



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001

ACRSR-2238

March 14, 2007

MEMORANDUM TO: Luis A. Reyes  
Executive Director for Operations  
**/RA/**

FROM: Frank Gillespie, Executive Director  
Advisory Committee on Reactor Safeguards

SUBJECT: COMMENTS REGARDING STAFF REVIEW OF THERMAL-  
HYDRAULIC METHODOLOGIES

On February 22 and 23, 2007, Dr. Sanjoy Bannerjee, a member of the Advisory Committee on Reactor Safeguards (ACRS), received the attached emails from Ms. Carmen DeLong which relate to the NRC staff practices in evaluating thermal-hydraulic methods for nuclear reactors. Subsequently, on February 28, 2007, Mr. Cayetano Santos, the Acting Chief of the ACRS Technical Support Branch, responded to Ms. DeLong's request concerning Dr. Bannerjee's views of draft regulatory guide DG-1145, "Combined License Applications for Nuclear Power Plants." We believe that the remaining issues discussed in these emails are more appropriately the province of the staff, and we are therefore forwarding the letter to you for any possible action. The Committee would like to be informed of your disposition of this matter.

Attachments:

1. Email from Dr. Sanjoy Bannerjee dated February 22, 2007
2. Email from Dr. Sanjoy Bannerjee dated February 23, 2007
3. Email from Cayetano Santos dated February 28, 2007
4. Email from Carmen DeLong dated February 23, 2007

cc w/atts.:

A. Vietti-Cook, SECY	F. Eltawila, RES
M. Johnson, OEDO	W. Burton, RES
G. Mulley, OIG	J. Lamb, OEDO
T. Martin, NRR	J. Wermiel, NRR
W. Reckley, NRR	S. (Min) Lee, NRR
R. Assa, RES	R. Landry, NRR
A. Mendiola, NRR	

**From:** "banerjee" <banerjee@engineering.ucsb.edu>  
**To:** " DeLong, Carmen " <delongc@p2s.com>  
**Date:** 02/22/2007 7:29:10 PM  
**Subject:** Re: DG-1145

Dear Carmen,

Sorry for the delay in replying and also for not returning your call of today. I have been on travel and will be leaving again on Monday. In view of my crazy schedule over the next few days I have passed on your remarks to NRC staff for a response. I will of course follow up when I am at the NRC next week.

In the mean time, many thanks for your interest in these important matters.

Sincerely,

Sanjoy Banerjee

On 8:42:38 am 02/20/07 "DeLong, Carmen" <delongc@p2s.com> wrote:

>  
> DG-1145  
> Dear Dr. Banerjee,  
> I apologize if this note seems odd. Allow me to introduce myself. My  
> name is Carmen DeLong, I have been a nuclear energy/engineering  
> enthusiast since I was 13 and read an article in Omni Magazine about  
> nuclear fussion. I wrote a school paper about it, and shared my  
> enthusiasm with my Father. Later, I studied Nuclear Engineering at the  
> University of Tennessee at Knoxville, where my Engineering Economy  
> professor was Dr. Tyler Kress&#8230;name sound familiar? He is Dr.  
> Thomas Kress' son. Do you know him? He serves on the ACRS with you.  
> He lives about 2 miles from me here in Oak Ridge. Small world, his  
> grandchildren go to Jefferson Middle School with my daughter,  
> Christina. Anyway, I am writing to you because I am particularly  
> interested in learning your comments to the Staff about Chapter 15.  
> They did not discuss your comments at the Nov. 30, 2006 ACRS  
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> have with Chapter 15. I have my own comments that are related to the  
> overall review process. I am a bit concerned with the methods in place  
> for performing reviews of LOCAs and associated Thermal-hydraulics (T/H)  
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> MCNP or SCALE without doing a trial sanity check on a few selected  
> figures. I have a self imposed practice of performing a few hand calcs  
> (generated in a spreadsheet) of Keff (I mean, it's simply a matter of  
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> and/or MCNP. There have been instances where the results differed, and  
> each time it was due to something that the code could not consider,  
> mostly either a geometry issue or a wrong cross section value, etc.. A  
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> correctly. I am sure you can appreciate the implications of such a  
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<http://www.nrc.gov/reading-rm/doc-collections/reg-guides/power-reactors/active/>  
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> website: www.p2s.com

**CC:** <FPG@nrc.gov>, <[rxo@nrc.gov](mailto:rxo@nrc.gov)>

**From:** "banerjee" <banerjee@engineering.ucsb.edu>  
**To:** " DeLong, Carmen " <delongc@p2s.com>  
**Date:** 02/23/2007 12:24:33 PM  
**Subject:** RE: DG-1145

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Unfortunately I will be in Europe at the time of the NRC meeting in March, but suggest you be in touch with ACRS member Prof. Graham Wallis (graham.b.wallis@dartmouth.edu), the previous Chair of the ACRS as well as the previous Chair of the Thermalhydraulics Phenomena Subcommittee.

Again, many thanks for your interest and please feel free to remain in touch. I am only sorry that I am not able to respond more expeditiously.

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Sanjoy Banerjee

On 5:55:23 am 02/23/07 "DeLong, Carmen" <delongc@p2s.com> wrote:

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> -----Original Message-----  
> From: banerjee [mailto:banerjee@engineering.ucsb.edu]  
> Sent: Thursday, February 22, 2007 7:28 PM  
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> Subject: Re: DG-1145  
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**From:** Cayetano Santos  
**To:** delongc@p2s.com  
**Date:** 02/28/2007 2:32:55 PM

Ms. DeLong,

My name is Cayetano Santos, I am the Acting Branch Chief for the technical support staff for the Advisory Committee on Reactor Safeguards (ACRS). I understand that you have contacted Dr. Sanjoy Banerjee, an ACRS member, requesting his comments on DG 1145 (Combined License Applications for Nuclear Power Plants). Since the ACRS is a collegial body it would be inappropriate for Dr. Banerjee to provide his individual views on an issue that was reviewed by the Committee. The Committee's recommendations regarding DG 1145 are documented in a December 12, 2006 letter from Graham B. Wallis, Chairman, ACRS to Dale E. Klein, Chairman, NRC.

Your emails to Dr. Banerjee also expressed concerns regarding thermal-hydraulic codes. These concerns are best addressed by the Office of Nuclear Reactor Regulation and/or the Office of Nuclear Regulatory Research. Therefore, we plan to forward your emails to Luis Reyes, Executive Director for Operations, NRC, for appropriate action.

Cayetano Santos Jr.

**CC:** Frank Gillespie; Ralph Caruso; Sanjoy Banerjee

**ATTACHMENT 3**

**From:** "DeLong, Carmen" <delongc@p2s.com>  
**To:** <banerjee@engineering.ucsb.edu>  
**Date:** 02/23/2007 1:34:05 PM  
**Subject:** RE: DG-1145

Dear Dr. Banerjee,

Thank you very much for replying and making the introduction to such distinguished Gentlemen, it is an honor to have this exchange with all of you.

I will be brief as I realize you are busy, but I just wanted to let you know that I just returned from ORNL where I obtained the manuals for RELAP5 and TRACPF-1, MOD2, which are the codes TRACE is borne of. I will be reviewing them against Vols. 1 and 2 of TRACE...it can't hurt to have an extra set of eyes looking at it. If you like, I will let you know if I find anything out of sort.

In the meantime, I hope you enjoy your travels to Europe, but Santa Barbara is quite lovely too. Last October I took my daughter (now 14) to UC San Diego in La Jolla to meet Dr. Jean Ferrante, Assoc. Dean of Engineering. We found it an absolutely breathtaking place, and we like the fact they are doing fusion research. We plan on visiting UCSB next.

Carmen DeLong  
Project Manager

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> > of Keff (I mean, it's simply a matter of understanding the 6-factor  
> > formula, and  $I = I_0 \cdot e^{-\Sigma x}$  shielding equation) and comparing them to  
> > the results I would obtain from running SCALE and/or MCNP. There  
> > have been instances where the results differed, and each time it was  
> > due to something that the code could not consider, mostly either a  
> > geometry issue or a wrong cross section value, etc.. A code is only  
> > as good as the user's ability to understand it and use it correctly.  
> > I am sure you can appreciate the implications of such a problem,  
> > particularly when it involves neutrons and safety. I fear the same  
> > applies to RELAP-5 and TRACG. I realize that the staffers have  
> > performed extensive reviews of the T/H codes, like TRACG, typically  
> > developed by the licensee (I think GE designed it for the ESBWR),  
> > but by what method? Did they do as I do, a sanity check with a few  
> > hand calcs? I strongly feel that performing a few hand calcs to  
> > verify the code should be a requirement. I have found huge gaps in  
> > the guidance on this issue. I see this as a serious problem for the  
> > licensee and the reviewer alike. Here are some specific comments I  
> > have with respect to the way that DG-1145 guides the potential  
> > reviewer on this issue: Let us say that I have a COL application  
> > referencing the certified design of the AP-1000, but the Emergency  
> > Core Cooling System (ECCS) is a new design so it needs to be  
> > reviewed against the SRP, CFRs, reg. guides. I'm tasked with LOCAs  
> > Resulting from Spectrum Postulated Piping Breaks Within the Reactor  
> > Coolant Pressure Boundary. So I go to SRP 15.6.5 to start my review:  
> > [http://adamswebsearch2.nrc.gov/idmws/doccontent.dll?library=PU\\_ADAMS](http://adamswebsearch2.nrc.gov/idmws/doccontent.dll?library=PU_ADAMS)  
> > ^P  
> > BNTAD01&ID=052730359:1

> > So now I'm moving right along, checking acceptance criteria, etc.  
> > when I get to page 5 of 24 and I read that Reg Guide 1.157 provides  
> > guidance on acceptable evaluation models. Now, I've had Heat  
> > Transfer and Fluid Mechanics in the Nuclear Engineering curriculum,  
> > so I am pretty confident I can look at the models and make sure the  
> > numbers are right by running them on my own model. But I must  
> > follow guidance on the reviews so I go to look up Reg. Guide 1.157:  
> >

<http://www.nrc.gov/reading-rm/doc-collections/reg-guides/power-reactors/active>

/ and I scroll down the page looking for Reg Guide 1.157. There is a link through the accession number, so I click on it: Best-Estimate Calculations of Emergency Core Cooling System Performance (ML003739584) (Draft RS 701-4 published 03/1987). And I find a document that has been scanned in from black print, so there's no document that lies behind it. Also, the format is such that the columns are blended together, which makes for a very tough reading experience. I see no formulas to refer to if I wanted to do a sanity check on the applicant's values, and the references at the bottom of the document require an act of congress to find.

> >

>

> > Am I missing something here? Is there another process the reviewer  
> > would follow to get the right information needed for an adequate and  
> > thorough review? Do you agree that, for the sake of safety, the  
> > reviewer and preparer should be required to show a sanity check on  
> > the codes with a hand calc (can be done on a spreadsheet) and that  
> > there should be guidance on how to do this, what formulas to use,  
> > what limiting factors to observe, etc., etc.? I strongly believe  
> > that the inherent risks of not doing so are too great. I apologize  
> > for the long-winded explanation, and I look forward with great  
> > anticipation to your comments.

> > Carmen DeLong

> > Project Manager

> >

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March 14, 2007

MEMORANDUM TO: Luis A. Reyes  
Executive Director for Operations

FROM: Frank Gillespie, Executive Director **/RA/**  
Advisory Committee on Reactor Safeguards

SUBJECT: COMMENTS REGARDING STAFF REVIEW OF THERMAL-  
HYDRAULIC METHODOLOGIES

On February 22 and 23, 2007, Dr. Sanjoy Bannerjee, a member of the Advisory Committee on Reactor Safeguards (ACRS), received the attached emails from Ms. Carmen DeLong which relate to the NRC staff practices in evaluating thermal-hydraulic methods for nuclear reactors. Subsequently, on February 28, 2007, Mr. Cayetano Santos, the Acting Chief of the ACRS Technical Support Branch, responded to Ms. DeLong's request concerning Dr. Bannerjee's views of draft regulatory guide DG-1145, "Combined License Applications for Nuclear Power Plants." We believe that the remaining issues discussed in these emails are more appropriately the province of the staff, and we are therefore forwarding the letter to you for any possible action. The Committee would like to be informed of your disposition of this matter.

Attachments:

1. Email from Dr. Sanjoy Bannerjee dated February 22, 2007
2. Email from Dr. Sanjoy Bannerjee dated February 23, 2007
3. Email from Cayetano Santos dated February 28, 2007
4. Email from Carmen DeLong dated February 23, 2007

cc w/atts.:

A. Vietti-Cook, SECY	F. Eltawila, RES
M. Johnson, OEDO	W. Burton, RES
G. Mulley, OIG	J. Lamb, OEDO
T. Martin, NRR	J. Wermiel, NRR
W. Reckley, NRR	S. (Min) Lee, NRR
R. Assa, RES	R. Landry, NRR
A. Mendiola, NRR	

**DOCUMENT NAME:** C:\FileNet\ML070740683.wpd

<b>OFC</b>	ACRS	ACRS	ACRS
<b>NAME</b>	RCaruso	CSantos	FGillespie
<b>DATE</b>	3/14/07	3/14/07	3/14/07

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