRADE DESIGN BASIS COMPONENTS RELATED TP SEISMICITY AND FLOODING – this should be the very essence of lessons of Fukushima. NOT LEARNED apparently.

We need more assurance about functioning at nuclear power facilities upon blackout conditions. Also, assure adequate staffing when in post-operation phase (including waiting and decommissioning phases).

Sincerely yours,

Bruce Campbell

12. Marni Magda Comments

-----Original Message-----
From: Marni Magda
Sent: Thursday, March 19, 2015 7:00 PM
To: JLD_Public Resource; Wengert, Thomas
Subject: Draft White Paper Fukushima Lessons Learned

The Draft White Paper applicability of Fukushima lessons learned to facilities other than operating Reactors is sadly a reminder that the NRC is not doing its job. Someone outside the NRC such as government accountability office must take on this paper. The paper states that the problem with Fukushima was natural disaster exceeded the design basis for the facility and all of the catastrophe happened because the events were considered extremely unlikely. By page three the 84 page paper is enough to prove the NRC is making the same mistake. They believe their design basis won't be exceeded. "The existing regulatory processes are sufficient to ensure protection of public health and safety."

Alara is the standard for radiation safety and that isn't a standard. Radiation exposure is addressed without the realities of human error such as WIPP or sabotage which could easily take out most stranded fuel facilities today. No regulations are even close to protect us. Dry storage canisters are a 25 year experiment with no concern for location in areas of natural disaster such as earthquakes tsunamis or fire. I listened to the February NRC Feb. 25-26 discussion of cement overpack safety and heard experts trying to decide if buried cement over pack needed inspection. Would coastal ground water erode the canisters stability? Should they excavate every 5 years to check. This system is NRC approved for 140 years. Yet the discussion sounded like they were making it up as they sat there.

I didn't learn about this paper to spend the time needed to address all of its issues. I will send my ideas to the commission when I have finished. San Onofre cannot be allowed to have buried canisters left on the bluff for 20 years! It is a deadly mistake. Nuclear mistakes are forever!!!

Marni Magda

13. Michel Lee Comments

From: Michel Lee
Sent: Friday, March 20, 2015 11:02 PM
To: JLD_Public Resource
Subject: Comments of Michel Lee, Chair CIECP, on Draft White Paper - NRC Staff Assessment Applicability Fukushima Lessons Learned to Facilities Other than Operation Power Reactors

March 20 2015

Comments of Michel Lee, Chairman, Council on Intelligent Energy & Conservation Policy (CIECP) on the Draft White Paper Containing Nuclear Regulatory Commission (NRC) Staff Assessment of the Applicability of Fukushima Lessons Learned to Facilities Other than Operation Power Reactors

U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Via e-mail **JLD_Public.Resource@nrc.gov**

These Comments are directed to the sections of the Draft White Paper Containing Nuclear Regulatory Commission (NRC) Staff Assessment of the Applicability of Fukushima Lessons Learned to Facilities Other than Operation Power Reactors (a/k/a "draft WP") which relate to spent fuel storage and transportation systems; fuel facilities, low-level waste disposal facilities; uranium recovery facilities and uranium mill tailings; and decommissioning reactors and complex materials facilities.

It is of concern that draft WP is an apparent preclude to a white paper that may misleadingly be used to assure policy makers and the public that materials with the potential to unleash vast destruction can be allowed to continue to accumulate and remain controllable forever.

UNDISPUTED FACTS

There are certain facts that are established and need to be simply stated.

Nuclear waste is among the most hazardous materials on the planet.

A man exposed to a spent fuel rod which has come out of a reactor will be delivered a fatal dose of radiation within a matter of seconds.

Nuclear waste remains highly toxic for hundreds of thousands of years.

The NRC itself has taken the position that it cannot be held responsible for cleanup in the event of a major release of radioactivity.

Historically and currently nuclear site operators have faced economic strains and business failures. The bankruptcy of numerous uranium mining concerns is of particular note. There is no guarantee any nuclear operator facing economic distress will continue to safely maintain nuclear waste installations (whether they be pools, dry cask facilities, or low-level waste burial sites). In fact, the NRC has allowed nuclear power related facilities to be owned and run by LLCs, limited liability corporations and other legal constructs which would allow the multi-billion parent corporations to walk away from a major liability, not just in the future, but today.

All spent fuel pools, mining and enrichment facilities release radiation and other pollutants into the environment as a matter of course throughout operation.

Sizable long-duration releases of radiation into environment have already occurred at mining, enrichment, and uranium mill tailings facilities and accidental releases of radiation into the environment from aging spent fuel pools have already occurred.

In the U.S., there are nuclear waste sites such as Indian Point which sit in densely and highly populated areas.

The majority of climate scientists around the globe have warned that climate change is occurring and that it brings risks of warming and extreme weather. Regardless of whether the "cause" is anthropogenic activity or not, events in recent decades such as hurricanes Katrina, Irene and Sandy, the prolonged droughts and forest fires that have plagued the Southwestern U.S., powerful tornadoes, earthquake activity, flooding, and numerous severe wind and snow storms have severely stressed the nation's infrastructure.

Many of these events have caused prolonged and wide-scale electric outages due to downed power lines, substation flooding and transformer explosions. Difficulties in power recovery have resulted in areas challenged by downed trees, flooding, damaged bridges, impaired rail lines and obstructed roads. Deteriorated infrastructure conditions add other challenges.

Transportation of nuclear material is subject to hazards of accidents – including accidents involving other vehicles and trains carrying hazardous, flammable and explosive materials. Fires from such accidents may last for long periods of time. Transportation of nuclear material is also subject to the hazards incident to natural disasters and deteriorated infrastructure.

Since the very inception of the nuclear age – our democracy has struggled, unsuccessfully, to reach consensus on how to dispose of nuclear waste.

The taxpayers of this nation have been forced to assume costs and liability for this waste that runs in the hundreds of billions.

The safety, security, health and environmental dangers involved in nuclear power are of such potential magnitude, that neither the commercial nuclear industry, nor the insurance industry, will accept more than a fraction of the potential liability. And thus through laws like the Price-Anderson Act of 1957 and the Nuclear Waste Policy Act of 1982, most of the risk burden has been placed on the American public.

Spent fuel pools need electricity and the movement of cooling water over spent fuel rods for safe operation. Both prolonged loss of power and loss of cooling water (including via blockage of intake structures) can result from extreme climate events, earthquakes, or attacks.

Over 67,500 metric tons of high-level nuclear waste (or MTU) are being stored at commercial nuclear power plants and that amount is expected to increase at a rate of approximately 2,000 a year or 20,000 MTU each decade.

The typical spent fuel pool at a light water reactor now holds the equivalent of about 6 reactor core loads of spent fuel, about 700 MTU.

Low-burnup fuel can be transferred from cooling pools into dry casks after 5 years, but high-burnup fuel may need to remain within pool cooling for over 20 years, and the use of high-burnup fuel has been increasing.

High-burnup fuel is both thermally hotter and more radioactive than traditional nuclear fuel.

High-burnup fuel will expose aging spent fuel pools to increasingly higher stresses. High-burnup fuel will also expose dry casks to higher stresses – and experiential data on the ability of spent fuel pools and casks to reliably withstand such stresses for prolonged periods is

nonexistent. Moreover, aging effects/mechanisms applicable to high-burnup fuel remain to be determined and the current engineering consensus is that high-burnup fuel is more subject to cladding radial hydride formation and embrittlement 20-25 years after the high-burnup fuel assemblies are placed in dry storage.

Transfer of fuel from pool to pad or from wet to dry storage (and back and forth) is an abrupt change of environment for used spent fuel assemblies.

Transfer of fuel also involves varying degrees of mechanical stress and dropping risk.

Aging effects/mechanisms include: degradation of toughness and strength of materials due to irradiation, including degradation of neutron absorber materials; changes in a mechanical property of materials, including change in dimensions or reconfiguration due to creep and effects of freeze-thaw; loss of preload due to stress relaxation; crack initiation and growth; loss or weakening of material due to corrosion; loss of strength and modulus due to elevated temperature.

America's existing nuclear fleet and the on-site spent fuel pools where most of the high-level spent fuel waste remains stored are aging.

It is a fundamental of engineering that as machines and structures age they become subject to age-related deterioration.

Aging effects/mechanisms apply to spent fuel pools and their associated structures.

When the spent fuel pools were originally constructed they were planned to hold spent fuel for a very short term – less than a year.

Unlike the reactors, the spent fuel containments are not hardened. The roofs are similar to the roofs commonly built at box top stores.

The spent fuel pool structures at nuclear plant sites were never designed, nor built, with the intention of holding large quantities of nuclear material for a decade, much less a century.

Data on dry cask performance has been collected for a matter of decades.

All attestations as to the containment of large quantities of nuclear waste for 60 years, 70 years, a century, and beyond are hypothetical, based on limited collections of experiential data, and untested by reality.

The U.S. government, intelligence and security experts have identified nuclear power plants to be terrorist targets.

REAL LIFE IMPACTS IGNORED IN FAVOR OF WILDLY OPTIMISTIC ASSUMPTIONS

The above noted facts are beyond serious dispute.

The legacy of uranium mining, milling, and enrichment which exists today continues to devastate nearby communities. Many such sites are located on or near Native American lands,

and tribal communities have long born a horrific share of the toxic burden. To now pretend such highly polluting activities as uranium mining (euphemistically called "uranium recover facilities" in the draft WP) will miraculously start to be clean simply because there exists some plan to limit contamination is fatuous.

The reality of what can happen when a "low-probability, high-risk" natural disaster occurs has been demonstrated by Fukushima. And yet the NRC staff in this draft WP apparently believes impacts from major natural disasters, major earthquakes, raging wildfires, floods, mudslides, and massive storm surges will be negligible. And all the possible consequences that could ensue will be completely manageable.

These conclusions are patently preposterous.

The NRC cannot seriously contend, for example, that climate change would not exert a multiplier effect on aging mechanisms. For a wide assortment of risks – flooding risk, dam failure risk, earthquake risk, site structure hazard risk, construction accident risk, landslide risk, hurricane risk, tornado risk, site fire risk, wildfire risk, malevolent insider risk, terrorism risk, human error, acts of nature, you name it – small risks can grow pretty exponentially when combined.

Most astonishingly, given the reality of recent years – including Fukushima, Hurricane Sandy and the East Coast-Canada blackout of 2003 – there is no analysis which connects the potential consequences of a protracted station blackout (SBO) to the risks presented by extreme weather, other infrastructure vulnerabilities, earthquakes, terrorism, sabotage, the aging transmission grid and just plain inept operation.

The draft WP disregards the entire discipline of disaster science.

America has had numerous nuclear power plant safety and security lapses. America has also endured a sobering series of terrorist and criminal events (9/11, Boston Marathon, etc.) and extreme weather events since commencement of the current century.

So far we have dogged the bullet of a concurrent nuclear emergency, grid failure, and extreme weather and/or security crisis. But at what point do the odds change for that bullet to connect?

DISREGARD OF ECONOMIC RISK PLACED ON TAXPAYER

More astoundingly, the NRC appears to have given no thought to what would (more likely, what *will*) happen if the private for-profit nuclear concerns operating the sites and facilities fail to adequately maintain operations, much less go out of business.

Who is responsible for cleaning up their mess?

Who pays?

We know the answer: The public. The NRC owes the public the curtsey of stating so plainly.

DISREGARD OF ELEVATED HUMAN HEALTH AND ENVIRONMENTAL DAMAGE RISK

The same failure to look at additive and multiplicative and accelerative factors infects all aspects of the draft WP's analysis of human health and environmental damage impacts.

Given the long lives of many dangerous radionuclides, any scientifically valid calculus would need to consider all the risks to health and environment from decades of radioactive effluent releases from the entire nuclear fuel and operations cycle (mining, milling, enrichment, effluent releases, accidental discharges, etc), from the beginning of the nuclear age onward. Thus proper analysis would acknowledge the totality of all the cumulative effects of the hundreds of different radionuclides (with so many different pathways and effects) that have been, are being, and will ineluctably be, disgorged.

As noted above, the toxic burden falls particularly heavily on Native American communities.

And, as findings of the National Academy of Sciences and numerous other studies attest, women, adolescents, children, babies and babies in utero are all more vulnerable to the effects of radiation. The NRC owes a duty to the public to note the additional risks to these groups in its reports.

An honest environmental damage analysis would need to consider population growth. Increased human populations mean increased population exposure. After all, if nuclear operations continue, there will be thousands of tons more waste and millions more people.

A proper analysis would include the effects of climate change as well as non-climate-related climate and geologic conditions. Such realities include drought, wildfires, mudslides, soil erosion, water source depletion, dwindling fisheries, polluted and heated waterways, algae growth....the list goes on and on.

Surely any sound analysis would evaluate the added burdens of heat and radioactive effluents into the groundwater and surface water as an added stressor that might well constitute a tipping point to major environmental crisis.

Added too would be the estimation of more accidental releases – large and/or small.

FLAWED ASSUMPTIONS

The number of flawed assumptions in the draft WP is mindboggling. We focus here solely on a few which are systemic and render the entire analysis defective.

Nothing Will Ever Go Really Wrong

The level of denial that things can go wrong in the draft WP borders on the level of delusion.

Sept 11th, Katrina, BP, now Fukushima. How many more examples do we need of the way events can aggressively overwhelm human-engineered systems? How many failures of "fail safe" structures must destroy the lives of thousands?

Somebody at the NRC, pick up a newspaper. Read it. Please.

Citing Regulations Is Equivalent to the Evaluation of Regulations

The circular reasoning in the draft WP is dizzying. Repeatedly the NRC staff refers to purported compliance with NRC regulations as proof of actual safety. Wasn't the whole point supposed to be an assessment of whether the regulatory scheme is adequate? How can reference to the scheme be proof of the scheme's validity?

This conceit is particularly galling when the referenced rules are decades old – and very outdated. And, of course, even current regulations fail to adequately account for the conditions of climate change.

There is, of course, a vast library of documentation of past NRC failures. With respect to monitoring of radioactive effluents into the environment, the NRC admits it rarely even does this, relying instead of the merry assumption that corporations will always monitor themselves flawlessly and report everything with the utmost candor.

Corporations Always Clean Up their Messes

Really?

Gee, if that's the case how come the industry is so intent on wrapping itself up in multiple protection layers of LLCs?

And why do we have so many statutes like the Price-Anderson Act of 1957 and the Nuclear Waste Policy Act of 1982, which shift the financial risk burden from the nuclear industry onto the shoulders of the public (i.e., taxpayers)?

Prioritization of profit and shareholder value is, of course, what corporations seek. Corporations are not biological beings with heart and soul, they are legal constructs devised to promote profit and reduce liability. That is actually what corporate law and corporate tax law allows. What the NRC has allowed, is for the behemoth nuclear corporations to wrap themselves in additional layers of "protection" that enable the parent corporations to cut loose at-risk subsidiaries, should they pose a substantial threat to profitability. The primary responsibility is to corporate bond holders and stock holders, not to the citizens of a community where a reactor is shut, and waste is seeping from spent fuel pools into the groundwater.

Further, today's viable and well-operated company can become tomorrow's failed corporation. This does not require a nuclear accident, just a financial disaster. (Enron.)

In fact, the NRC regulatory scheme seems to have given no thought to what would or could happen if an operator goes bankrupt. This is exactly what has led to the nation's numerous (and desperately underfunded) Superfund sites. Who will be left footing the bill for all this waste?

If the NRC really believes that nuclear operators who will no longer be pumping profits out of their old machines in 10 or 20 years will stick around to spend the following 100 or 200 years maintaining and cleaning up their defunct operations, we have a wonderful deal for you: Mars condo, ready for move-in, river view.

Noting a Hazard is the Same thing as Analyzing a Hazard

Over and over again the draft WP notes a potential hazard or impact and then just waves it away with the wand that the NRC/ industry has a plan to deal with the issue.

Actually, many of these plans are paper plans with little to no evidence the plans can be implemented.

Having plans and regulations does not constitute evidence of either adequate protection or lack of major impact.

CRUCIAL OMMISSION OF COST TO PUBLIC

One would think that somewhere in the draft WP would be a frank acknowledgement of the estimated costs to the American public of the whole shebang.

These costs include all the federal, state, and locality costs entailed in safety and security. The costs include government management and oversight of all the massive construction activities and all the transportation-related activities.

The costs include publically financed R&D for things such as trying to find out how to contain high-burnup fuel.

The costs include all the potential financial and risks transferred to the public.

The costs include all the potential remediation costs for past, present, and future toxic effluents.

One would think. But one would think wrong.

CRUCIAL OMMISSION OF CYBER

Even putting everything noted above aside, there is one astonishing omission that renders the entire draft WP fatally flawed:

The draft WP completely fails to look at cyber. It ignores cybersafety issues, cybersecurity issues, complications that can result from interactions between computer networks.

This area is scopic and critical.

Were space and copyright law not at issue, we would insert the complete contents of the book *America the Vulnerable* by Joel Brenner, former head of counterintelligence for the director of National Intelligence here. Somebody at the NRC should read it, with special attention to the chapter "Dancing in the Dark" about vulnerabilities to nuclear power installations and the grid in general.

The NRC also needs to review the government findings on the Davis-Besse boric acid corrosion fiasco with attention to the fact that the same nuclear operator was implicated in setting off the East Coast and Canada blackout of 2003, and recall that Davis-Besse turned out to also be infected with the malicious virus known as the Slammer worm. Connect some dots and add in a storm like Sandy.

CONCLUSION

The draft WP is based on poor evaluation of inadequate criteria. It promulgates hypotheses as evidence, unrealistically bounds scenarios, disregards likely malfunctions, discounts human error, minimizes all risks, and shows profound indifference to the effects of radiation upon human health and the environment.

The conclusions of the document defy both experience and reason.

That such a simplistic analysis would be presented in response to the Fukushima lessons recommendations of other NRC staff is quite dispiriting.

Sincerely,

Michel Lee, Esq.
Chairman
Council on Intelligent Energy & Conservation Policy (CIECP)
New York

RELEVANT SOURCES

These Comments incorporate the Appendix references contained in the filed Comments dated December 19, 2013 of the Indian Point Safe Energy Coalition (IPSEC) Expressing No Confidence on Waste Confidence Generic Environmental Impact Statement (GEIS) Draft Report, Docket ID No: NRC–2012–
0246. http://pbadupws.nrc.gov/docs/ML1336/ML13360A355.pdf

References & sources listed by year, and then alphabetically by institution or major publication. Other sources and non-publication-affiliated opinion pieces are listed under the name of the author. A few well known studies are listed by their commonly referenced names. Internal footnote references are excluded. Bracketed synopses of specific points following citations have been the added for the purpose of advocacy and to support points of emphasis in the core of the brief, and are not intended to be summaries.

2014

ARIZONA DAILY INDEPENDENT: Navajo Nation wins $5 billion settlement in uranium mine case, Arizona Daily Independent, Apr 7, 2014. http://www.arizonadailyindependent.com/2014/04/07/navajo-nation-wins-5-billion-settlement-in-uranium-mine-case/.

[Anadarko Petroleum Corp and its former parent Kerr-McGee Corp agree to pay $5.15 billion for abandoned uranium mine cleanup in the northern and eastern agencies of the Navajo Nation.

The Nation is one of several claimants in the case, which also includes the Department of Justice, 22 states, and several environmental response and tort trusts. The Navajo Nation plans to use its percentage of the settlement – about $1 billion – to help cleanup 49 abandoned uranium mines that were owned by Kerr-McGee. Some 460 other cleanup sites remain unfunded.]

CHICAGO TRIBUNE: Wernau, Julie and Alex Richards, As Exelon Threatens to shut nuclear plants, Illinois town fears fallout, Chicago Tribune, Mar 9, 2014. http://articles.chicagotribune.com/2014-03-09/business/ct-exelon-closing-nuclear-plants-0308-biz-20140309_1_quad-cities-plant-byron-plant-exelon/3.

[A Chicago Tribune analysis found that several nuclear plants operated by Exelon, the nation's largest nuclear plant operator and parent of Commonwealth Edison, haven't made enough money to cover operating and ongoing capital costs since 2008. Exelon stated in Feb 2014 that it will announce plant closings by the end of 2014 if market conditions don't improve. In recent years, a boom in wind power cheap natural gas and have driven down electricity prices, eroding nuclear power's profits.

Travis Miller, director of utilities research at Chicago-based Morningstar, told the Chicago that nuclear has "'lost a lot of its cost advantage when you consider the amount of capital investment it requires.'"

Exelon's Quad Cities and Byron plants "have been hit the hardest by 'negative' price conditions, meaning Exelon paid the operator of the electric grid to take its power. Because nuclear plants have to operate around the clock, they have to continually producing power. In 2012, Quad Cities plant was paying the grid operator to take its power 8% of the time. The Clinton plant is vulnerable because it sells electricity to a market "that's flush with cheap electricity generated by wind turbines."

"Once a wind turbine is constructed, the cost to run it is minimal, regardless of subsidies."

"'The real impact of wind energy on electricity markets is that it displaces a more expensive, polluting source of energy with zero-fuel-cost wind energy, driving down electricity prices and saving consumers money,' said Michael Goggin, senior electric industry analyst for the American Wind Energy Association."]

FORBES: McMahon, Jeff, 3 Utilities Most Likely To Fall In Death Spiral, According to Morningstar, Forbes Op-Ed, Mar 27, 2014. http://www.forbes.com/sites/jeffmcmahon/2014/03/27/utilities-most-likely-to-fall-in-death-spiral-morningstar/.

[Jeff McMahon is a Forbes contributor who covers energy, technology and the environment. Here he reports on a Morningstar analysis.

"Utilities that rely on nuclear fleets and speculative coal plants are most vulnerable to the solar-powered 'death spiral' roiling the electric industry, Morningstar analysts conclude in a report to institutional investors." Distributed generation (DG) is also posing a competitive threat to large centralized power forms of generation.]

NEW YORK TIMES: Wald, Matthew L, Experts Queried on Risks Posed by Closed Reactors, New York Times, May 15, 2014. http://www.nytimes.com/2014/05/15/us/politics/panel-questions-experts-on-closed-reactor-risks.html.

[Spent fuel sitting at reactor sites will remain "dangerously radioactive for centuries". Under 1980s legislation the Energy Department, was obligated to start accepting high level nuclear waste in 1998. However the Yucca Mountain program was cancelled and there is no process in place to find a new national waste repository. Collections from nuclear operators to the Nuclear Waste Fund, which began in 1983, ceased as of May 15, 2014.

"Meanwhile, the costs keep rising for a declining industry."

The cost of taking down Entergy's Vermont Yankee reactor (closing in 2014), and shipping the low-level waste for burial is estimated to be at least $1 billion. The expected cost of transferring spent fuel from pool to dry casks at Vermont Yankee is $150 million to $175 million, according to Entergy. Entergy is seeking reimbursement from the Energy Department. Entergy wants to take money out of the $600 million decommissioning fund, but that fund is already too small.

At a May 14, 2014 Senate hearing, Entergy's vice president for regulatory strategy, T. Michael Twomey, testified that maintaining a full-scale emergency capacity would cost about $20 million a year, which would also come out of the decommissioning fund. "'It's not a free option,'" he said.]

NUCLEAR INFORMATION AND RESOURCE SERVICE: Judson, Tim, Killing the Competition, Report of the Nuclear Information and Resource Service (NIRS), Sep 2014. http://www.nirs.org/neconomics/killingthecompetition914.pdf.

SECURITIES AND EXCHANGE COMMISSION: Letter of Matt S. McNair, Special Counsel to United States Securities and Exchange Commission letter to Edna M. Chism of Entergy Corporation, Feb 11, 2014. http://www.sec.gov/divisions/corpfin/cf-noaction/14a-8/2014/nystatecommonentergy021114-14a8.pdf.

U~T SAN DIEGO: Lee, Morgan,Plan unveiled to dismantle San Onofre, U~T San Diego Aug 2, 2014. http://www.utsandiego.com/news/2014/aug/01/decommissioning-san-onofre-moves-forward/2/?#article-copy.

[Dismantlement of the San Onofre nuclear plant is estimated to cost $4.4 billion and take 20 years, its operator, Southern California Edison announced in August 2014.

San Onofre reactors shutdown in January 2012 after a small radiation leak was traced to the rapid degradation of brand new steam generators. The plant was permanently closed in June 2013.

As San Onofre's containment domes are cleared out and leveled, heavily radioactive reactor parts will be stored in canisters. Less radioactively contaminated components will be transported to low level waste disposal facilities at Andrews County, Texas, and Clive,

Utah. Spent nuclear fuel will remain indefinitely on site, until the US government comes up with a permanent solution for high level nuclear waste storage.

In a conference call with investors and analysts, SC Edison's CEO Ted Craver said San Onofre was fully funded. However, under a proposed settlement agreement being reviewed by the California Public Utilities Commission, utility customers would pay leftover costs of $3.3 billion.]

WALL STREET JOURNAL: Wastelands: America's forgotten nuclear legacy, 2013-2014. http://projects.wsj.com/waste-lands/.

[Wall Street Journal interactive database shows New York as the state with the largest number of legacy atomic waste.]

WORLD NUCLEAR INDUSTRY STATUS REPORT PROJECT: Schneider M and Froggatt A, with contrib.: Hosokawa K, Thomas S, Yamaguchi Y, and Hazemann J, Independent Assessment of Nuclear Developments in the World, Jul 30, 2014. http://www.worldnuclearreport.org/IMG/pdf/201407msc-worldnuclearreport2014-hr-v1.pdf. http://www.worldnuclearreport.org/-2014-.html.

2013

BURLINGTON FREE PRESS: Hallenbeck, Terri, Vermont Yankee deal calls for $25M from Entergy, Burlington Free Press, Dec 24, 2013. http://www.burlingtonfreepress.com/article/20131223/NEWS02/312230014/Vermont-Yankee-deal-calls-25M-from-Entergy-lawsuits-dropped

[The decommissioning cost of Vermont Yankee is estimated to be $1billion, but only 60% of this sum is in the decommissioning fund set up by the nuclear plant's owner, Entergy.

In Dec 2013, the State of Vermont and Entergy Corp reached a settlement agreement whereby Vermont would drop legal claims pending in federal court and not oppose plant operation for one more year. Entergy, in turn, promised to decommission the plant more quickly than the 60 years allowed by the NRC. Entergy agreed to move spent fuel to dry cask within 7 years. "Entergy agreed to start decommissioning the plant as soon as the decommissioning fund is adequate, acknowledging that it's unknown when that will be. Entergy has agreed to determine by the end of next year how much decommissioning that specific site will cost. When the fund, which now has about $600 million, grows to that amount, Entergy agrees to start the decommissioning process within 120 days.

Entergy also agreed to set up a $25 million fund to restore the site along the Connecticut River after plant dismantling. However, no agreement was reached on a specific *definition* of site restoration or establishing which things Entergy could pay for out of the decommissioning fund.

The Connecticut River Watershed Council was critical of the terms of the settlement, because the agreement does not elicit any guarantees from Entergy over discharge of heated water into the river, leaving that to the existing Agency of Natural Resources permitting process.]

Cooper, Mark, Declaration In Matter of Proposed Rule: Waste Confidence Continued

Storage of Spent Nuclear Fuel 10 C.F.R. Part 51, Nuclear Regulatory Commission Draft Waste Confidence Generic Environmental Impact Statement, Docket No. 2012-0246, Dec 16, 2013. https://www.nirs.org/radwaste/exhibitd2013-12-16markcooperfinaldeclaration.pdf.

[Mark Cooper, PhD, Senior Fellow for Economic Analysis at the Institute for Energy and the Environment at Vermont Law School, uses "a 'multi-criteria portfolio analysis' for evaluating and choosing between the available alternatives in the increasingly complex and ambiguous conditions of the electricity market." (p 2)

The costs of nuclear waste management alone – even excluding decommissioning costs – are high enough to significantly affect the cost-benefit evaluation of nuclear power and make it a non-optimal candidate for power compared with energy efficiency and alternative energy sources.

The analysis shows that the costs of managing spent nuclear fuel are likely to be quite large in absolute value, running to hundreds of billions of dollars; conservatively in the range of $210 billion to $350 billion.

In addition, there are decommissioning costs which are rising. "For license renewals, there would be an additional question about whether extending the life of a reactor increases the decommissioning costs." (p 11)

"The economics of old reactors is already fraying and many are already on the economic 'razor's edge'... Proper consideration of waste disposal costs could play a part in pushing them over the edge." (p 20)]

ENVIRONMENTAL NEWS SERVICE: Entergy to close Vermont Yankee nuclear plant, Environmental News Service, Aug 27, 2013. http://ens-newswire.com/2013/08/27/entergy-to-close-vermont-yankee-nuclear-power-plant/.

[Entergy announced its decision to stop operation of its Vermont Yankee nuclear plant for financial reasons in late 2014. The plant began operation in 1972 and had, in 2011, been granted relicensing by the NRC to operate until 2032.]

ENVIRONMENTAL SCIENCE & TECHNOLOGY: Sovacool BK, Parenteau P, Ramana MV, Valentine SV, Jacobson MZ, Delucchi MA, and Diesendorf M, Comment in response to "Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power," Environmental Science & Technology (2013); 47 (12): 6715-6717. http://www.its.ucdavis.edu/research/publications/publication-detail/?pub_id=1927.

[Authors are affiliated with Princeton University, Stanford University, University of California Davis, Vermont Law School (all in the US), the University of Tokyo (Japan), and the University of New South Wales (Australia).

Nuclear power plants are less effective at displacing greenhouse gas emissions than energy efficiency initiatives and renewable energy technologies. A comparative study has shown each dollar invested in efficiency displaces nearly 7 X as much CO2 as a dollar invested in nuclear.

And, in a lifecycle equivalent carbon dioxide basis analysis, wind energy has been shown to be 24 X as effective at displacing emissions per kWh, while hydoelectricity is roughly 2 X as effective. When recent marginal capital and levelized costs are factored in for the US, wind energy is 96 X more effective at displacing carbon than nuclear power, and other renewable sources range from about 20 X to 2 X as effective.

Aside from the direct high financial costs of nuclear power are the detriments of serious environmental degradation from uranium mining and milling. Nuclear power also is a highly water use intensive industry and nuclear power plant operability is impaired during water shortages and droughts.

Adding to the problems with nuclear are the security and accident risks. "There is no such catastrophic risk associated with efficiency and renewables." (p 6715)

Energy efficiency and renewable energy should be "front and center" in any campaign to address environmental pollution and climate change. Given the opportunity costs involved, nuclear power could reduce and retard the climate protection. (p 6716)]

INTERNATIONAL ENERGY POLICY: Williams W, Maniam B, and Subramaniam G, U.S. Energy Independence With Lower Emissions, Journal of International Energy Policy (2013): 2 (2): 39-47). http://journals.cluteonline.com/index.php/JIEP/article/view/8274.

[Researchers from Sam Houston State University (US) and Universiti Teknologi (Malaysia).

America's current energy portfolio is not sustainable, but there are many options the US can choose to power the future. Near-term, available "win-win" clean energy solutions involve implementing small scale options.

Nuclear fission power plants produce large amounts of hazardous waste. Uranium is a finite resource and uranium mining is costly. These factors make nuclear impractical as a replacement to fossil fuels. (p 44)]

NEW YORK TIMES: Foderaro, Lisa W, Cleaning Up Radiation In Park May Take Years, New York Times, Nov 26, 2013. http://www.nytimes.com/2013/11/26/nyregion/radiation-cleanup-at-staten-island-park-to-take-years.html.

[In Nov 2013, officials said that the level of radioactive contamination is more extensive than previously thought. Cleanup likely to take years. Garbage with trace amounts of radium was dumped into the wetlands at Great Kills Park on Staten Island in the 1940s and 1950s. Contamination was first detected in 2005 when a police flyover of New York City detected a positive reading for radioactive material. In the years since, investigations by the city's Department of Health and Mental Hygiene, the EPA and the United States Army Corps of Engineers turned up more hot spots and a more disturbing picture.

"'As we're getting through this tough job, we're finding that the contamination is not only in these discrete pockets, but is dispersed in the soil and also at the surface,'" said Kathleen Cuzzolino, an environmental protection specialist for the Park Service. In late 2013, after another flyover and years of excavations, "the Park Service acknowledged that the contamination was more

extensive than had originally been believed. Indeed, more than half of the park has shown some degree of radioactivity — virtually the entire area containing the historic fill."

Park officials have fenced off 260 acres and started the lengthy process of mapping the contamination and devising a cleanup plan. "[T]he National Park Service, with help from the Army Corps of Engineers, is now surveying every square foot of the 260 acres. Radiation technicians have so far scanned three-fourths of the park with detectors, a painstaking job that entailed clearing vegetation in the survey area so that the detectors could come within six inches of the ground...the Park Service will remove at least 30 hot spots with the highest levels of radiation in the coming months. ...The federal government will also undertake a 'human health and ecological risk assessment,' in which soil and ground water samples will be analyzed. Then comes the eventual cleanup, which will involve a feasibility study and a public comment period. 'It's going to be several years,' [the Park Service's Kathleen] Cuzzolino said. 'It's not going to be an easy task to remediate contamination across 260 acres.'"]

NUCLEAR STREET NEWS: Entergy Details Company-Wide Job Cuts, Nuclear Street News, Jul 31, 2013.
https://nuclearstreet.com/nuclear_power_industry_news/b/nuclear_power_news/archive/2013/07/31/entergy-details-company_2d00_wide-job-cuts-073102.aspx#.UjnZKJ3D8gE.

[Entergy cited disappointing earnings as reason for the decision to cut 800 positions across its organization. The New Orleans Times-Picayune reported the company will trim 240 positions in Louisiana, 165 in Arkansas, 115 in Texas, 80 in Mississippi and the remainder in New York, Massachusetts, Michigan, and Vermont. "The effects of cost cutting are likely to be felt across the organization's nuclear fleet, which provides about a third of Entergy's electrical generation. It is made up of 11 reactors at Arkansas Nuclear One, Grand Gulf, River Bend, Waterford, Palisades, Indian Point, Fitzpatrick, Pilgrim and the Vermont Yankee." Entergy "cited higher tax, operation, maintenance and depreciation expenses in its justification for a company-wide reorganization expected to save between $200 million and $250 million over the next few years." Also Entergy has filed suit against contractor companies at Arkansas Nuclear One, where a crane accident took the life of a worker in 2013.]

REUTERS: Entergy Michigan Palisades reactor may have to shut by 2017, Reuters, Mar 8, 2013. http://www.reuters.com/article/2013/03/08/utilities-entergy-palisades-idUSL1N0C0B0520130308.

[Entergy's Palisades reactor in Michigan may have to shut by 2017 due to NRC findings that the metal in the aging reactor vessel could reach the regulatory limit for handing pressurized thermal shock as a result of decades of radiation, temperature and pressure stresses. NRC spokeswoman Viktoria Mityng told Reuters: that, as a reactor vessel ages the metal becomes less ductile – it tends to bend less and becomes more brittle – as it is bombarded by neutrons and other forces. An example of the kind of accident in which a pressurized thermal shock could occur is if a large pipe breaks, forcing the operator to fill the vessel with emergency water supplies from cold lake water. Palisades began operation in 1971 and is located on the shore of Lake Michigan. In 2007, the NRC gave Entergy a 20 year license renewal, allowing operation to 2031.]

WALL STREET JOURNAL: Emshwiller, John R, Wasteland: One Town's Atomic Legacy:

A $500 Million Cleanup, Wall Street Journal Nov 22, 2013. http://online.wsj.com/news/articles/SB10001424052702304868404579194231922830904.

[Estimate of the cleanup costs of radioactive contamination at a long-defunct nuclear weapons site is as high as $500 million. Federal regulators originally said the waste could safely stay buried in the field. Subsequently the Army Corps of Engineers authorities found unexpected amounts of "complex material," mandating increased security at the site. "In a 2007 report, the Corps, taking a different stance from the NRC's prior assessment of the site, said 'concentrations of radionuclides in the buried wastes are high enough to present a potential future risk to human health' and need to be removed."]

WALL STREET JOURNAL: Emshwiller, John R and Jeremy Singer-Vine, A Nuclear Cleanup Effort Leaves Questions Lingering at Scores of Old Sites, Wall Street Journal, Oct 30, 2013. http://online.wsj.com/news/articles/SB10001424127887323342404579079483154040874#printMode.

2012

BUSINESSWEEK: Funk, Josh, Nebraska nuclear plant not restarting soon, Bloomberg Businessweek News (report from AP), Jul 18, 2012. http://www.businessweek.com/ap/2012-07-18/nebraska-nuclear-plant-not-restarting-soon.

[The Fort Calhoun nuclear power plant in Nebraska was shut down for more than a year due to safety problems. Fort Calhoun was initially shut down in April 2011 for routine refueling maintenance, but flooding along the Missouri River and the safety violations regulators identified forced it to remain offline. Problems included a small electrical fire in June 2011 and deficiencies in flood planning (discovered before extended flooding along the Missouri River). In May 2012, workers found a crack in the steel shield surrounding one of the heaters that help maintain the temperature of the water used to generate steam. A key electrical part had also failed during a 2010 test.]

CONGRESSIONAL RESEARCH SERVICE: Werner, JD, U.S. Spent Nuclear Fuel Storage, Report of the Congressional Research Service, 7-5700; R42513, May 24, 2012. https://www.fas.org/sgp/crs/misc/R42513.pdf.

[As of Dec 2011 more than 67,000 metric tons of spent fuel in more than 174,000 assemblies is stored at 77 sites (including 4 DOE facilities) in 35 states, increasing at the rate of about 2,000 metric tons per year. About 73% (67,450 metric tons) of spent fuel continues to be in spent fuel pools, which are becoming filled to capacity. At 27 sites there is no current dry cask storage capability. (Summary.) The 5 states with the largest total amount of spent nuclear fuel measured by metric tons of heavy metal content are: New York; Illinois; Pennsylvania; South Carolina; and North Carolina. The top five states with the largest amount of spent nuclear fuel in pools are: New York; Illinois: Pennsylvania; North Carolina; and Alabama. (p 24)

"In fact, virtually every site that has ever hosted a commercial nuclear reactor is currently also a storage site for SNF." (p 17) Approximately 80% of commercial spent nuclear fuel, measured by mass, is stored east of the Mississippi River. (p 23)

"Notwithstanding the mandate in the Nuclear Waste Policy Act (NWPA) and various contracts that DOE begin accepting SNF for disposal in 1998, no disposal repository has been completed or licensed." Even if the Yucca Mountain program – terminated in 2009 – were to be resumed quickly, the time required to ship nuclear waste would require an extended period of storage, with interim storage being needed until at least 2056. The current quantity of nuclear waste in the nation (at commercial and government sites) exceeds the legal capacity of the proposed Yucca Mountain repository. (p 5)

A survey of spent fuel storage in 10 nations with significant nuclear operations found that all store substantial amounts of spent fuel in pools or dry casks. France (with 13,500 metric tons of spent fuel and 2,229 cm of vitrified high level waste as of 2007) has not yet selected a disposal site for high level waste. Finland (with 4 nuclear reactors) is the only country where a commercial nuclear waste repository site has been selected with local government acquiescence. (p 7)

The U.S. federal government has already paid out about $1 billion in claims and faces significant and growing liability arising from contracts DOE signed in 1983 and the 1987 Nuclear Waste Policy Act whereby the government was supposed to assume nuclear waste from commercial nuclear utilities. "The future estimated costs for storage of commercial SNF are approximately $500 million per year." (pp 7-8)

The Department of Energy took possession of the spent fuel and debris from the 1979 Three Mile Island plant accident. (p 25)

"In the 1970s a relatively small amount (248.7 MTU of commercial SNF was shipped from commercial reactors, including utilities in Michigan and New York, to the West Valley site in New York, which reprocessed SNF for about six years (1966 to 1972). The resulting high-level waste and contaminated facilities remain at the site. DOE has estimated that decommissioning and environmental remediation of the contamination at the West Valley site will continue until at least 2020, cost $3.7 billion, and require indefinite long-term stewardship thereafter." (pp 25-26)

In addition to the releases of tritium contamination from spent fuel pools and other structures to groundwater at 38 commercial nuclear sites, "tritium contamination was found in groundwater from spent fuel storage pools at DOE sites, including the Brookhaven National Laboratory in New York, Hanford in Washington State, and the Savannah River Site in South Carolina....Tritium is inherently difficult to remediate, once released, because it is simply a radioactive form of hydrogen that substitutes freely with hydrogen in water and decays at a rate of about 5% per year (12.32 year half life). (p 34)

The inherent hazards of spent nuclear fuel can result in a variety of risks. "A variety of forces or 'threats' acting on spent fuel could result in containment being breached, resulting in potential exposures and risks, generally: (1) loss of power for water supply, circulation, or cooling, which can have significant consequences for SNF in wet pool storage; (2) external threats, like hydrogen explosions from adjacent reactors, or an airplane crashing into an SNF storage facility; (3) long-term degradation of SNF through chronic corrosion of cladding (e.g., hydride corrosion); and (4) leakage of contaminated water from wet pools to groundwater." (p 30) In contrast to the US, "Germany explicitly requires protection against risks, including 'external events' such as an attack on SNF storage, and this has resulted in construction of hardened

storage buildings for dry cask storage of SNF." (p 32)

"Another potential threat to SNF storage safety is degradation of the cladding and fuel elements." The potential for degradation of SNF cladding has been well known for decades. (p 33) "'Zirconium has a high affinity for hydrogen. Absorption of hydrogen leads to hydrogen embrittlement, which can lead to failure of the zirconium tubing used as cladding for nuclear fuel. In addition, zirconium also reacts with oxygen, which can lead to corrosion.'" (p 33, fn 142, quoting Kok, Kenneth D, *Nuclear Engineering Handbook*, CRC press, 2009, at p 287)]

MICROGRID HORIZONS: Roach M, Hurricane Sandy & the Emperor's New Clothes: Microgrids as a Risk Mitigation Strategy for Extreme Weather Events, White Paper, Dec 13, 2012.
http://nyses.org/pmwiki/uploads/EnergyLiteracyLibrary/2012_Roach_HurricaneSandyandtheEmperorsNewClothes_wRefs.pdf

[White Paper by Michael Roach, CEO of MicroGrid Horizons, provides analysis of feasibility and emphasizes the urgency of transformation to microgrids.

Hurricane Sandy and other severe storms have exposed the fact the 20th Century electricity transmission systems and utility modes of operation are inadequate to cope with extreme weather events we can anticipate in the 21st Century. Hurricane Sandy exposed "the reckless and extreme level of risk" involved.

Nuclear accidents like Three Mile Island and Fukushima exposed extreme disruptions not included in scenario risk analyses. (p 8)

The Consortium for Electricity Reliability Technology Solutions (CERTS), a group of universities, government research laboratories and corporate partners, have conducted studies that show the US continues to experience intermittent but catastrophic blackouts. "Whether nature-made (e.g., hurricanes, lighting, snowstorms, fires, etc.) or man-made (operator errors, equipment malfunction, etc.), the results of an outage were the same for electricity customers – no grid electricity for extended periods of time and no backup."]

NUCLEAR INFORMATION AND RESEARCH SERVICE: Damveld H and Bannick D, Management of Spent Fuel and Radioactive Waste: State of affairs – A worldwide overview, NIRS Nuclear Monitor, 746/747/748, May 2, 2012.
http://www.nirs.org/mononline/nm746_48.pdf.

TIMES-PICAYUNE: Galofaro, Claire, City Council grills Entergy on response to Hurricane Isaac, Times-Picayune / NOLA.com, Sep 4, 2012.
http://www.nola.com/hurricane/index.ssf/2012/09/city_council_grills_entergy_on.html.

[The New Orleans City Council unanimously passed a resolution launching an inquiry into how Entergy New Orleans prepared for and responded to Hurricane Isaac, which hit the city on Aug 28, 2012 and sat above the city for over 50 hours. The City Council hammered Entergy "on several topics -- its poor communication with the thousands left in the dark, whether it had neglected rotten poles and encroaching trees and what it could have done better to steel its

infrastructure to weather such storms." The council focused on Entergy's failure to communicate their process with the public. "People were left in the dark, deciding whether to stick it out or find somewhere else to go with no information about when they might expect their power to be restored. Entergy's web site, often inaccurate, the company admitted, was also no good to most without power or Internet access." Cynthia Hedge-Morrell, Chair of the council's Utility Committee said, "'We've got to have one-time, real-time information so people can make life or death decisions.'"

Widespread flooding and heavy winds stalled thousands of crews coming into the city from states as far away as New Jersey, he said. Across the state, more than 700,000 lost power and thousands remained without power for over a week. Council President Stacy Head expressed concern that Entergy had not adequately maintained the transmission system, pointing to the high number of rotten poles that toppled in the storm. "Head, and the other council members, asked what system maintenance the company had done since it received $200 million in federal recovery funds after declaring bankruptcy in the wake of Hurricane Katrina. 'I think we need to investigate the investment in infrastructure versus the profit by the big boys at Entergy,' said Council Vice President Jackie Clarkson."

About an hour after the meeting wrapped up, and the council voted unanimously to launch an inquiry, 11,000 more lost power in downtown New Orleans because of a substation problem.]

2011

GOVERNMENT ACCOUNTABILITY OFFICE: Commercial Nuclear Waste: Effects of a Termination of the Yucca Mountain Repository Program and Lessons Learned, Report of the Government Accountability Office, Apr 2011, GAO-11-229. http://www.gao.gov/assets/320/317627.pdf.

["Spent nuclear fuel – considered very hazardous – is accumulating at commercial reactor sites in 33 states." The Nuclear Waste Policy Act of 1982 put the responsibility for creating a waste depository on the government. But DOE determined the Yucca Mountain repository program is not a workable option. Resolving the issue of what to do with spent commercial nuclear fuel "will likely be a decades-long, costly, and complex endeavor, which can be disrupted by changing views and unpredictable funding".

Some funding mechanism is needed to support development and implementation of a disposal solution the nation's spent nuclear fuel. However, "there is no guarantee" that an acceptable less costly than Yucca Mountain alternative will be identified. Finding another permanent solution may be a costly and time-consuming process which will likely take decades and will likely prolong the need for interim storage of spent nuclear fuel at reactor sites, which would have financial and other impacts. The federal government bears part of the nuclear waste storage costs. Industry lawsuits over DOE's failure to take custody of commercial spent nuclear fuel in 1998, "exceed $15.4 billion and could grow by an additional $500 million a year after 2020."]

UNION OF CONCERNED SCIENTISTS: Koplow D, Nuclear Power: Still Not Viable without Subsidies, Report of the Union of Concerned Scientists, Feb 2011. http://www.ucsusa.org/assets/documents/nuclear_power/nuclear_subsidies_report.pdf.

Summary at: http://www.psr.org/nuclear-bailout/resources/nuclear-power-still-not.pdf.

[Report (136 pp) for the Union of Concerned Scientists written by Doug Koplow, founder of Earth Track, Inc., an economic analysis firm which specializes in evaluation of energy market subsidies.

This report is the first comprehensive analysis of the many market-distorting subsidies provided to nuclear power throughout all stages of the nuclear fuel cycle. Such information is critical for an understanding of the economics of nuclear power and for comparing nuclear to emerging energy options.

"The findings are striking: since its inception more than 50 years ago, the nuclear power industry has benefited – and continues to benefit – from a vast array of preferential government subsidies. Indeed... subsidies to the nuclear fuel cycle have often exceeded the value of the power produced. This means that buying power on the open market and giving it away for free would have been less costly than subsidizing the construction and operation of nuclear power plants." (p 1)

"In total, we estimate the value of legacy subsidies to nuclear power were at least 7.5 ¢/kWh – equivalent to nearly 140 percent or more of the value of the power produced from 1960 to 2008. In other words, the value of government subsidies to the first generation of nuclear reactors actually exceeded the value of the power produced by those plants." (p 104) Ongoing subsidies to existing reactors have a broad range, but even the lowest estimate for ongoing subsidies at 2011 power prices would erode nearly 80% of the production cost advantage of nuclear relative to coal. High-end estimates indicate subsidies to existing reactors of roughly 4-6 ¢/kWh, or 70 to nearly 100% of the value of the power produced. "Given that these values *exclude* the massive legacy subsidies to the plants, their magnitude is impressive." (p 104)

Notably missing from evaluations have been the costs to the taxpayer of nuclear waste and the shifting of long-term safety and security risks to the public. Nuclear plant security concerns have increased significantly since 9/11, and proliferation risks affect the US and the globe. "The complexity and lack of data in these areas make it impossible to quantify the magnitude of security subsidies for this analysis. But it is clear that as the magnitude of the threat increases, taxpayers will be forced to bear a greater share of the risk." (p 7)

Environmental damage done by nuclear plants is also a large hidden cost. When existing plants were sited, little consideration was given to the economic or ecological impacts of' massive withdrawals of cooling water. Nuclear power reactors are the most intense water users per kilowatt hour of electricity produced. (pp 72-77, 105) As pressure on resources grows, nuclear plants consumptive withdrawals put increasing pressure on waterways.]

WALL STREET JOURNAL: Maremont, Mark, Nuclear Waste Piles Up—in Budget Deficit, Wall Street Journal, Aug 9, 2011.
http://online.wsj.com/article/SB10001424053111904292504576484133479927502.html

[Spent nuclear fuel stranded nuclear sites across the US is not just a potential public health hazard, but a growing burden on federal finances. The federal government's assumption of responsibility for nuclear waste disposal three decades ago has become another unfunded

liability, starting with a $25 billion Nuclear Waste Fund gone astray. Congress spent the fund money on other things, so it is little more than an IOU. In addition, the Department of Energy will owe an estimated $16.2 billion in legal judgments to nuclear utilities for the cost of holding nuclear waste by 2020; and $500 million a year after that.

The costs of the ultimate disposal project also are sure to rise, with no plan in sight. (The DOE in 2008 estimated that building the Yucca Mountain facility and then transferring waste to it would cost $83 billion in 2007 dollars on top of $13.5 billion already spent.) Taxpayers are on the hook for the cost.]

2010

ASSOCIATED PRESS: More than one quarter of U.S. nuclear plants have leaked tritium, Associated Press interactive diagram, 2010.
http://hosted.ap.org/specials/interactives/_national/leaking_nukes/index.html?SITE=AP.

[The diagram identifies nuclear sites which have leaked tritium with red dots and shows the vast majority to be located in the Northeast/East coast.]

JOURNAL NEWS: Clary, Greg, PSc takes heat over tree-cutting, Entergy spin off, Journal News, Mar 5, 2010.
http://archive.lohud.com/article/20100305/COLUMNIST18/3050345/PSC-takes-heat-over-tree-cutting-Entergy-spin-off.

[The office of the NY Attorney General is opposing the attempt of Entergy to spin-off its nuclear holdings into a company called Enexus Energy Corp. The AG submission states: "'Entergy seeks to spin off several aging nuclear power plants to a new and debt-laded corporation whose only assets would be the plants themselves. Not only would this new corporation be heavily indebted, it would be unique; no other corporation is exclusively built around aging nuclear reactors that operate in a 'merchant' (i.e., non-utility) power system.'"]

2009

ASSOCIATED PRESS: Not enough money to dismantle old nuclear plants, Associated Press interactive diagram, 2009.
http://hosted.ap.org/specials/interactives/_national/nuclear_decommission/index.html?SITE=AP.

[The AP diagram features links to 2008 data on the amounts in decommissioning funds for nuclear plants compared to the 2008 estimates of decommissioning cost. At Indian Point 2 & 3 (*no data is provided for the defunct reactor no 1*), the decommissioning funds are indicated to be short $114,430,000. At Calvert Cliffs, the funds are indicated to be short $417,308,000. At Limerick, the funds are indicated to be short $716,200,000.]

ASSOCIATED PRESS: Gram, Dave and Frank Bass, Nuclear reactor owners not saving enough to shut down, clean up, Associated Press, Jun 17, 2009.
http://www.wibw.com/home/headlines/48181512.html.

[The companies that own almost half the nation's nuclear reactors do not have adequate funds set aside for dismantlement and cleanup. Reactors may sit idle for decades and radioactive waste could leak from abandoned plants into ground water or be released into the air. Spent nuclear fuel poses security risks. In Jun 2009, British officials reported on a 2007 leak in a cooling tank at the decommissioned Sizewell-A nuclear plant. "If the leak had not been promptly discovered, officials said, nuclear fuel rods could have caught fire and sent airborne radioactive waste along the English coast, harming plant operators or the public."

Decommissioning cost estimates have risen by more than $4.6 billion over two years, while the investment funds that are supposed to pay for shutdown have lost $4.4 billion

NRC rules do not require nuclear plant owners to set aside money to store old nuclear fuel, demolish buildings, or return the plant sites to pristine states. Some states require a full site restoration, but the federal government does not. "'No one at the NRC wants to acknowledge what is absolutely obvious to us, that the funds are inadequate and that the industry has bare assets,' said Arnold Gundersen, a retired nuclear engineer and decommissioning expert."

Luminant Corp, the owner of two nuclear plants near Glen Rose, Texas, has about $385 million set aside to close the reactors expected to shut down in 2030 and 2033. The estimated decommissioning cost is $824 million.

Entergy, owner of the Vermont Yankee plant along the banks of the Connecticut River, has $384 million set aside for shut down. The estimated decommissioning cost is $932 million.]

2008

ENERGY POLICY: Sovacool, BK, Valuing the greenhouse gas emissions from nuclear power: A critical survey, Energy Policy (2008); 36 (8): 2950-2963. http://www.sciencedirect.com/science/article/pii/S0301421508001997.

[Study screens 103 lifecycle studies of greenhouse gas-equivalent emissions for nuclear power plants to identify a subset of the most current, original, and transparent studies.

The range of emissions for nuclear energy over the lifetime of a plant, reported from qualified studies examined ranges from 1.4 g of carbon dioxide equivalent per kWh (g CO_2e/kWh) to 288 g CO_2e/kWh, with the mean value is 66 g CO_2e/kWh. Lifecycle greenhouse gas emissions occur through plant construction, operation, uranium mining and milling, and plant decommissioning.]

NEW YORK TIMES: Hakim, Danny, Nuclear Operator Seeks to End Revenue Deal With State, New York Times, Jul 21, 2008. http://www.nytimes.com/2008/07/21/nyregion/21indian.html.

[Entergy Nuclear, the owner of the two Indian Point plants in Westchester County and the FitzPatrick plant in Oswego County is trying to get out of a revenue sharing agreement with New York. Under the agreement, Entergy is supposed to pay the New York State Power Authority up to $72 million annually – a total of $432 million – through 2014.

Entergy's strategy was revealed in a securities filing which outlined a plan to spin off its nuclear plant holdings into a new company called Enexus. In one clause Entergy claims that Enexus would not have to live up to a revenue sharing agreement between Entergy and New York. While the terms of the revenue sharing deal would hold if the plants were transferred to an Entergy affiliate, company officials said that they would not be creating a new affiliate but rather a new independent company.

The Federal Energy Regulatory Commission (FERC) approved the spinoff. Alex J. Schott, an Entergy spokesman, said the spinoff "'optimizes the value for all our stakeholders.'"

NY State officials are concerned about both the loss of state funds and the potential loss of operator funding needed for decommissioning the Indian Point and FitzPatrick plants.]

NEW YORK TIMES: Wald, Matthew L, As Nuclear Waste Languishes, Expense to U.S. Rises, New York Times, Feb 17, 2008. http://www.nytimes.com/2008/02/17/us/17nuke.html?_r=0.

[With waste sitting at reactor sites with no long term repository, the federal government may need to pay damages that could reach $35 billion. "The payments come from an obscure and poorly understood government account that requires no new Congressional appropriations, and will balloon in size...." The money comes out of the Treasury, not the Energy Department from a fund called the "Judgment Fund."

The government is also running up extra expenses on its own nuclear waste. Some of the waste that is supposed to go to Yucca, left over from nuclear weapons production, is sitting in storage expensive to maintain."]

ROCKY MOUNTAIN INSTITUTE: Lovins AB and Sheikh I, The Nuclear Illusion, Rocky Mountain Institute Report (2008). http://www.rmi.org/Knowledge-Center/Library/E08-01_NuclearIllusion. www.citizenscampaign.org/PDFs/It_RETF_Report.pdf

TAXPAYERS FOR COMMON SENSE: Nuclear Subsidies Past and Present, Taxpayers for Common Sense Fact Sheet, Dec 12, 2008. http://www.taxpayer.net/library/article/nuclear-subsidies-past-and-present.

[As of 2008, more than $85,870,000,000 in direct federal subsidies, tax breaks and loan guarantees was given to the nuclear industry. (All valuations are in 2007 dollars.)

Yet, despite these sums, the nuclear power industry continues to demand subsidies and is "unable to stand on its own two feet in the marketplace."

In addition to the specified subsidies, Congress has significantly limited the liability of individual nuclear plant operators and the industry as a whole for more than half-a-century. This has been done via the Price-Anderson Act, a 1959 law that has been repeatedly extended. Thus the cost of an accident is a liability which would be primarily borne by American taxpayers.

High level nuclear waste deposition is also a cost. The estimated cost from 2007 through permanent closure and decommissioning of the Yucca Mountain repository is $83 billion. "The

potential risk the US government bears with nuclear power is a cost well beyond any other federal subsidy."]

2006

BAYOU BUZZ: Tidmore, Chrisopher, Is Entergy New Orleans Out of Power? Bayou Buzz, Mar 23, 2006. http"//www.bayoubuzz.com/articles.aspx?aid=6576.

[Entergy reported to threaten walking away from its New Orleans subsidiary if multi hundred million dollar federal bailout money not provided to help rebuild utility systems damaged by Katrina.]

CORP WATCH: King, Rita, Entergy Holds New Orleans for Ransom, Special to Corp Watch, May 10, 2006. http://www.corpwatch.org/article.php?id=13569.

[Following Katrina, Entergy threatened to leave New Orleans "quite literally in the dark" unless the federal government granted Entergy $718 million to help maintain and rebuild its storm-damaged infrastructure.

While the parent corporation Entergy Corp had prior year revenues of $10 billion and holds $29 billion in collective assets – which could comfortably cover storm losses and repairs – Entergy's subsidiary Entergy New Orleans LLC filed for bankruptcy weeks after the storm to protect its assets.

"According to a May 2004 report from the United States General Accounting Office (GAO), limited liability companies such as Entergy Corp resulted from the deregulation of the electricity industry in the 1990s. 'Like a partnership,' the report said, 'the profits are passed through and taxable to the owners ... like a corporation, it is a separate and distinct legal entity and the owners are insulated from personal liability for its debts and liabilities.'"

Entergy estimated its Katrina losses as over $1 billion and determined that its first duty was to protect its shareholders, not the population of New Orleans. Entergy spokesman {Morgan} "Stewart explained that each subsidiary is a 'separate business,' and that each company is 'protected from the burden' of picking up unexpected costs from the others."]

INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH (IEER): Smith, Brice, Insurmountable Risks: The Dangers of Using Nuclear Power to Combat Global Climate Change, Report of the Institute for Energy and Environmental Research, IEER Press (Takoma Park, Maryland) and RDR Books(Muskegon, Mich / Berkely, Calif), 2006. Link to full report (429 pages) at: http://ieer.org/resource/books/insurmountable-risks-dangers-nuclear/#download.

[Author Brice Smith, PhD, is a security and energy expert.

Climate change, catastrophic nuclear reactor accidents (or attacks), and nuclear war are the most serious vulnerabilities associated with the world's current energy system. The frequency and magnitude of many extreme climate events interact with the technological risks of nuclear, making nuclear power especially risky. See Executive Summary at: http://ieer.org/wp/wp-content/uploads/2006/05/InsurmountableRisksSummary.pdf..]

NUCLEAR REGULATORY COMMISSION: NRC Leak Task Force Report, 2006: NRC Liquid Radioactive Release Lessons Learned Task Force, Sep 1, 2006. http://pbadupws.nrc.gov/docs/ML0626/ML062650312.pdf.

2005

GOVERNMENT ACCOUNTABILITY OFFICE: NUCLEAR REGULATORY COMMISSION: Challenges Facing NRC in Effectively Carrying Out Its Mission, GAO-05-754T, May 26, 2005. http://www.gao.gov/assets/120/111727.pdf.

TIMES-PICAYUNE: Darce, Keith, Entergy New Orleans gets financing. Times-Picayune, Sep 26, 2005. http://www.nola.com/katrina/index.ssf/2005/09/entergy_new_orleans_gets_financing.html

[The Entergy Corp subsidiary Entergy New Orleans filed for Chapter 11 bankruptcy protection in Sep 2005.

Bank financing to Entergy New Orleans "isn't available now that Moody's Investors Service has downgraded the company's debt to junk status, utility attorneys said. ...Utility executives and lawyers described a company entrenched in a financial and physical crisis, its cash and bank credit lines dry, its customers displaced, its revenue flow nearly depleted and its power grid in the city severely damaged or destroyed."

Entergy Corp provided an emergency $100 million infusion to Entergy New Orleans as debtor in possession (DIP) financing at the rate of interest that the parent company obtains for its own financing in lending markets. The first payments are going to Con Edison and dozens of other "critical" contractor companies that supply equipment and services needed to repair Entergy's networks of electricity wires and gas pipelines damaged by Hurricane Katrina. One piping supplier is owed $478,632 for replacing underground gas lines that corroded after filling with flood water.

Entergy New Orleans may seek another $100 million from Entergy Corp., but the parent corporation is under no obligation to honor the requests.]

2003

GOVERNMENT ACCOUNTABILITY OFFICE: NUCLEAR REGULATION: NRC Needs More Effective Analysis to Ensure Accumulation of Funds to Decommission Nuclear Power Plants, GAO-04-32, Oct 30, 2003, Dec 1, 2003. http://www.gao.gov/products/GAO-04-32

[NRC analyses do not ensure there will be an adequate funds available for decommissioning US nuclear plants. The NRC does not directly monitor whether owners' actual contributions match their planned contributions. (p 12) Moreover, the NRC has not established criteria for taking action if it determines than an owner is not accumulating sufficient funds. (p 14)

"Without a more effective method for evaluating owners' decommissioning trust funds, and without criteria for responding to any unacceptable levels of financial assurance, NRC will not be able to effectively ensure that sufficient funds will be available when needed." (p 16)]

2002

SYNAPSE ENERGY ECONOMICS: Schlissel D, Peterson P, and Biewald B, Financial Insecurity: The Increasing Use of Limited Liability Companies and Multi-Tiered Holding Companies to Own Nuclear Power Plants, Report of Synapse Energy Economics, Cambridge, MA for STAR Foundation and Riverkeeper, Inc., Aug 7, 2002. http://www.riverkeeper.org/wp-content/uploads/2011/03/SYNAPS2.pdf.

[Report exposes how Limited Liability Companies (LLCs) are used by large nuclear energy firms to simultaneously maximize corporate profits and shield operators from liability. The allowance of such structures by the NRC allows such parent corporations to discard assets with impunity and shifts to the public responsibility for consequences that might ensue from financial failure, as well as the consequences of any major nuclear catastrophe.

A prime example of the risk to the public is the Indian Point nuclear plant in New York, where Entergy Corp has wrapped the nuclear installation in multiple levels of "shell" companies.]

2001

GENERAL ACCOUNTING OFFICE: Nuclear Regulation: NRC's Assurances of Decommissioning Funding During Utility Restructuring Could Be Improved, GAO-02-48, Dec 3, 2001. http://www.gao.gov/products/GAO-02-48.

[When new nuclear power owners proposed to continue relying on periodic deposits to external sinking funds, NRC review was not always rigorous enough to ensure adequate decommissioning funds. Financial Accounting Standards Board's financial reporting standard is not intended to, and will not, establish a legal requirement that these licensees set aside adequate funding for decommissioning.

Incomplete historical plant contamination data is among the factors confounding the ability to estimate future decommissioning costs. (p 37)

NRC's contamination cleanup standard is less stringent than the EPA standard. The EPA Administrator has called standards to be tightened to 15 millirems per year and for limiting the concentration of radiation in groundwater to 4 millirems per year, limits which would be consistent with EPA's standards for cleanup at Superfund sites. "NRC, however, shows no sign of changing its standards. NRC disagrees with EPA's preferences and questions EPA's technical basis for proposing the extra groundwater protection. Differences in agency missions, legislative mandates, and regulatory strategies contribute to this disagreement, which, despite resolution efforts spanning a number of years, remains essentially unresolved." (p 38) New York has a soil cleanup standard of 10 millirem for radioactive materials. (p 39)

Entombment of high level nuclear waste at reactor sites for periods of 100 years or more raises questions of institutional control, monitoring and surveillance and security. Potential property ownership changes at a site could also complicate the issue of financial responsibility should containment fail. (p 48)

Low level nuclear waste is also an issue. Despite 20 years of effort and the expenditure of about $600 million, no new regional disposal facilities have emerged. (p 48)

In past decades (before there were even record keeping requirements for burials or spills), "record-keeping was less than meticulous" and if site characterization does not begin until the latter stages of decommissioning, discovery of unexpected contamination may occur without adequate decommissioning funds left to cover the cost of cleanup. (p 50) For example, the Saxton reactor in Pa ceased operation in 1972, but full scale decommissioning did not begin for 26 years and the full extent of contamination was not realized until about 27 years after shutdown. (pp 50-51)]

14. Patricia Borchmann Supplemental Comments

From: Patricia Borchmann
Sent: Tuesday, March 24, 2015 2:57 PM
To: Sebrosky, Joseph; scott.burnel@nrc.gov; Benney, Kristen
Cc: Donna Gilmore; Patricia Borchmann
Subject: Re: Public Opposition - NRC White Paper - Fukishima Lessons Learned

Joseph Sebrosky,

I received your email from last night, in which you confirmed the public comment period for NRC's White Paper ended March 20, 2015. As understood, altho additional public comments may be submitted, NRC staff may not have time to consider additional comments received after that deadline, and there is no mandate requiring NRC to do so.

Since the NRC had already extended the public comment period one additional week already, (from March 13th, to March 20, 2015), your response is probably reasonable, since agencies must establish reasonable limits for consideration of public comments.

fyi, in my public comments dated 03 19 15, there was one additional flood related concern in my rough draft, which was later withdrawn from my final draft, for purpose of brevity. The omission consisted of my handwritten notes, which reflect the new emergency funding restrictions FEMA will apply, with regard to climate change impacts, including rising sea levels, and more extreme, and frequent storm intensity on a global scale. I now regret having chosen to omit this observation from my written comments dated 03 19 15.

My earlier handwritten draft contained comments about FEMA's vital role in flood hazard analysis, and the apparent gap between flood criteria applied by both federal agencies. This is the example pertaining to my earlier observations about White Paper's inconsistencies, since climate change impacts (rising sea levels) did not appear to have been used by NRC's senior analysts who prepared the White Paper. This inconsistency still seems of critical importance, and I am hopeful the same concern was already raised in other public comments NRC received before the March 20, 2015 deadline.

My earlier rough draft reflected the recent newspaper article(s) in mainstream national media about FEMA's warning, and alerted the public how any future claims for emergency funding to restore damage caused by flooding, would be rejected by FEMA, unless emergency plans for

communities reflected their response plans are consistent with newer global climate change constraints. So, I hope NRC will allow this single opportunity to expand my earlier written comments (dated 03 19 15), since this specific FEMA observation was also meant to be included as a specific example, to support my assertions that the White Paper contained a number of inconsistencies.

Thank you for consideration.

On Tue, Mar 24, 2015 at 5:39 AM, Sebrosky, Joseph <Joseph.Sebrosky@nrc.gov> wrote:

Ms. Borchmann,

The extended comment period for the subject white paper closed on March 20, 2015. The staff will consider Comments received after this date to the extent possible as it completes its assessment in this area.

Sincerely,

Joe Sebrosky
Senior Project Manager
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation
joseph.sebrosky@nrc.gov

From: Patricia Borchmann
Sent: Monday, March 23, 2015 6:32 PM
To: Sebrosky, Joseph
Cc: JLD_Public Resource; kotzalas.margie@nrc.gov; Benney, Kristen; majeed.fajr@nrc.gov; Donna Gilmore; Gibson, Lauren; Burnell, Scott; Bowman, Gregory; Patricia Borchmann

Subject: Re: Public Opposition - NRC White Paper - Fukishima Lessons Learned

Joseph Sebrosky,

Thank you for your email, confirming you received my comments, and responding with the two Nonconcurrences, (which seem related to flood hazard analysis methods) however your email indicated these are not within the scope of the White Paper, which this extended public comment period applies to.

I appreciate your email, which contained numerous other links to various NRC resources, that I was unfamiliar with . I have only had an opportunity to briefly skim them in their entirety so far, but hope to have more time this week to spend reviewing materials more throroughly. I hope to develop a better understanding of how these various approaches relate to each other, and how they will be applied in practice. It's far more complex than expected.

I only wish that during NRC earlier public review and comment periods, that I had been aware of these important undertakings, and could have become a more active participant during an

earlier phase.

Your email asserts the two Nonconcurrences are unrelated to the current NRC public review of the White Paper, Upon just a preliminary review of the Nonconcurrences (and supporting material)I cannot help but notice there still seems to be such extensive overlap, and important analytical factors that are relevant in flood/seismic hazard analysis, that it is difficult to, at this point disregard the Nonconcurrences, as I still think they are highly relevant, and should not be disregarded.

I wish to thank you for responding promptly, to confirm my comments were received, and providing links to so many other NRC resources. The email links you provided appear to be primarility associated with flood hazard analyses policies, practices, guidance memos, with information on updated (delayed) timeframe projections, for completion of NRC future rulemakings. Given the volume and complexity of this new material, I seek assurance on whether additional comments could be submitted within 30 days, regarding the Nonconcurrences, and the additional linked NRC resources ?

On Mon, Mar 23, 2015 at 5:31 AM, Sebrosky, Joseph <Joseph.Sebrosky@nrc.gov> wrote:

Ms. Borchmann,

Based on the review of your comments it appears that one of your concerns involves SUPERFLEX, which is not discussed in the paper for which we are seeking comment. The paper for which we are seeking comment can be found at:
http://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML15042A367

The paper was subject of a public meeting on 3/13/15. The meeting notice for this meeting can be found
at:http://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML15071A299

The slides for the public meeting can be found
at: http://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML15070A530

It appears that the two non-concurrences to which you are referring can be found in COMSECY-14-0037, "Integration of Mitigating Strategies for Beyond-Design Basis External Events and the Reevaluation of Flooding Hazards." The COMSECY is available at the following link:
http://www.nrc.gov/reading-rm/doc-collections/commission/comm-secy/2014/2014-0037comscy.pdf

Enclosure 3 and 4 of this COMSECY discuss the non-concurrences received on this document.

Sincerely,
Joe Sebrosky
Senior Project Manager
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation
joseph.sebrosky@nrc.gov

As discussed in the announcement associated with the meeting, the staff stated that it would also accept comments via email and that such comments would be considered if they were provided by March 13, 2015. During the meeting a stakeholder requested an extension of the date for providing email comments to March 20, 2015. The staff stated in the meeting that it would revise the date for email comments, such that comments received by March 20, 2015, would be considered in the revision to the staff's preliminary assessment. Enclosure 3 provides a listing of the email comments.

The staff intends to address the comments found in Enclosures 2 and 3 as part of the revised assessment that will be provided to the Commission. To this end, the comments found in Enclosure 2 were assigned a number to allow stakeholders to better determine how their comments are addressed in the assessment that will be provided to the Commission at a later date.

Enclosures:

1. List of Attendees
2. Public Comments Received During the Meeting
3. Emails Comments Received Associated with the Staff's Preliminary Assessment on the Applicability of Fukushima Lessons Learned to Facilities Other than Operating Power Reactors

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ADAMS Accession No.: ML15077A410 *concurrence via email

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