

Coyne, Kevin

From: Wong, See-Meng
Sent: Thursday, May 29, 2014 2:59 PM
To: Jim Riccio; timj@nirs.org
Cc: Weerakkody, Sunil; Vaughn, Stephen; Coyne, Kevin
Subject: FW: ML14148A459. Summary of Public Meeting Held on May 19, 2014 to Discuss Issues Related to Risk Assessment Methods...

Jim, Tim,

Attached is the link to access the "Summary of Public Meeting Held On May 19, 2014 To Discuss Issues Related to Risk Assessment Methods Used in the NRC Significance Determination Process," that is now publicly available. We want to thank you and Tim for participating in this important NRC public meeting. We, NRC staff, appreciate your comments on the NRC regulatory processes to assure nuclear safety in our U.S. nuclear power plants. Once again, thank you.

See Meng Wong
Senior Reactor Analyst
Office of Nuclear Reactor Regulation
U.S. Nuclear regulatory Commission
Tel: 301 415 1225

From: Chavarria, Jennifer
Sent: Thursday, May 29, 2014 2:29 PM
To: RidsNrrDra Resource; RidsNrrDraAphb Resource; NRR_DRA_APOB Distribution; Coyne, Kevin; Vaughn, Stephen; Nakoski, John
Subject: ML14148A459. Summary of Public Meeting Held on May 19, 2014 to Discuss Issues Related to Risk Assessment Methods...

Good Afternoon,

Package dated May 29, 2014, is now an official agency record.

[View ADAMS P8 Properties ML14148A459](#)

[Open ADAMS P8 Package \(Summary of Public Meeting Held On May 19, 2014 To Discuss Issues Related to Risk Assessment Methods Used in the NRC Significance Determination Process.\)](#)

Sincerely,
Jennifer Chavarria

Contract Administrative Assistant
U.S. Nuclear Regulatory Commission
NRR/DRA, Location: O-10H4
Main: 301-415-2884 Direct: 301-415-1136
Jennifer.Chavarria@nrc.gov

Coyne, Kevin

From: ANDERSON, Victoria <vka@nei.org>
Sent: Tuesday, May 27, 2014 2:24 PM
To: Wong, See-Meng; roy.linthicum@exeloncorp.com
Cc: Weerakkody, Sunil; Coyne, Kevin; Ng, Ching
Subject: RE: Draft Summary of NRC Public Meeting on May 19, 2014

Thank you, we have no further comments.

From: Wong, See-Meng [mailto:See-Meng.Wong@nrc.gov]
Sent: Tuesday, May 27, 2014 1:30 PM
To: ANDERSON, Victoria; roy.linthicum@exeloncorp.com
Cc: Weerakkody, Sunil; Coyne, Kevin; Ng, Ching
Subject: RE: Draft Summary of NRC Public Meeting on May 19, 2014

Victoria,

Per your clarifications, I have revised (redlined) the draft May 19, 2014 Public Meeting Summary in consultation with other NRC staff. Please let me know if you have any other concerns. Thanks for your help.

See Meng.

From: ANDERSON, Victoria [mailto:vka@nei.org]
Sent: Friday, May 23, 2014 4:39 PM
To: Wong, See-Meng; roy.linthicum@exeloncorp.com
Cc: Weerakkody, Sunil; Coyne, Kevin; Ng, Ching
Subject: RE: Draft Summary of NRC Public Meeting on May 19, 2014

Hi See Meng,

I have three clarifications:

-Mary Presley works for EPRI, not NEI.

-Under the discussion regarding use of licensee models in SDP, the following is noted: "NRC staff reminded the meeting participants that this proposal had been discussed in the 2006-2007 timeframe, and NRC had responded to NEI and the industry at that time expressing the agency's view of maintaining the independence of NRC's SPAR models for regulatory assessment of licensee performance."

This is not exactly accurate, as we were discussing a new proposal made via the ROP in early 2014

-The 2nd action item is stated as: "The NRC staff maintains the view that NRC's SPAR models are independent tools for regulatory assessment of licensee performance."

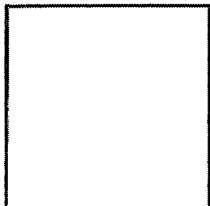
My recollection was that there would be feedback and further discussion through the ROP meetings.

From: Wong, See-Meng [mailto:See-Meng.Wong@nrc.gov]
Sent: Friday, May 23, 2014 4:30 PM
To: ANDERSON, Victoria; roy.linthicum@exeloncorp.com
Cc: Weerakkody, Sunil; Coyne, Kevin; Ng, Ching
Subject: Draft Summary of NRC Public Meeting on May 19, 2014

Victoria, Roy,

Attached is a draft summary of minutes of the May 19, 2014 NRC Public Meeting. Please review the contents and list of industry participants, and provide comments before we issue this document as final in ADAMS. We intend to issue this document no later than Wednesday, May 28, 2014. Thanks for your participation in the public meeting.

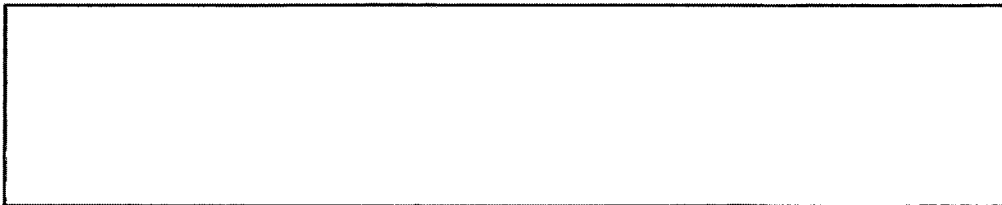
See Meng.



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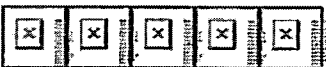
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Sent through mail.messaging.microsoft.com

May 22, 2014

MEMORANDUM TO: Sunil D. Weerakkody, Chief */RA/*
PRA Operations and Human Factors Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

FROM: See-Meng Wong, Senior Reactor Analyst
PRA Operations and Human Factors Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF PUBLIC MEETING HELD ON MAY 19, 2014 TO
DISCUSS ISSUES RELATED TO RISK ASSESSMENT
METHODS USED IN THE NRC SIGNIFICANT
DETERMINATION PROCESS

On May 19, 2014, the U.S. Nuclear Regulatory Commission (NRC) held a Category 2 public meeting to discuss specific issues related to risk assessment methods used in the NRC Significance Determination Process (SDP) with industry stakeholders and interested members of the public. The attendance list, meeting agenda and presentation slides are included in the enclosure to this summary.

Summary of Meeting

The purpose of the meeting was to hear comments from interested industry stakeholders and members of the public on specific issues related to the risk assessment methods in SDP. The meeting announcement can be found under ADAMS accession number ML13351A115.

The public meeting commenced with an NRC staff presentation summarizing the rules of engagement and fundamental attributes of the Significant Determination Process (ADAMS Accession No. ML14141A361). The staff indicated that Inspection Manual Chapter 0308 Attachment 3 provided the technical basis of the SDP (ADAMS Accession No. ML062890430). The staff also pointed out that the SDP is an NRC process and IMC 0308 Attachment 3 delineated the rules of engagement with external stakeholder participation in SDP development and its changes. NRC staff from the Office of Nuclear Regulatory Research also provided the staff's perspective in using plant-specific Standardized Plant Analysis Risk (SPAR) models in SDP assessments (ADAMS Accession No. ML14141A419).

CONTACT: See-Meng Wong, NRR/DRA Ching Ng, NRR/DRA

The NRC staff received feedback from the Pressurized Water Reactor Owners Group (PWROG), the Nuclear Energy Institute (NEI), and the public interest groups on issues related to the risk assessment methods in SDP. Mr. Roy Linthicum, PWROG, provided a presentation entitled: "Initiating Event SDP White Paper" (ADAMS Accession No. ML14141A425). Ms. Victoria Anderson, NEI and Mr. Anil Julka, NextEra, jointly provided an NEI presentation entitled: "Use of Licensee PRA Models in SDP Assessments" (ADAMS Accession No. ML14141A369). Ms. Mary Pressley, NEI, provided the NEI presentation entitled: "Joint Human Error Probability for the Significance Determination Process" (ADAMS Accession No. ML14141A422).

The main discussions between NRC staff and industry participants are summarized below:

1) Use of Conditional Core Damage Probability (CCDP) in SDP Assessments

The PWROG asserted the industry position that SDP methods are inappropriate for evaluating licensee performance deficiencies that caused initiating events, and there is no consensus on the approach to convert initiating event CCDP to the delta core damage frequency (CDF) as the metric for SDP assessments. The PWROG further asserted that the use of the CCDP metric in SDP assessments is a policy issue outside the scope of the PWROG effort. However, the PWROG agrees that Bayesian updating methods for evaluating initiating event significance are not appropriate or consistent with SDP methodology. The NRC staff will evaluate this industry feedback to support the work in future revisions of NRC guidance documents such as Inspection Manual Chapter (IMC) 308 and the Risk Assessment Standardization Project (RASP) Handbook.

2) Use of Licensee PRA Models in SDP Assessments

NRC staff from the Office of Nuclear Regulatory Research (RES) provided a presentation entitled: "Perspectives on the NRC's Standardized Plant Analysis Risk (SPAR) Models." This presentation lays out the uses and capabilities of SPAR models for SDP assessments, the modeling philosophy of SPAR model structure, and the quality assurance activities and processes to assure the high quality of SPAR models used in all NRC risk-informed regulatory applications. NEI and industry representatives provided the overview of an industry proposal to use licensee PRA models in SDP assessments. The industry proposal discussed the advantages of using licensee PRA models and the better focus on resources and efforts on evaluating safety significant findings. NRC staff clarified reminded the meeting participants that a previous NEI letter on the proposal to use licensee PRAs for SDP had been discussed in the 2006-2007 timeframe (ADAMS Accession Nos. ML072290362, ML072490566). NRC had responded to NEI and the industry at that time expressing the agency's view of maintaining the independence of NRC's SPAR models for regulatory assessment of licensee performance (ADAMS Accessions No. ML 072490540, ML072490566). The current NEI/industry proposal contains some recommendations considered to be different from the 2007 NEI letter; specifically, that plant licensees conduct the analysis of record for SDP assessments. NRC staff may discuss these suggestions in future ROP meetings if there are merits to specific recommendations in the NEI/industry proposal.

3) Minimum Joint Human Error Probability (HEP) Threshold for Dependent Human Failure Events

Ms. Mary Pressley, EPRI, provided the NEI presentation entitled: "Joint Human Error Probability for the Significance Determination Process." This was an update of industry efforts in this subject area, and more discussions will be held in additional public meetings to achieve a better understanding of the technical issues.

As noted above, the action items for the topics discussed at this meeting are:

- 1) The NRC staff will evaluate industry feedback to support the work in future revisions of NRC guidance documents such as Inspection Manual Chapter (IMC) 308 and the Risk Assessment Standardization Project (RASP) Handbook. The staff will inform NRC management on the industry position that the use of CDDP metric in SDP assessments is a policy issue.
- 2) The NRC staff maintains the view that NRC's SPAR models are independent tools for regulatory assessment of licensee performance. NRC staff may continue discussion of the NEI/industry proposal to use licensee PRA models for SDP assessments in future ROP meetings if there are merits.

Mr. James Riccio, Greenpeace and Mr. Tim Judson, NIRS provided comments on the NRC regulatory processes during discussions on the three topics throughout the public meeting.

No public comment feedback forms were received after the meeting.

Enclosure:

1. Attendance List
2. Agenda
3. Meeting Presentation slides

S. Weerakkody

3

3) Minimum Joint Human Error Probability (HEP) Threshold for Dependent Human Failure Events

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**Public Meeting on to Discuss Risk Assessment Issues in the Significance Determination
Process**

**May 19, 2014
List of Participants**

NRC STAFF

Sunil Weerakkody
John Nakoski
Kevin Coyne
See Meng Wong
Jeffrey Mitman
Jeff Circle
Fernando Ferrante
Dan Merzke
Stephen Vaughn
Michelle Kichline
Chris Cahill
Jonathan DeJesus
John Hanna
Richard Deese
Keith Tetter
David Aird
Dale Yeilding
Wayne Schmidt
Michael Montecalvo
Ching Ng
Michelle Gonzalez
Peter Appignani*
Donald Helton*

OTHER

Victoria Anderson	NEI
Roy Linthicum	PWROG
Jim Riccio	Greenpeace
Gene Kelly	Exelon Nuclear
Anil Julka	Nextera Energy
Tim Judson	NIRS
Mary Presley	EPRI
Zhiping Li*	Callaway Energy Center
Kevin Schoolcraft*	Callaway Energy Center
Michael Calley*	INL
Curtis Smith*	INL
John Conly*	Certrec
Allen Shirelle*	Duke Energy Corporation
Sarah Zafar*	ERIN
Elijah DeV Vaughn*	Southern Nuclear
Jason Hall*	Entergy

Enclosure

Adrienne Driver*	Duke Energy
Marv Lewis*	public

*Participation via teleconference

MEETING AGENDA

<u>TIME</u>	<u>TOPIC</u>	<u>LEAD</u>
1:00 – 1:10 p.m.	Introduction and Opening Remarks	NRC
1:10 – 1:30 p.m.	Initiating Event SDP White Paper	NEI/PWROG
1:30 – 2:30 p.m.	Discussion	All
2:30 – 2:45 p.m.	Break	
2:45 – 3:15 p.m.	Perspectives on SPAR Models	NRC
3:15 – 3:45 p.m.	Use of Licensee PRA Models in SDP Assessments	NEI
3:45 – 4:15 p.m.	Discussion	All
4:15 – 4:30 p.m.	Update on Minimum HEP Threshold for Dependent Human Failure Events	NEI
4:30 – 4:50 p.m.	Perspectives from Public Interest Groups	Greenpeace
4:50 – 5:00 p.m.	Closing Remarks	NRC

Reference Materials

1. PWROG Paper, "Initiating Event SDP White Paper – Draft." (Agencywide Documents and Management System (ADAMS) Accession No. ML14125A070).
2. NRC White Paper, "Modeling the Safety Significance of Findings that are the Proximate Cause of an Initiating Event Occurrence and a Framework for Defining the Threshold for Causality to Support the Significance Determination Process (SDP)." (ADAMS Accession No. ML14080A051).
3. NEI White Paper, "Proposal for Use of Licensee PRA Models in the Significance Determination Process." (ADAMS Accession No. ML14106A571, ML14107A083)
4. M. Fertel, NEI Letter, "Followup to August 2 Commission Briefing on Risk-Informed Regulation," August 2007. (ADAMS Accession Nos. ML 072290362, ML072490566)
5. L. Reyes, NRC EDO Letter, "Response to NEI Letter, M. Fertel," October 2007. (ADAMS Accession Nos. ML 072490540, ML072490566).

Meeting Presentation Slides

1. See-Meng Wong, NRC, "Meeting Objective"
2. Roy Linthicum, PWROG, "Initiating Event SDP White Paper"
3. Kevin Coyne, NRC, "Perspectives on the NRC's Standardized plant Analysis Risk Models"
4. Victoria Anderson and Anil Julka, NEI, "Use of Licensee PRA Models in SDP Assessments"
5. Mary Presley, EPRI, "Industry Efforts on Addressing Minimum Joint Human Error "

Coyne, Kevin

From: Wong, See-Meng
Sent: Tuesday, May 27, 2014 1:15 PM
To: Coyne, Kevin
Subject: RE: Draft Summary of NRC Public Meeting on May 19, 2014

I send the draft to NEI so that there are no complaints from them. I will forward the final meeting summary to Jim Riccio & Tim Judson to acknowledge their participation in the meeting. Thanks again.

From: Coyne, Kevin
Sent: Tuesday, May 27, 2014 12:01 PM
To: Wong, See-Meng
Subject: RE: Draft Summary of NRC Public Meeting on May 19, 2014

No problem with the current draft. Is sending the draft to NEI part of the normal process? Are you also going to forward the draft to the invited Greenpeace participant for review and comment? I noticed that the summary does not include any summation of Riccio's comments – should we at least have a sentence that acknowledges he provided some remarks?

Kevin

From: Wong, See-Meng
Sent: Tuesday, May 27, 2014 11:09 AM
To: Coyne, Kevin
Subject: RE: Draft Summary of NRC Public Meeting on May 19, 2014

Kevin,

Thanks for your comments. I have made a minor revision to clarify the difference in the current NEI proposal. I am trying to kill this NEI/industry proposal in a nice way, without saying more than is needed. Yes, I have avoided making commitments, and my next action in the next ROP is to inform NEI of our response in a letter that says "no thanks." If you have no further objections, I will forward the redlined draft to Victoria Anderson.

See Meng.

From: Coyne, Kevin
Sent: Tuesday, May 27, 2014 10:18 AM
To: Wong, See-Meng
Subject: RE: Draft Summary of NRC Public Meeting on May 19, 2014

See-Meng –

Thanks for the chance to offer a view point on this. While Victoria Anderson may have indicated that the "new" proposal is different than the one from 2007, the only thing that seems to be materially different is the proposal for the licensees to conduct the analysis of record for the SDP. So this certainly does change one of the basis points from the 2007 timeframe (e.g., the need for our staff to learn multiple code platforms and become familiar with all licensee models), but it is in direct contradiction to our main point about independence. Anyway, I would highlight that the main difference between this new proposal and the previous one is that NEI believes that the SDP analysis of record should be conducted by the licensees. I think this gives you an opening to bring up the points about the importance of maintaining an independent process and also note that the Greenpeace stressed the importance of the NRC being independent on this process. This

can help us set up a dialogue that focuses not one which model is better than the other (which will likely never be resolved to the satisfaction of industry) but instead on the importance of an NRC independence for SDP evaluations. Nothing that the industry or NEI brought forward talked about how the issue of independence (both actual and perceived) is addressed nor how it would address the biggest issue of all which is the differences in key engineering assumptions that underlie the analysis (hra, functionality, exposure time, ccf, etc.). I'll note that the industry stressed the issue of RG 1.200 peer reviews for the licensee models, but I don't believe the quality issue of licensee models was ever really a major point for the staff on using SPAR models for the SDP back in 2007 (so this isn't really a change...).

Contrary to Victoria's comment, I also don't remember to the NRC committing to follow-up meetings on this topic – but I think you have handled this well in the summary with the "If there are merits.." line. I guess we did commit to some form of formal response, but this could be as simple as a letter to NEI with a "thanks, but no thanks" position if our management would support it.

Hope this is enough to work with, if not give me a call.

Good job with the meeting by the way –

Kevin

From: Wong, See-Meng
Sent: Tuesday, May 27, 2014 10:03 AM
To: Coyne, Kevin
Subject: FW: Draft Summary of NRC Public Meeting on May 19, 2014

Kevin,

Attached are my revised statements in the draft public meeting summary, per NEI's comments. Please review and let me know if this is OK. Thanks.

See Meng.

From: ANDERSON, Victoria [<mailto:vka@nei.org>]
Sent: Friday, May 23, 2014 4:39 PM
To: Wong, See-Meng; roy.linthicum@exeloncorp.com
Cc: Weerakkody, Sunil; Coyne, Kevin; Ng, Ching
Subject: RE: Draft Summary of NRC Public Meeting on May 19, 2014

Hi See Meng,

I have three clarifications:

-Mary Presley works for EPRI, not NEI.

-Under the discussion regarding use of licensee models in SDP, the following is noted: "NRC staff reminded the meeting participants that this proposal had been discussed in the 2006-2007 timeframe, and NRC had responded to NEI and the industry at that time expressing the agency's view of maintaining the independence of NRC's SPAR models for regulatory assessment of licensee performance."

This is not exactly accurate, as we were discussing a new proposal made via the ROP in early 2014

-The 2nd action item is stated as: "The NRC staff maintains the view that NRC's SPAR models are independent tools for regulatory assessment of licensee performance."

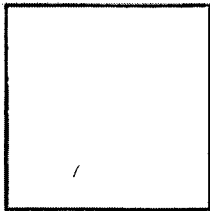
My recollection was that there would be feedback and further discussion through the ROP meetings.

From: Wong, See-Meng [<mailto:See-Meng.Wong@nrc.gov>]
Sent: Friday, May 23, 2014 4:30 PM
To: ANDERSON, Victoria; roy.linthicum@exeloncorp.com
Cc: Weerakkody, Sunil; Coyne, Kevin; Ng, Ching
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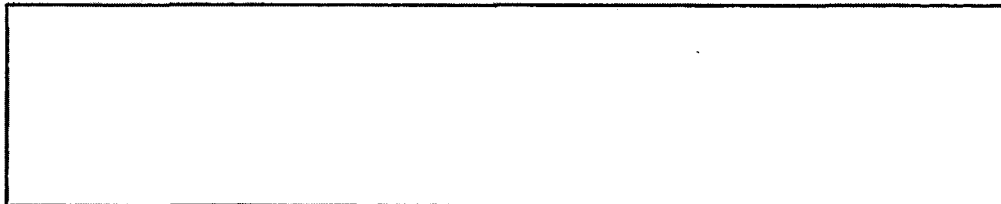
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Coyne, Kevin

From: Coyne, Kevin
Sent: Wednesday, May 27, 2015 9:13 AM
To: Weerakkody, Sunil
Subject: RE: do not forward - factsheetC.docx
Attachments: factsheetC_coyne.docx

Sunil –

Thank you for sharing your briefing notes on the use of SPAR models by NRR. Please see attached suggested revisions and comments. Just a note to keep in mind, the SPAR models were initially developed to support the RES ASP program (which in turn supports a key metric in our performance budget) – even if NRR made a decision to not use SPAR models for the ROP, it is possible that RES would still want an independent PRA tool to support ASP, system studies, generic issue screening, etc. (in fact, I think this would be even more essential if the reactor oversight process were biased by the use of licensee risk assessments). So, the cost savings for use of licensee models for the sdp may not come to fruition.

Let me know if you would like to discuss further –

Kevin

From: Weerakkody, Sunil
Sent: Tuesday, May 26, 2015 3:43 PM
To: Coyne, Kevin
Subject: do not forward - factsheetC.docx
Importance: High

Kevin,

I want to keep this at the level-of-detail provided here. Appreciate your thoughts/comments. The only reason that I request you not forward is (a) once you review, I don't think we'll miss any high-level issues, and (b) I don't undue expenditure of staff energy.

Once I incorporate your comments, I'll share with Joe/Rich.

Sunil D Weerakkody, Chief
PRA Operations & Human Factors Branch
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission

Address: Mail Stop O-10 C-15, US NRC, Washington DC 20005-0001

Tel: 301-415-2870

Black Berry: (b)(6)

Background

NRR uses Standardized Plant Analysis Risk (SPAR) Models in support of various oversight, licensing, and rulemaking activities as articulated below:

Oversight:

- ROP: SPAR models support significance determination process (SDP) assessments without relying on completely reliance on licensee's models or risk assessments. The SPAR models also support inspection planning and are used to develop Plant Risk Information eBooks (PRIBs).
- Incidence Response: Provides regional SRAs the capability to advise regional management on agency response (MD 8.3) without relying completely on reliance on licensee's models or risk assessments
- NOED: SPAR models Enables agency staff to use make risk-informed NOED decisions within a very short period without relying on risk assessment results provided by the licensee
- Provide technical bases for EGMs (e.g., tornado missile EGM)

Commented [kxc51]: Spell out

Licensing:

- We do not (or rarely use) SPAR models to review risk-informed licensing actions.
 - o Staff has the ability to rely on the RAI process and audits.
 - o Staff requires that licensee meet standards established by RG 1.200 (on the contrary, for ROP related actions described above, staff does not require licensees to meet RG 1.200).

Commented [kxc52]: I have always thought that was short sighted in not using SPAR models to independently assess licensee risk information. The agency routinely performs confirmatory analysis to support licensing decisions (particularly in other core analytical areas such as thermal hydraulics) and SPAR could be used to develop better and more comprehensive RAIs and better quality risk assessments (where applicable)

Rulemaking:

- Supports detailed cost-benefit analysis and assessment of safety benefits for proposed regulatory actions (e.g., rulemaking, backfits, etc.) when reg. analyses relies on cost-benefit analysis

Indirect

- Staff uses SPAR models to train NRC staff (e.g. Grow Your Own PRA Analysts).
 - o Models that reflect actual plants are desired, but not-essential for this training.

Option 1: Continue with Status Quo

Under this option, NRC will ~~be continuing~~ to update about 8-12 internal event SPAR models per year and develop ~~x-2-3 new external event~~ All Hazard (including fire and seismic hazards) SPAR models per year. Actual number of models updated during a given year depends upon the resources applied to these updates and existing user needs. Based on the past ~~x~~ years Annually, NRC expended approximately ~~x~~ \$1.5 million dollars and ~~3y~~ FTEs to update internal event models and develop external event models and maintain the SPAR models.

Commented [kxc53]: Were you asked to develop options? If not, I would consider just explaining how program works now and why, rather than explicitly highlighting options.

Advantages:

- Provide a means to maintain an independent assessment tool from that of the licensees.
- Provides an enhanced public confidence in that the regulator will arrive at a conclusion based on a diverse path from that of the licensee.
- All plants will be assessed on a common basis, i.e., PRA methods used to estimate critical parameters such as common cause failures and human error probabilities will be identical (RG 1.200 compliance does not assure use of one method).
- Modeling techniques and data are standardized for each plant and run on the same software platform making it possible for trained NRC staff to efficiently make timely assessments.
- Will not rely on licensees' commitment to develop external event models or updates to internal events (e.g., flex equipment) to enhance NRC's understanding of risk profile of plants (See Attachment-- This is the spread sheet that Fernando generated).
- Enables NRR staff to support management efforts to risk-inform regulatory decisions on generic or plant specific basis.

Disadvantages

- Requires staff to expend additional resources to update models.
 - Requires additional staff resources in comparison to Option 2.
- Creates opportunities to perform unnecessary analysis and increase undue reliance on numerical values.

Option 2: Rely on results provided by licensee's models

Under this option NRC staff will rely on licensees to run their PRA models. Results will be provided to NRC staff in order to make a determination.

Advantages:

- Will not require staff to expend additional resources to update the models.
- May motivate licensee to develop and maintain PRA models that comply with RG 1.200.

Disadvantages:

- Inhibits staff's ability provide timely, independent, and unbiased inputs to time-critical NRC decisions in support of NOEDs and MD 8.3s.
- NRC may have to impose additional standards (e.g. RG 1.200) on licensees' PRA models even when they support of licensees' ROP related efforts.
 - Despite having R.G. 1.200 compliance, licensee's models will still be unique and non-standard using since each licensee may use various modeling techniques and software platforms.
- The burden of performing screening and final assessments in support of SDPs, NOEDs, MD 8.3s and answering staff questions with respect to results in a timely manner will shift to the licensees increasing their workload.

Commented [kxc54]: Where did this come from? There is no regulatory requirements for operating reactor licensees to even have PRAS, let alone develop external hazard models.

Commented [kxc55]: I am not a fan of providing this spreadsheet – it is already out of date.

Commented [kxc56]: I do not understand what this point is trying to say. The tool provides objective information, it's the decision makers who abuse it.

Commented [kxc57]: This is actually not true. The SPAR models were actually developed to support the ASP program – a program which has been in existence for well over 35 years. It is quite possible that RES would still require independent SPAR models to support activities such as ASP, regulatory analysis, generic issue screening, and system studies. So, there may be minimal cost savings for the agency if NRR were to utilize licensee models.

Commented [kxc58]: I'm not seeing why this would be the case – to require RG 1200 compliant models for event and condition assessment would a change in staff position. Additionally, one could argue that there would be a disincentive to develop new fire and seismic models since it would only make the risk significance increase for potential SDP assessments.

Commented [kxc59]: Not sure what regulatory bases you could claim for this...

Commented [kxc510]: Regardless of RG 1.200 compliance or not, the main issue is that ECA results are driven by the analysis assumptions – you can easily generate garbage with a perfect PRA model by making bad assumptions.

- Timeliness will be a significant challenge for licensees who rely on contractors.
- Significant NRC staff resources will be required to become familiar in the various licensee models and software platforms in order to effectively direct modifications required for assessments.
- May inhibit NRR's ability to effectively deal with "Aggregation" and "Integrated Risk-informed Decision Making," related challenges since staff's ability to enhance external events risk assessments will be affected.

Commented [kxc511]: It's not clear that this is a case – if you have some objective evidence to show this is what may happen, it would be good to add it.

Commented [kxc512]: I'm not sure what we're trying to say with this bullet – is it that we would not have external hazard information for those licensees that do not develop these additional modeling elements?

Option 3: Staff relies on access and use of licensees' models

Under this option, NRC staff will be given access and training to run licensees' PRA models in support of various regulatory actions.

Advantages

- Will not require staff to expend additional resources to update the models.
- May motivate licensee to develop and maintain PRA models that comply with RG 1.200.

Commented [kxc513]: Similar to the comment on option 2, the agency may still need to maintain some SPAR capability to support other programs (e.g. ASI system studies, etc.).

Commented [kxc514]: As noted under Option 2, one could go either way... there may actually be a disincentive to develop new modeling elements if the licensees felt that they may get worse colored findings if they had additional modeling capability.

Disadvantages

- Will require significant resources to train the multiple NRC staff members (both in NRR, NRO, and the Regions) train-on running licensees' models. This may pose significant burdens since
 - Licensees use different software to develop PRA models
 - Each PRA models contain important switches\House Events that requires familiarity on the part of the analyst (i.e., there can be significant training burden).
- NRC will need to maintain commercial software licenses for multiple PRA codes (e.g., CAFTA, RISKMAN, FRANX, FTREX, etc.)
- Licensee may not grant access of their models to NRC

Coyne, Kevin

From: Linthicum, Roy R.:(GenCo-Nuc) <roy.linthicum@exeloncorp.com>
Sent: Tuesday, May 27, 2014 6:54 AM
To: Wong, See-Meng; ANDERSON, Victoria <vka@nei.org> (vka@nei.org)
Cc: Weerakkody, Sunil; Coyne, Kevin; Ng, Ching
Subject: RE: Draft Summary of NRC Public Meeting on May 19, 2014

See-Meng,

I have no additional comments.

Roy Linthicum
Exelon Nuclear
Chairman, PWROG RMSC
(630)-657-3846

(b)(6) (Cell)

 Exelon Generation.



From: Wong, See-Meng [mailto:See-Meng.Wong@nrc.gov]
Sent: Friday, May 23, 2014 3:30 PM
To: ANDERSON, Victoria <vka@nei.org> (vka@nei.org); Linthicum, Roy R.:(GenCo-Nuc)
Cc: Weerakkody, Sunil; Coyne, Kevin; Ng, Ching
Subject: Draft Summary of NRC Public Meeting on May 19, 2014

Victoria, Roy,

Attached is a draft summary of minutes of the May 19, 2014 NRC Public Meeting. Please review the contents and list of industry participants, and provide comments before we issue this document as final in ADAMS. We intend to issue this document no later than Wednesday, May 28, 2014. Thanks for your participation in the public meeting.

See Meng.

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Coyne, Kevin

From: Wong, See-Meng
Sent: Friday, May 23, 2014 5:05 PM
To: ANDERSON, Victoria; roy.linthicum@exeloncorp.com
Cc: Weerakkody, Sunil; Coyne, Kevin; Ng, Ching
Subject: RE: Draft Summary of NRC Public Meeting on May 19, 2014

Victoria,

Thanks for the clarifications. I will revise the statements that you find exception after I hear from other NRC staff. I will re-submit a revised draft for your review. Have a good weekend.

See Meng.

From: ANDERSON, Victoria [mailto:vka@nei.org]
Sent: Friday, May 23, 2014 4:39 PM
To: Wong, See-Meng; roy.linthicum@exeloncorp.com
Cc: Weerakkody, Sunil; Coyne, Kevin; Ng, Ching
Subject: RE: Draft Summary of NRC Public Meeting on May 19, 2014

Hi See Meng,

I have three clarifications:

-Mary Presley works for EPRI, not NEI.

-Under the discussion regarding use of licensee models in SDP, the following is noted: "NRC staff reminded the meeting participants that this proposal had been discussed in the 2006-2007 timeframe, and NRC had responded to NEI and the industry at that time expressing the agency's view of maintaining the independence of NRC's SPAR models for regulatory assessment of licensee performance."

This is not exactly accurate, as we were discussing a new proposal made via the ROP in early 2014

-The 2nd action item is stated as: "The NRC staff maintains the view that NRC's SPAR models are independent tools for regulatory assessment of licensee performance."

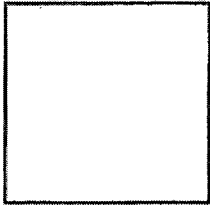
My recollection was that there would be feedback and further discussion through the ROP meetings.

From: Wong, See-Meng [mailto:See-Meng.Wong@nrc.gov]
Sent: Friday, May 23, 2014 4:30 PM
To: ANDERSON, Victoria; roy.linthicum@exeloncorp.com
Cc: Weerakkody, Sunil; Coyne, Kevin; Ng, Ching
Subject: Draft Summary of NRC Public Meeting on May 19, 2014

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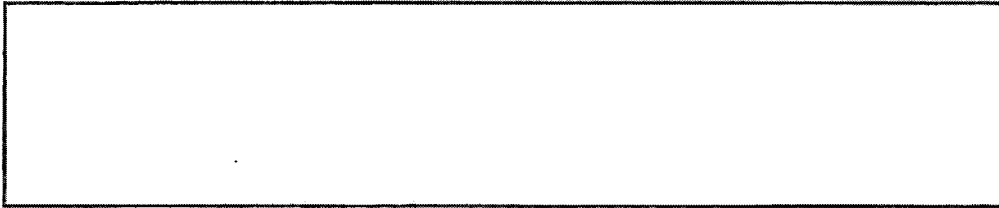
See Meng.



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Sent through mail.messaging.microsoft.com

Coyne, Kevin

From: Coyne, Kevin
Sent: Tuesday, May 20, 2014 3:41 PM
To: Weerakkody, Sunil
Cc: Madden, Patrick; Wong, See-Meng; Giitter, Joseph
Subject: RE: Thank you!

No problem at all Sunil and thank you for the note. Let me know what RES can do to help as we gear up to respond to NEI on their whitepaper.

Kevin

From: Weerakkody, Sunil
Sent: Tuesday, May 20, 2014 1:32 PM
To: Coyne, Kevin
Cc: Madden, Patrick; Wong, See-Meng; Giitter, Joseph
Subject: Thank you!

Thank you for the tremendous support that you offered at yesterday's public meeting.

*Sunil D. Weerakkody
Branch Chief, PRA Operations and Human Factors Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission*

*Tel: 301-415-2870
Email: sunil.weerakkody@nrc.gov*

From: Coyne, Kevin
Sent: Friday, May 16, 2014 5:18 PM
To: Wong, See-Meng
Cc: Weerakkody, Sunil; Vaughn, Stephen; Ng, Ching; Kozak, Laura; Nakoski, John; Marksberry, Don; Schmidt, Wayne; Cahill, Christopher; Cook, William; Bernhard, Rudolph; Hanna, John; MacDonald, George; Passehl, Dave; Valos, Nicholas; Loveless, David; Replogle, George; Deese, Rick; Ng, Ching; Correia, Richard; Madden, Patrick; Ferrantè, Fernando; Nakoski, John; Michael B Calley (Michael.Calley@inl.gov); 'Buell, Robert F' (robert.buell@inl.gov); James K Knudsen (james.knudsen@inl.gov)
Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...
Importance: High

See-Meng –

Here are the final slides on the SPAR program perspectives for the May 19th public meeting. I made a several changes to reflect the comments received – thanks again to all those who provided feedback.

Let me know if you need anything additional and I'll plan on bringing 15 copies of the slides to the meeting.

Kevin

From: Wong, See-Meng
Sent: Tuesday, May 06, 2014 6:52 PM
To: Schmidt, Wayne; Cahill, Christopher; Cook, William; Bernhard, Rudolph; Hanna, John; MacDonald, George; Passehl, Dave; Valos, Nicholas; Lovelless, David; Replogle, George; Deese, Rick
Cc: Weerakkody, Sunil; Vaughn, Stephen; Ng, Ching; Kozak, Laura; Coyne, Kevin; Nakoski, John; Marksberry, Don
Subject: FW: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

SRAs,

I am forwarding you the NRC Public Meeting Announcement to Discuss Risk Assessment Issues In The Significance Determination Process (SDP) on May 19, 2014. This public meeting is scheduled on the day before the May 2014 SRA Counterpart Meeting for your convenience to attend, if you choose to do so. The detailed agenda is enclosed in this meeting announcement, and the 5 reference materials can be accessed through NRC ADAMS with the Accession Nos. provided. Please go to the link in the email below: "Open ADAMS P8 Document."

Please inform the meeting contact, Ching Ng, of your intention to participate, either in person or via teleconference. Looking forward to your attendance at this public meeting. Thank you.

See Meng.

From: Chavarria, Jennifer
Sent: Tuesday, May 06, 2014 9:11 AM
To: RidsNrrOd Resource; RidsNrrDra Resource; Weerakkody, Sunil; Wong, See-Meng; Coyne, Kevin; RidsNrrDraAphb Resource; Merzke, Daniel
Subject: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

Good Morning,

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[Open ADAMS P8 Document \(Public Meeting Between U.S. Nuclear Regulatory Commission Staff And External Stakeholders To Discuss Risk Assessment Issues In The Significance Determination Process \(SDP\).\)](#)

Sincerely,
Jennifer Chavarria

Contract Administrative Assistant
U.S. Nuclear Regulatory Commission
NRR/DRA, Location: O-10H4
Main: 301-415-2884 Direct: 301-415-1136
Jennifer.Chavarria@nrc.gov

Coyne, Kevin

From: MacDonald, George
Sent: Monday, May 19, 2014 8:58 AM
To: Coyne, Kevin
Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

You are Welcome, Good Luck.

From: Coyne, Kevin
Sent: Monday, May 19, 2014 8:40 AM
To: MacDonald, George
Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

George -

Thanks very much for taking a look at the slides and the feedback. I'll make sure to highlight the availability of the code and models during the presentation. Thanks again!

Kevin

From: MacDonald, George
Sent: Monday, May 19, 2014 8:35 AM
To: Coyne, Kevin
Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

Kevin,

Your presentation looks good. I had forwarded some comments to John Hanna and Steve Vaughn. They largely reinforce what you have already clearly shown. I would make sure to add that the SPAR Saphire platform is already available to all NRC folks to support ROP use and the models are all available.

From: Coyne, Kevin
Sent: Friday, May 16, 2014 5:18 PM
To: Wong, See-Meng
Cc: Weerakkody, Sunil; Vaughn, Stephen; Ng, Ching; Kozak, Laura; Nakoski, John; Marksberry, Don; Schmidt, Wayne; Cahill, Christopher; Cook, William; Bernhard, Rudolph; Hanna, John; MacDonald, George; Passehl, Dave; Valos, Nicholas; Loveless, David; Replogle, George; Deese, Rick; Ng, Ching; Correia, Richard; Madden, Patrick; Ferrante, Fernando; Nakoski, John; Michael B Calley (Michael.Calley@inl.gov); 'Buell, Robert F' (robert.buell@inl.gov); James K Knudsen (james.knudsen@inl.gov)
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Kevin

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Sent: Tuesday, May 06, 2014 6:52 PM
To: Schmidt, Wayne; Cahill, Christopher; Cook, William; Bernhard, Rudolph; Hanna, John; MacDonald, George; Passehl, Dave; Valos, Nicholas; Loveless, David; Replogle, George; Deese, Rick
Cc: Weerakkody, Sunil; Vaughn, Stephen; Ng, Ching; Kozak, Laura; Coyne, Kevin; Nakoski, John; Marksberry, Don
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See Meng.

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Sent: Tuesday, May 06, 2014 9:11 AM
To: RidsNrrOd Resource; RidsNrrDra Resource; Weerakkody, Sunil; Wong, See-Meng; Coyne, Kevin; RidsNrrDraAphb Resource; Merzke, Daniel
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Sincerely,
Jennifer Chavarria

Contract Administrative Assistant
U.S. Nuclear Regulatory Commission
NRR/DRA, Location: O-10H4
Main: 301-415-2884 Direct: 301-415-1136
Jennifer.Chavarria@nrc.gov

Coyne, Kevin

From: Coyne, Kevin
Sent: Monday, May 19, 2014 8:49 AM
To: Bernhard, Rudolph
Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

Rudy -

Thanks very much for the review and the feedback. Excellent point on the sequence results – I'll be sure to add this in as a talking point about SAPHIRE and SPAR being specifically designed to support event and condition assessment. Your comment on fire results resonates with something Laura had noted – during a recent (and controversial) SDP, NextEra was all too happy to point out where SPAR cutsets were too high, but did not flag where their own results were higher – and more importantly, would not provide any results from their fire PRA.

-Kevin

From: Bernhard, Rudolph
Sent: Monday, May 19, 2014 8:04 AM
To: Coyne, Kevin
Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

Kevin,
Great Job!

Here is some stuff for your backup slides, if you want to use it. Your presentation was well focused and to the point. Much of this stuff might just confuse things.

Most of our SDP differences come from treatment of common cause, given a failure, or a change in probability of failure; or from the HRA recovery the licensee wants to credit.

The licensee models do not address changes in CCF.

We credit recovery on a case by case basis for each SDP, and either model it explicitly, or we change the failure frequency of the surrogate event in the model to consider the recovery.

The HRA methods in the base model, and their treatment of dependencies can also lead to differences.

ONE HUGE STRENGTH the SPAR/Saphire has over the licensee models for SDP is that we can see the explicit changes to the impacted sequences. Licensees have to separate the wheat from the chaff. This is especially true for lower change in risk findings. When they look at a mid E-5 model looking for the cutsets contributing to the 2E-6 delta, many of the sequences are at two orders of magnitude lower than their top lister baseline cutsets.

One other note. Recently, it has been the external events driving the most significant findings. If Aux Feed is out for several weeks, both our and their internal events model agree on the result. If Aux Feed is also important to fighting fires at the facility, that is where the disagreements can start (Fire HRA drives risk because of lack of redundant remaining mitigating systems in many cases)

From: Coyne, Kevin
Sent: Friday, May 16, 2014 5:18 PM

To: Wong, See-Meng

Cc: Weerakkody, Sunil; Vaughn, Stephen; Ng, Ching; Kozak, Laura; Nakoski, John; Marksberry, Don; Schmidt, Wayne; Cahill, Christopher; Cook, William; Bernhard, Rudolph; Hanna, John; MacDonald, George; Passehl, Dave; Valos, Nicholas; Loveless, David; Replogle, George; Deese, Rick; Ng, Ching; Correia, Richard; Madden, Patrick; Ferrante, Fernando; Nakoski, John; Michael B Calley (Michael.Calley@inl.gov); 'Buell, Robert F' (robert.buell@inl.gov); James K Knudsen (james.knudsen@inl.gov)

Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

Importance: High

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Kevin

From: Wong, See-Meng

Sent: Tuesday, May 06, 2014 6:52 PM

To: Schmidt, Wayne; Cahill, Christopher; Cook, William; Bernhard, Rudolph; Hanna, John; MacDonald, George; Passehl, Dave; Valos, Nicholas; Loveless, David; Replogle, George; Deese, Rick

Cc: Weerakkody, Sunil; Vaughn, Stephen; Ng, Ching; Kozak, Laura; Coyne, Kevin; Nakoski, John; Marksberry, Don

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Please inform the meeting contact, Ching Ng, of your intention to participate, either in person or via teleconference. Looking forward to your attendance at this public meeting. Thank you.

See Meng.

From: Chavarria, Jennifer

Sent: Tuesday, May 06, 2014 9:11 AM

To: RidsNrrOd Resource; RidsNrrDra Resource; Weerakkody, Sunil; Wong, See-Meng; Coyne, Kevin; RidsNrrDraAphb Resource; Merzke, Daniel

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Sincerely,
Jennifer Chavarria

Contract Administrative Assistant
U.S. Nuclear Regulatory Commission
NRR/DRA, Location: O-10H4
Main: 301-415-2884 Direct: 301-415-1136
Jennifer.Chavarria@nrc.gov



Perspectives on the NRC's Standardized Plant Analysis Risk (SPAR) Models

Kevin Coyne, RES/DRA/PRAB

Kevin.Coyne@nrc.gov

May 19, 2014



Outline

- SPAR Uses & Capabilities
- SPAR Modeling Philosophy
- Quality Activities & Processes
 - SPAR QA Program Activities
 - SDP Process Controls
- Comparison with Licensee PRAs
- Key Messages



SPAR Model Uses

- **Reactor Oversight**
 - Significance Determination Process (SDP)
 - Notices of Enforcement Discretion (NOEDs)
 - Management Directive MD 8.3 Incident Investigation Assessments
 - Accident Sequence Precursor Program
- **System & Component Studies**
- **Generic Issue Screening**
- **Special Studies**

3



SPAR Model Capabilities

- **Operating Reactors**
 - 79 full-power, internal events models representing all operating plants
 - 17 IPEEE-based external hazard models
 - 3 All Hazard Models
 - 8 Shutdown template models
 - 3 Level 2 feasibility models
 - 1 Integrated Capability Model
- **New Reactors**
 - ABWR – GE & Toshiba (SD)
 - APWR
 - AP1000 (seismic, flooding, fire)
 - US EPR

4



SPAR Philosophy

- Provide independent, plant-specific PRA models for use by agency risk analysts
 - "[I]ndependent oversight of licensee performance is critical for effective NRC oversight and is an important aspect of upholding public confidence in the [SDP] process" (letter from EDO to NEI, October 2007, ML072490566)
- Use standardized modeling conventions
 - Standardization approach supports plant-specific modeling
 - Ease of use for agency analysts
 - Efficient model maintenance and updating

5



SPAR Philosophy

- Support event and condition assessment (ECA) activities
 - SAPHIRE user "workspaces" structured to support ROP
 - SPAR models designed to efficiently address typical ECA activities (e.g., CCF, LOOP modeling)
- Apply agency resources in a cost-effective manner
 - SPAR models generally not as detailed as licensee models (with some exceptions)
 - SPAR generally relies on licensee PRA modeling assumptions (supported with some independent analysis)
 - Models developed with the best available information provided by licensees

6



SPAR QA Program

- SPAR Quality Assurance Plan
- SPAR Project Manager Handbook
- RASP Handbook
 - Volume 3 provides detailed guidance on performing SPAR model modifications and reviews to ensure that the models are of adequate quality and reflect the as-built, as-operated plant for the problem being analyzed
- Model Maker Guidelines (MMGs)
 - All Hazard Models
 - Shutdown
 - Integrated Capability Modeling

7



SPAR & SAPHIRE QA Programs

- Onsite verification reviews
 - Onsite reviews conducted during MSPI benchmarking activities
 - Onsite reviews conducted for new modeling elements (e.g., shutdown, fire, external hazards)
- SPAR Configuration/Version Control
- SAPHIRE Quality Assurance Plan
 - Independent Verification and Validation for SAPHIRE 8
 - NUREG/BR-0167, "Software Quality Assurance Program and Guidelines" compliant QA program, including annual audits

8



SPAR QA - Process

- SPAR model Maintenance Program
 - Major updates are performed on approximately 8-12 SPAR models per year based on feedback from model users and licensees
 - Less significant model changes are performed on an additional ~20 models per year to support risk assessments for specific regulatory applications
 - Approximately a third of the plant-specific SPAR models are typically updated in a given year

9



SPAR QA Program

- Licensees are provided their SPAR models upon request
 - Consistent with SECY 2004-0191, SPAR models are non-public and licensees are expected to protect the models against inadvertent release (using controls consistent with RIS 2005-026)
 - With each distribution, NRC requests feedback on unresolved differences between the models
 - Ideally, differences between SPAR and licensee models could be reconciled before an SDP, but this is difficult in practice

10



SPAR QA Program

- 2009 ASME PRA Standard Peer Reviews
 - BWROG and PWROG led peer reviews of a typical BWR and PWR SPAR model
 - Peer review team consisted of industry experts and experienced agency risk analysts (HQ and SRAs)
 - The Peer Review noted the following SPAR model strengths:
 - Model structure is robust and well developed.
 - Fault trees are streamlined with an appropriate level of detail for its intended uses.
 - Model structure and the SAPHIRE computer software are at the state of the technology.
 - Models are an efficient method to develop qualitative and quantitative insights for applications, SDP evaluations, inspections, event assessments, and model evaluations.

11



SDP Process Controls

- Qualified Analysts - SRAs complete a rigorous training and qualification program (described in Inspection Manual Chapter 1245, Appendix C-9) to ensure that they can proficiently apply risk tools
- Internal SERP reviews are held for all "greater than green" findings to ensure appropriate risk assessment methods are applied with consistency in the ROP
- Licensees afforded an opportunity to either attend a Regulatory Conference or provide a written response for all performance issues of "Greater than Green" significance

12



Comparisons to Licensee PRAs

- SPAR models are benchmarked to licensee PRA information after major SPAR updates
 - Comparisons rely on the best available information provided by the licensee
- Benchmarking includes the following baseline model checks:
 - SPAR core damage frequency (CDF) less than $1E-4/\text{yr}$
 - Difference between SPAR and PRA CDF less than a factor of 3
 - Difference between initiator specific CCDPs less than factor of 10
 - Difference in CDF of top 25 cut sets less than a factor of 5
 - Qualitative review of top cut sets
- Identified differences are described in the SPAR model documentation

13



Comparisons to Licensee PRAs

- The NRC has not observed significant divergence in analysis results due to modeling differences between licensee and SPAR models
 - While divergence between licensee and NRC SDP assessments is sometimes noted, the reasons generally involve analysis-specific assumptions and boundary conditions (e.g., human reliability analysis, recovery credit) rather than baseline modeling differences
- Exchange of technical PRA information between the NRC and licensees is an expected part of the SDP
 - Focused discussion on a specific operational event is often more efficient than attempting to make more generic changes to the base model

14



Key Messages

- Exchange of technical information between the NRC and licensees is an expected part of the significance determination process
- SPAR models provide an independent and effective risk assessment tool and are fully capable of supporting ROP activities.

Coyne, Kevin

From: Helton, Donald
Sent: Friday, May 16, 2014 4:01 PM
To: Coyne, Kevin
Subject: RE: SPAR presentation for may 19 public meeting

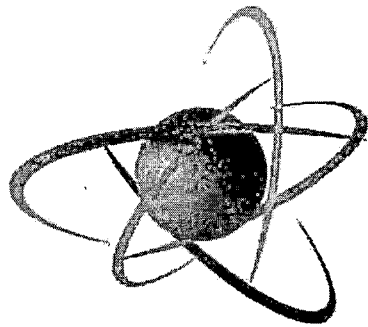
Looks good. A few minor suggestions below. It strikes a nice balance of being confident of the program, without being defensive. The program is as good as it can be within the constraints of information and resources, and is adequate for its regulatory uses...

- Slide 3 – feel free to leave as is, but it's a bit confusing to have ASP under the NRR & Regions header
- Slide 7 – I would remove the "(e.g., Level 2)"...the ICM MMG simply provides some conventions for making integrated models, but does not provide any "mean" for developing the logic models themselves
- Slide 8 – Add SAPHIRE to title

From: Coyne, Kevin
Sent: Friday, May 16, 2014 2:55 PM
To: Helton, Donald
Subject: SPAR presentation for may 19 public meeting
Importance: High

Thanks for the review help Don –

Kevin



U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Perspectives on the NRC's Standardized Plant Analysis Risk (SPAR) Models

Kevin Coyne, RES/DRA/PRAB

Kevin.Coyne@nrc.gov

May 19, 2014

Outline

- SPAR Uses & Capabilities
- SPAR Modeling Philosophy
- Quality Activities & Processes
 - SPAR QA Program Activities
 - SDP Process Controls
- Comparison with Licensee PRAs
- Key Messages



SPAR Model Uses

- **Reactor Oversight (NRR & Regions)**
 - Significance Determination Process (SDP)
 - Notices of Enforcement Discretion (NOEDs)
 - Management Directive MD 8.3 Incident Investigation Assessments
 - Accident Sequence Precursor Program (RES)
- **System & component studies (RES)**
- **Generic Issue Screening (RES)**
- **Special Studies (all)**



SPAR Model Capabilities

- **Operating Reactors**
 - 79 full-power, internal events models representing all operating plants
 - 17 IPEEE-based external hazard models
 - 3 All Hazard Models
 - 8 Shutdown template models
 - 3 Level 2 feasibility models
 - 1 Integrated Capability Model
- **New Reactors**
 - ABWR – GE & Toshiba (SD)
 - APWR
 - AP1000 (seismic, flooding, fire)
 - US EPR



SPAR Philosophy

- Provide independent, plant-specific PRA models for use by agency risk analysts
 - “[I]ndependent oversight of licensee performance is critical for effective NRC oversight and is an important aspect of upholding public confidence in the [SDP] process” (letter from EDO to NEI, October 2007, ML072490566)
- Use standardized modeling conventions
 - Standardization approach supports plant-specific modeling
 - Ease of use for agency analysts
 - Efficient model maintenance and updating

SPAR Philosophy

- **Support event and condition assessment (ECA) activities**
 - SAPHIRE user “workspaces” structured to support ROP
 - SPAR models designed to efficiently address typical ECA activities (e.g., CCF, LOOP modeling)
- **Apply agency resources in a cost-effective manner**
 - SPAR models generally not as detailed as licensee models (with some exceptions)
 - SPAR generally relies on licensee PRA modeling assumptions (supported with some independent analysis)
 - Models developed with the best available information provided by licensees.



SPAR QA Program

- SPAR Quality Assurance Plan
- SPAR Project Manager Handbook
- RASP Handbook
 - Volume 3 provides detailed guidance on performing SPAR model modifications and reviews to ensure that the models are of adequate quality and reflect the as-built, as-operated plant for the problem being analyzed
- Model Maker Guidelines (MMGs)
 - All Hazard Models
 - Shutdown
 - Integrated Capability Modeling (e.g., Level 2)



SPAR QA Program

- Onsite verification reviews
 - Onsite reviews conducted during MSPI benchmarking activities
 - Onsite reviews conducted for new modeling elements (e.g., shutdown, fire, external hazards)
- SPAR Configuration/Version Control
- SAPHIRE Quality Assurance Plan
 - Independent Verification and Validation for SAPHIRE 8
 - NUREG/BR-0167, "Software Quality Assurance Program and Guidelines" compliant QA program, including annual audits



SPAR QA - Process

- **SPAR model Maintenance Program**
 - Major updates are performed on approximately 8-12 SPAR models per year based on feedback from model users and licensees.
 - Less significant model changes are performed on an additional ~20 models per year to support risk assessments for specific regulatory applications.
 - Approximately a third of the plant-specific SPAR models are typically updated in a given year



SPAR QA Program

- Licensees are provided their SPAR models upon request
 - Consistent with SECY 2004-0191, SPAR models are non-public and licensees are expected to protect the models against inadvertent release (using controls consistent with RIS 2005-026)
 - With each distribution, NRC requests feedback on unresolved differences between the models
 - Ideally, differences between SPAR and licensee models could be reconciled before an SDP, but this is difficult in practice



SPAR QA Program

- 2009 ASME PRA Standard Peer Reviews
 - BWROG and PWROG led peer reviews of the Peach Bottom and Comanche Peak models
 - Peer review team consisted of industry experts and experienced agency risk analysts (HQ and SRAs)
 - The Peer Review noted the following SPAR model strengths:
 - Model structure is robust and well developed.
 - Fault trees are streamlined with an appropriate level of detail for its intended uses.
 - Model structure and the SAPHIRE computer software are at the state of the technology.
 - Models are an efficient method to develop qualitative and quantitative insights for applications, SDP evaluations, inspections, event assessments, and model evaluations.



SDP Process Controls

- **Qualified Analysts** - SRAs complete a rigorous training and qualification program (described in Inspection Manual Chapter 1245, Appendix C-9) to ensure that they can proficiently apply risk tools
- **Internal SERP reviews** are held for all “greater than green” findings to ensure appropriate risk assessment methods are applied with consistency in the ROP.
- **Licensees** afforded an opportunity to either attend a Regulatory Conference or provide a written response for all performance issues of “Greater than Green” significance.



Comparisons to Licensee PRAs

- SPAR models are benchmarked to licensee PRA information after major updates
 - Comparisons rely on the best available information provided by the licensee
- Benchmarking includes the following baseline model checks:
 - SPAR core damage frequency (CDF) less than $1\text{E-}4/\text{yr}$
 - Difference between SPAR and PRA CDF less than a factor of 3
 - Difference between initiator specific CCDPs less than factor of 10
 - Difference in CDF of top 25 cut sets less than a factor of 5
 - Qualitative review of top cut sets
- Identified differences are described in the SPAR model documentation



Comparisons to Licensee PRAs

- The NRC has not observed significant divergence in analysis results due to modeling differences between licensee and SPAR models
 - While divergence between licensee and NRC SDP assessments is sometimes noted, the reasons generally involve analysis-specific assumptions and boundary conditions (e.g., human reliability analysis, recovery credit) rather than baseline modeling differences
- Exchange of technical PRA information between the NRC and licensees is an expected part of the SDP
 - Focused discussion on a specific operational event is often more efficient than attempting to make more generic changes to the base model



Comparisons to Licensee PRAs

- In general, SPAR models do not credit equipment repair & recovery
 - SPAR equipment recovery is generally limited to EDGs and offsite power
 - Generic approach to recovery is not practical
- The lack of recovery modeling is not an “error”, but a consequence of the SPAR modeling philosophy
 - NRC analysts can adjust SPAR models when there is sufficient technical justification
 - However, even appropriate changes for a specific event or condition, may not be appropriate for the base model



Key Messages

- No PRA (SPAR or licensee) can accurately capture every nuance of an operational event
 - Experienced risk analysts must make modeling decisions for each specific event
 - Process controls include peer reviews of model results
- NRC maintains an active Quality Assurance Programs for SPAR and SAPHIRE
 - Process controls include issue reporting and resolution
 - Actively seek feedback on models to ensure they represent the as-built, as-operated plant



Key Messages

- Exchange of technical information between the NRC and licensees is an expected part of the significance determination process
- SPAR models provide an independent and effective risk assessment tool and are fully capable of supporting ROP activities.

Coyne, Kevin

From: Kozak, Laura
Sent: Friday, May 16, 2014 2:50 PM
To: Coyne, Kevin; Ferrante, Fernando
Cc: Weerakkody, Sunil; Wong, See-Meng
Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders... (SPAR Presentation)

And just to say it again – licensees don't always want to provide a lot of information for this effort. Bob Buell told me the top 200 cutsets, etc (the stuff on the industry list) doesn't help much all. We need all their cut-sets and PRA notebooks (wish list)

Apparently RI transmits PRA notebooks obtained for inspections to INL. I am not comfortable doing it this way. I typically ask the licensee to send the info directly to INL. In recent requests to Exelon, they provided their cut-sets but not the notebooks to INL.

So lobby for more info!

From: Coyne, Kevin
Sent: Friday, May 16, 2014 2:40 PM
To: Ferrante, Fernando
Cc: Weerakkody, Sunil; Kozak, Laura; Wong, See-Meng
Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders... (SPAR Presentation)

Fernando –

Great comments. And you pointed an oversight on my part - I had an earlier slide that included the following information:

- SPAR benchmarking includes the following baseline model checks:
 - SPAR core damage frequency (CDF) less than 1E-4/yr
 - Difference between SPAR and PRA CDF less than a factor of 3
 - Difference between initiator specific CCDPs less than factor of 10
 - Difference in CDF of top 25 cut sets less than a factor of 5

INL also performs a qualitative check of the top sets. Anyway, this information got lost in a cut and paste maneuver – I'll make sure to add it back in (probably in the comparison to licensee models section). I also want to add the thought that the comparison (and the SPAR models for that matter) is only as good as the information submitted to us by the licensees.

I had a couple of minor changes I'll be making in a few minutes and then I'll send the final version back out.

Thanks to all for the comments!

Kevin

From: Ferrante, Fernando
Sent: Friday, May 16, 2014 1:41 PM
To: Coyne, Kevin
Cc: Weerakkody, Sunil; Kozak, Laura; Wong, See-Meng

Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders... (SPAR Presentation)

Kevin,

The presentation looks good. I just have a couple of questions/comments based on the last page on the white paper the licensees submitted:

Isn't the following already done to some extent? Can we address benchmarking of SPAR models more explicitly in the presentation?

1. The licensee and NRC staff should benchmark the licensee and SPAR models whenever there is a revision to either model. This activity should be completed outside of an actual SPD evaluation.

Benchmarking should consider:

- a. Baseline Average CDF and LERF values,
- b. Top 100 CDF and LERF cutsets,
- c. Importance Measures (RAW and F-V).

I don't mind the suggested path forward item, although it comes with baggage. I think you clearly state the issue is usually data and credit for operator actions.

2. Significant differences should be investigated to determine the reason for the differences. Examples could be:

- a. Success Criteria,
- b. Data,
- c. Human Reliability Modeling,
- d. Modeling of Recovery Actions.

I don't mind the following item, although it also comes with baggage. I think we need to make it clear that if they want to follow this path, we will also document issues we observe that we do not agree with and/or appear to point to technical deficiencies...

3. Significant differences in assumptions/modeling should be documented and treated as sources of uncertainty in future SDPs.

This is already done to its appropriate extent in my opinion. Like most of these comments, there is a disingenuous intent to misrepresent the issue (i.e., just because we don't take their information at face value, it should not mean that we don't reasonably accept valid information). I expect this to turn out to be an attempt to hand-cuff the NRC into not looking at the full extent of an issue with sufficient independence.

4. Prior to starting an SDP, the NRC and Licensee should agree to the boundary conditions and assumptions needed to model the impact of the finding

This is also already done to its appropriate extent in my opinion. And, as the recommendation above, this is a trap.

5. The same process (see Recommendation above) should be used to validate the SDP results as is used for the base model.

This is also already done to its appropriate extent in my opinion. And, as with many of the above recommendations, this is a trap. Regardless, we cannot let this statement go unanswered in the meeting!

6. Need to have open communication between the SRA and utility PRA personnel

We also need to stay on guard as I think this will turn out to be another attempt to get rid of SPAR models and rely on licensee PRAs, although it is not strongly construed as such yet.

Thanks,
Fernando

From: Coyne, Kevin

Sent: Thursday, May 15, 2014 3:05 PM

To: Wong, See-Meng; Vaughn, Stephen; Ferrante, Fernando; Weerakkody, Sunil; Appignani, Peter; Gonzalez, Michelle; Kozak, Laura; Hanna, John; Schmidt, Wayne; Cahill, Christopher; Cook, William; Bernhard, Rudolph; MacDonald, George; Passehl, Dave; Valos, Nicholas; Replogle, George; Loveless, David; Deese, Rick; 'Buell, Robert F' (robert.buell@inl.gov); Michael B Calley (Michael.Calley@inl.gov); James K Knudsen (james.knudsen@inl.gov)

Cc: Nakoski, John; Sancaktar, Selim; Wood, Jeffery

Subject: FW: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders... (SPAR Presentation)

Importance: High

To all –

Please see attached presentation for the May 19th public meeting providing the NRC perspective on SPAR models. Your comments/feedback/revisions are very much appreciated. I've also attached a couple of other documents referenced in the meeting announcement that will give some additional context to the SPAR discussion.

Thanks for your help-

Kevin

*Kevin Coyne, P.E., PhD
Chief, Probabilistic Risk Assessment Branch
Division of Risk Analysis
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555
(301) 251-7586*

From: Wong, See-Meng

Sent: Tuesday, May 06, 2014 6:52 PM

To: Schmidt, Wayne; Cahill, Christopher; Cook, William; Bernhard, Rudolph; Hanna, John; MacDonald, George; Passehl, Dave; Valos, Nicholas; Loveless, David; Replogle, George; Deese, Rick

Cc: Weerakkody, Sunil; Vaughn, Stephen; Ng, Ching; Kozak, Laura; Coyne, Kevin; Nakoski, John; Marksberry, Don

Subject: FW: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

SRAs,

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Please inform the meeting contact, Ching Ng, of your intention to participate, either in person or via teleconference. Looking forward to your attendance at this public meeting. Thank you.

See Meng.

From: Chavarria, Jennifer

Sent: Tuesday, May 06, 2014 9:11 AM

To: RidsNrrOd Resource; RidsNrrDra Resource; Weerakkody, Sunil; Wong, See-Meng; Coyne, Kevin; RidsNrrDraAphb Resource; Merzke, Daniel

Subject: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

Good Morning,

Document dated May 5, 2014, is now an official agency record.

[View ADAMS P8 Properties ML14125A371](#)

[Open ADAMS P8 Document \(Public Meeting Between U.S. Nuclear Regulatory Commission Staff And External Stakeholders To Discuss Risk Assessment Issues In The Significance Determination Process \(SDP\).\)](#)

Sincerely,
Jennifer Chavarria

Contract Administrative Assistant
U.S. Nuclear Regulatory Commission
NRR/DRA, Location: O-10H4
Main: 301-415-2884 Direct: 301-415-1136
Jennifer.Chavarria@nrc.gov

Coyne, Kevin

From: Coyne, Kevin
Sent: Thursday, May 15, 2014 3:53 PM
To: Kozak, Laura
Cc: Wong, See-Meng; Weerakkody, Sunil; Passehl, Dave; Valos, Nicholas
Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders... (SPAR Presentation)

Laura –

Thanks very much for the quick feedback – I'll definitely keep your points in mind and be prepared for some pushback from the industry (and thanks for the heads up on that).

Hope all is going well-

Kevin

From: Kozak, Laura
Sent: Thursday, May 15, 2014 3:37 PM
To: Coyne, Kevin
Cc: Wong, See-Meng; Weerakkody, Sunil; Passehl, Dave; Valos, Nicholas
Subject: RE: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders... (SPAR Presentation)

Kevin

Good presentation. Thanks for getting the word out.

NextEra may complain when you get to the slide about NRC and licensees sharing information and claim that we didn't share cutsets and they couldn't figure out how we got our results.

Just for background, keep in mind that we typically do not send the cutsets in the inspection report – rather we describe the dominant sequences and influential factors and assumptions (law IMC 0612). RII typically does send cutsets.

For the DAEC EDG issue, we made an exception and sent about the top 50 cut-sets (which had already been discussed over the phone at length). The licensee's tactic then was to work on all the basic events they could see in the cutsets and argue that they should be lower. Of course, they did not inform us that some BE values should be higher according to their PRA – including the IE frequency.

For the DAEC RCIC issue we did not send the cut-sets and discussed the results over the phone.

I don't want to get into the practice of routinely sending them because of what happened with the EDG issue – which was a distraction but wanted you to be prepared if they complain.

As always we discuss results as necessary with the licensee. I have no doubt that NextEra understood our assumptions and results but simply disagreed.

Laura

From: Coyne, Kevin
Sent: Thursday, May 15, 2014 3:05 PM

To: Wong, See-Meng; Vaughn, Stephen; Ferrante, Fernando; Weerakkody, Sunil; Appignani, Peter; Gonzalez, Michelle; Kozak, Laura; Hanna, John; Schmidt, Wayne; Cahill, Christopher; Cook, William; Bernhard, Rudolph; MacDonald, George; Passehl, Dave; Valos, Nicholas; Replogle, George; Loveless, David; Deese, Rick; 'Buell, Robert F' (robert.buell@inl.gov); Michael B Calley (Michael.Calley@inl.gov); James K Knudsen (james.knudsen@inl.gov)

Cc: Nakoski, John; Sancaktar, Selim; Wood, Jeffery

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Thanks for your help-

Kevin

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U.S. Nuclear Regulatory Commission
Washington, DC 20555
(301) 251-7586*

From: Wong, See-Meng

Sent: Tuesday, May 06, 2014 6:52 PM

To: Schmidt, Wayne; Cahill, Christopher; Cook, William; Bernhard, Rudolph; Hanna, John; MacDonald, George; Passehl, Dave; Valos, Nicholas; Loveless, David; Replogle, George; Deese, Rick

Cc: Weerakkody, Sunil; Vaughn, Stephen; Ng, Ching; Kozak, Laura; Coyne, Kevin; Nakoski, John; Marksberry, Don

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See Meng.

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Sent: Tuesday, May 06, 2014 9:11 AM

To: RidsNrrOd Resource; RidsNrrDra Resource; Weerakkody, Sunil; Wong, See-Meng; Coyne, Kevin; RidsNrrDraAphb Resource; Merzke, Daniel
Subject: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

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Main: 301-415-2884 Direct: 301-415-1136
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Coyne, Kevin

From: Coyne, Kevin
Sent: Thursday, May 15, 2014 3:35 PM
To: 'Buell, Robert F'
Cc: Appignani, Peter; Gonzalez, Michelle
Subject: RE: FW: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders... (SPAR Presentation)

Bob –

Thanks very much for taking a look at the slides – I will adjust the wording to something along the lines of the “NRC has generally not observed significant divergence in SDP results as a result modeling differences”. This actually provides a better lead in for the sub bullet and I can also mention some of known differences you noted below.

Thanks again and have a great weekend –

Kevin

From: Buell, Robert F [mailto:robert.buell@nrc.gov]
Sent: Thursday, May 15, 2014 3:29 PM
To: Coyne, Kevin
Subject: Re: FW: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders... (SPAR Presentation)

Kevin,

I have only one relatively minor comment. The first bullet on Slide 13 (The NRC has not observed significant divergence in licensee and SPAR models.) This bullet may be a little too broad. There are still some non-negligible differences between the SPAR models and the licensee models. Some that come to mind are residual differences in PORV success criteria (Westinghouse 4-LOOP plants), some LOOP/SBO issues where we agree to disagree, etc. That being said, these are not the issues that typically cause divergence in results during a SDP. Typically the divergence is due to disagreements on things like CCF impacts, HEP values, etc. The issues are well understood, but the NRC just disagrees with licensee position.

Robert Buell
208-526-9400

On Thu, May 15, 2014 at 1:05 PM, Coyne, Kevin <Kevin.Coyne@nrc.gov> wrote:

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Thanks for your help-

Kevin

Kevin Coyne, P.E., PhD

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Division of Risk Analysis

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Cc: Weerakkody, Sunil; Vaughn, Stephen; Ng, Ching; Kozak, Laura; Coyne, Kevin; Nakoski, John; Marksberry, Don

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Sincerely,

Jennifer Chavarria

Contract Administrative Assistant

U.S. Nuclear Regulatory Commission

NRR/DRA, Location: O-10H4

Main: 301-415-2884 Direct: 301-415-1136

Jennifer.Chavarria@nrc.gov

Coyne, Kevin

From: Coyne, Kevin
Sent: Thursday, May 15, 2014 3:07 PM
To: Correia, Richard; Madden, Patrick
Subject: FW: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders... (SPAR Presentation)
Attachments: Perspectives on SPAR_May 19_2014.pptx; ML14106A571.pdf; ML0724905400.pdf

Rich, Pat –

The attached power point presentation is what I intend to present at the May 19 public meeting on the SDP (use of SPAR models is an agenda item). I've asked for some feedback from the SRAs and our NRR counterpoints, but let me know if you have any additional comments.

Thanks –

Kevin

From: Coyne, Kevin
Sent: Thursday, May 15, 2014 3:05 PM
To: Wong, See-Meng; Vaughn, Stephen; Ferrante, Fernando; Weerakkody, Sunil; Appignani, Peter; Gonzalez, Michelle; Kozak, Laura; Hanna, John; Schmidt, Wayne; Cahill, Christopher; Cook, William; Bernhard, Rudolph; MacDonald, George; Passehl, Dave; Valos, Nicholas; Replogle, George; Loveless, David; Deese, Rick; 'Buell, Robert F' (robert.buell@inl.gov); Michael B Calley (Michael.Calley@inl.gov); James K Knudsen (james.knudsen@inl.gov)
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Subject: FW: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

SRAs,

I am forwarding you the NRC Public Meeting Announcement to Discuss Risk Assessment Issues In The Significance Determination Process (SDP) on May 19, 2014. This public meeting is scheduled on the day before the May 2014 SRA Counterpart Meeting for your convenience to attend, if you choose to do so. The detailed agenda is enclosed in this meeting announcement, and the 5 reference materials can be accessed through NRC ADAMS with the Accession Nos. provided. Please go to the link in the email below: "Open ADAMS P8 Document."

Please inform the meeting contact, Ching Ng, of your intention to participate, either in person or via teleconference. Looking forward to your attendance at this public meeting. Thank you.

See Meng.

From: Chavarria, Jennifer

Sent: Tuesday, May 06, 2014 9:11 AM

To: RidsNrrOd Resource; RidsNrrDra Resource; Weerakkody, Sunil; Wong, See-Meng; Coyne, Kevin; RidsNrrDraAphb Resource; Merzke, Daniel

Subject: ML14125A371. Public Meeting Between U.S. Nuclear Regulatory Commission Staff and External Stakeholders...

Good Morning,

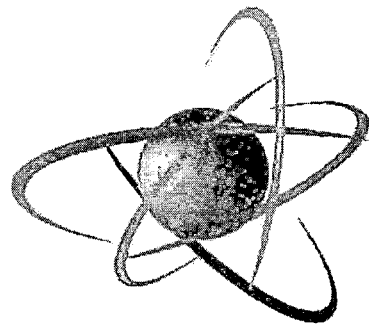
Document dated May 5, 2014, is now an official agency record.

[View ADAMS P8 Properties ML14125A371](#)

[Open ADAMS P8 Document \(Public Meeting Between U.S. Nuclear Regulatory Commission Staff And External Stakeholders To Discuss Risk Assessment Issues In The Significance Determination Process \(SDP\).\)](#)

Sincerely,
Jennifer Chavarria

Contract Administrative Assistant
U.S. Nuclear Regulatory Commission
NRR/DRA, Location: O-10H4
Main: 301-415-2884 Direct: 301-415-1136
Jennifer.Chavarria@nrc.gov



U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Perspectives on the NRC's Standardized Plant Analysis Risk (SPAR) Models

Kevin Coyne, RES/DRA/PRAB

Kevin.Coyne@nrc.gov

May 19, 2014



Outline

- SPAR Uses & Capabilities
- SPAR Modeling Philosophy
- Quality Activities & Processes
 - SPAR QA Program Activities
 - SDP Process Controls
- Comparison with Licensee PRAs
- Key Messages



SPAR Model Uses

- **Reactor Oversight (NRR & Regions)**
 - Significance Determination Process (SDP)
 - Notices of Enforcement Discretion (NOEDs)
 - Management Directive MD 8.3 Incident Investigation Assessments
 - Accident Sequence Precursor Program (RES)
- **System & component studies (RES)**
- **Generic Issue Screening (RES)**
- **Special Studies (all)**



SPAR Model Capabilities

- **Operating Reactors**
 - 79 full-power, internal events models representing all operating plants
 - 17 IPEEE-based external hazard models
 - 3 All Hazard Models
 - 8 Shutdown template models
 - 3 Level 2 feasibility models
 - 1 Integrated Capability Model
- **New Reactors**
 - ABWR – GE & Toshiba (SD)
 - APWR
 - AP1000 (seismic, flooding, fire)
 - US EPR



SPAR Philosophy

- Provide independent, plant-specific PRA models for use by agency risk analysts
 - “[I]ndependent oversight of licensee performance is critical for effective NRC oversight and is an important aspect of upholding public confidence in the [SDP] process” (letter from EDO to NEI, October 2007, ML072490566)
- Use standardized modeling conventions
 - Standardization approach supports plant-specific modeling
 - Ease of use for agency analysts
 - Efficient model maintenance and updating



SPAR Philosophy

- Support event and condition assessment (ECA) activities
 - SAPHIRE user “workspaces” structured to support ROP
 - SPAR models designed to efficiently address typical ECA activities (e.g., CCF, LOOP modeling)
- Apply agency resources in a cost-effective manner
 - SPAR models generally not as detailed as licensee models (with some exceptions)
 - SPAR generally relies on licensee PRA modeling assumptions (supported with some independent analysis)



SPAR QA Program

- SPAR Quality Assurance Plan
- SPAR Project Manager Handbook
- RASP Handbook
 - Volume 3 provides detailed guidance on performing SPAR model modifications and reviews to ensure that the models are of adequate quality and reflect the as-built, as-operated plant for the problem being analyzed
- Model Maker Guidelines (MMGs)
 - All Hazard Models
 - Shutdown
 - Integrated Capability Modeling (e.g., Level 2)



SPAR QA Program

- Onsite verification reviews
 - Onsite reviews conducted during MSPI benchmarking activities
 - Onsite reviews conducted for new modeling elements (e.g., shutdown, fire, external hazards)
- SPAR Configuration/Version Control
- SAPHIRE Quality Assurance Plan
 - Independent Verification and Validation for SAPHIRE 8
 - NUREG/BR-0167, “Software Quality Assurance Program and Guidelines” compliant QA program, including annual audits



SPAR QA - Process

- **SPAR model Maintenance Program**
 - Major updates are performed on approximately 8-12 SPAR models per year based on feedback from model users and licensees.
 - Less significant model changes are performed on an additional ~20 models per year to support risk assessments for specific regulatory applications.
 - Approximately a third of the plant-specific SPAR models are typically updated in a given year



SPAR QA Program

- Licensees are provided their SPAR models upon request
 - Consistent with SECY 2004-0191, SPAR models are non-public and licensees are expected to protect the models against inadvertent release (using controls consistent with RIS 2005-026)
 - With each distribution, NRC requests feedback on unresolved differences between the models
 - Ideally, differences between SPAR and licensee models could be reconciled before an SDP, but this is difficult in practice



SPAR QA Program

- 2009 ASME PRA Standard Peer Reviews
 - BWROG and PWROG led peer reviews of the Peach Bottom and Comanche Peak models
 - Peer review team consisted of industry experts and experienced agency risk analysts (HQ and SRAs)
 - The Peer Review noted the following SPAR model strengths:
 - Model structure is robust and well developed.
 - Fault trees are streamlined with an appropriate level of detail for its intended uses.
 - Model structure and the SAPHIRE computer software are at the state of the technology.
 - Models are an efficient method to develop qualitative and quantitative insights for applications, SDP evaluations, inspections, event assessments, and model evaluations.



SDP Process Controls

- **Qualified Analysts** - SRAs complete a rigorous training and qualification program (described in Inspection Manual Chapter 1245, Appendix C-9) to ensure that they can proficiently apply risk tools
- **Internal SERP reviews** are held for all “greater than green” findings to ensure appropriate risk assessment methods are applied with consistency in the ROP. .
- **Licensees** afforded an opportunity to either attend a Regulatory Conference or provide a written response for all performance issues of “Greater than Green” significance.



Comparisons to Licensee PRAs

- The NRC has not observed significant divergence in licensee and SPAR models
 - While divergence between licensee and NRC SDP assessments is sometimes noted, the reasons generally involve analysis-specific assumptions and boundary conditions (e.g., human reliability analysis, recovery credit) rather than baseline modeling differences
- Exchange of technical PRA information between the NRC and licensees is an expected part of the SDP
 - Focused discussion on a specific operational event is more efficient than attempting to make more generic changes to the base model



Comparisons to Licensee PRAs

- In general, SPAR models do not credit equipment repair & recovery
 - SPAR equipment recovery is generally limited to EDGs and offsite power
 - Generic approach to recovery is not practical
- The lack of recovery modeling is not an “error”, but a consequence of the SPAR modeling philosophy
 - NRC analysts can adjust SPAR models when there is sufficient technical justification
 - However, even appropriate changes for a specific event or condition, may not be appropriate for the base model



Key Messages

- No PRA (SPAR or licensee) can accurately capture every nuance of an operational event
 - Experienced risk analysts must make modeling decisions for each specific event
 - Process controls include peer reviews of model results
- NRC maintains an active Quality Assurance Programs for SPAR and SAPHIRE
 - Process controls include issue reporting and resolution
 - Actively seek feedback on models to ensure they represent the as-built, as-operated plant



Key Messages

- Exchange of technical information between the NRC and licensees is an expected part of the significance determination process
- SPAR models provide an independent and effective risk assessment tool and are fully capable of supporting ROP activities.

Siu, Nathan

From: Andrew O'Connor <andrew.oconnor@relken.com>
Sent: Thursday, May 14, 2015 5:17 AM
To: Ma (Non-US), Zhegang; Ali Mosleh; Cory Atwood; Martin B Sattison; John A Schroeder; Curtis L Smith; James K Knudsen; Coyne, Kevin; Hunter, Christopher; Lane, John; Ali Mosleh; Shen, Song-hua; Michael B Calley; Nakoski, John; Marksberry, Don; Mitman, Jeffrey; Ferrante, Fernando; Bernhard, Rudolph; Siu, Nathan
Subject: Comments on industry review of ECA NUREG - O'Connor
Attachments: Draft Responses to all Industry Comments on Draft CCF NUREG (4-16-2015).....docx

Hi Gents,

Thanks again for the opportunity to attend the CCF workshop. It was great to hear first-hand the concerns of industry regarding the future of CCF modelling in PRA and hopefully contribute to NRC's ability to address these concerns to move forward with an improved NUREG.

To that end, I've attached my response to each of the comments from industry. I've structured these responses as follows:

- A general observation on the issue discussed
- Categorisation of each issue within the comment into 'key themes'
- A remark on whether PAFM or GDM addresses the issue.

At the beginning of the document I have included a list of discussion points for each 'key theme'.

My overall sense from both the workshop and the comments is that most of industry's concerns are valid when viewed from their perspective. However, they can either reflect a legitimate issue or show that they have misinterpreted the assumptions or technical details of CCF modelling.

- In the first case, the aim is to alleviate the concern, noting that the reviewers will also be the user community.
- In the second case, this is essential to allow the application of ground rule three where appropriate. While no answer we generate is correct, the NUREG needs to address the business decision on what is sufficient to regulate safety without imposing impractical resources requirements (for both the NRC and industry).

In both cases, the NUREG needs to acknowledge these concerns and provide a comprehensive explanation of the basis and assumption of the approach. I'd recommend against a directive approach without explanation as its clear that this document will set the tone for the future improvements in this area.

Please don't hesitate to contact me if you require any clarification of the responses provided or if we can assist in getting the draft NUREG to publication.

Thanks again for the feedback on the proposed model and the invitation to attend the workshop.

Best of luck,

Andrew

Andrew O'Connor
PhD, MSc, BE, MIEAust, CRE
Director

m (b)(6) | p 1300 761 998 | f 02 8355 7307



Review Comments: Andrew O'Connor

I have reviewed the comments from industry and provided:

- A general response to the industry comment
- Identify the key-reoccurring theme from the industry comment
- Identify if PAFM or GDM address the concern.

Key Themes

I have made a first draft at identifying the key themes from the industry comments. Due to the reoccurring nature of these themes, it is imperative that the discussion is comprehensive and the logic sound to ensure the credibility of the document and improve the understanding across industry. Each theme overlaps with other themes and as these discussions are development I am sure they will be separated or combined as the discussion matures.

Piece Part Theme

The licensee argues (correctly) that the more information that is available, the more accurate our estimation is of the risk. This comment needs to be embraced because it is the role of all PRA practitioners to incorporate this evidence where possible. The issues which the NUREG needs to discuss is the validity of current methods to incorporate that information because the assessment becomes subjective. This needs to include the following evidence:

1. Knowledge that a component failed (AFM)
2. Knowledge of the cause of failure (PAFM)
3. Knowledge of the cause condition at other components in the CCCG (GDM)
4. Knowledge of a performance deficiency which could increase the probability of other failures (not modelled)

Assumption of Perfect Symmetry

A common comment is in regards to specific scenarios where the assumption of shared dependency between components in the CCCG is violated. Ground rule 1 ensures that the analysis does not go further than the assumption inherent in the current method (AFM). The NUREG needs to discuss the following aspects of this problem:

1. Occasions where this assumption causes conservative results (i.e when the coupling factor does not exist for that cause)
2. Occasions where this assumption causes optimistic results (i.e when the coupling factor goes outside the CCCG or between failure modes on the same components).
3. Support people doing further analysis if required to justify ground rule 3 if applicable.

Failure Memory

The justification for the failure memory approach is not in the NUREG and instead these discussions are directive without explanation. I believe giving it a name 'failure memory' gives the impression that this approach is 'made up' for this NUREG (and ECA). Instead the following concepts need discussion (preferably without a name):

1. What is the objective of ECA.
2. What is the point in time at which the risk is being assessed?
3. What evidence can be incorporated to assess the risk at that point in time.
4. The concept that the *actual risk* of core damage for the plant only changes when something physical changes (like the state of the plant – i.e a failure or a design change occurs).
5. The concept that the *assessed risk* is our estimate of the *actual risk* given the information available. The uncertainty around this estimate decreases as more information is made available, but the *actual risk* does not change.

Boundary conditions for dependency assessment

There is a concern regarding where the scope of dependency assessment stops (in particular organizational factors). This discussion needs to cover:

1. **Identical Q_T Constraint.** Current methods require the boundary to be confined to identical components (equal Q_T) and therefore is limited to dependencies between identical component types. Discuss how future models are likely to increase the scope of this dependency assessment because everyone would agree that all components in a flooded room are effected together. Significantly underestimates the risk.
2. **Symmetrical Component Type Assumption.** Current methods require an assumption of identical and complete coupling factors between all components within a CCG. The CCG assessment makes this determination and therefore the consideration for CCF is constrained to components which share the majority of its coupling factors. When estimating parameters from historical data using this assumption it may under estimate the risk. When applying CCF modelling to a particular system it may overestimate the risk.
3. **Data Classification Level.** See 'Piece Part' key theme. For the same reasons that the data collection does not directly support piece part analysis, it also does not directly support the analysis of high level organizational dependency assessments.
4. **Significance of Dependency.** NRC recognizes that dependencies exist but may not require modelling due to its insignificant impact. If

implemented correctly (i.e with sensitivity analysis) then this consideration will not have a significant impact on the outcome.

Modelling Synchronized Events through CCF

CCF model the synchronization of events which are observed to cause simultaneous failure at a higher rate than the union of the independent failures. A lot of feedback proposed an increase to the individual failure rates instead of using CCF modelling. The key message missing from this logic is whether the components are 'dependent' in some way. I.e if failure of one component changed my belief that the other component would fail.

This discussion needs to cover:

1. Degradation failure mechanism modelling (light bulb, 4 x tires on car). Why CCF includes synchronized failures of components with degradation failure mechanisms (which a FTA cannot account for).
2. Latent human error.
3. Partial failures.
4. Mission time. The data collection assumption for mission time needs to be identical to the definition of time period for basic events in the FTA.
5. When to adjust an independent failure rate and when this violates the logic of CCF.

"Cause Condition Exists" versus "Failure due to Cause"

In many causes the evidence is that the cause condition (i.e design error) did not exist at the other components. Knowing this CCF is not applicable. However the current models do not allow this distinction to be made. A discussion on this needs to include:

1. Acknowledgement that knowing the cause condition does not exist at other components means CCF was not likely for that mission (beyond the normal effect without failure).
2. Acknowledgement that if the model was able to model the propagation of failure only when the cause condition was present at each component, that the AFM parameters would be significantly higher.
3. Acknowledgement that the current AFM is a expected value of propagation for both these scenarios. That means we cannot just apply it only when the cause condition existed at more than one component, because this would SIGNIFICANTLY under estimate the risks.

Responses to Key Industry Comments

1. Several comments were received concerning the definition of common-cause failure (CCF). Specifically, failure timing and coupling mechanism were issues that were mentioned. The most representative comment was received from Karl Fleming and is provided in [Appendix A](#).

- Common Cause Failure (CCF): a failure of two or more components during a short period of time as a result of a single shared cause.
- The causes of independent and common cause failures were essentially the same. CCF is not based on the common root cause but rather the existence of a coupling mechanism.

Draft NRC Response

Failure Timing. CCFs should not be limited by the time separated. A shared cause may not make multiple components fail at the exactly same time. For example, assume that the wrong lube oil is used in two EDGs. One EDG may fail in the 2nd test after the wrong lube oil was used, while the other EDG may fail on the 5th test. If the wrong lube oil causes the EDG failures, even if the two failures are separated months, they should still be considered as CCF events.

In the PRA space, we are concerned with the multiple failures of components within the same CCF group occurring within the mission time. We believe the CCF definition is not inconsistent with the reports (e.g., NUREG/CR-4780 and NUREG/CR-6268) stated in comments provided by industry.

NUREG/CR-4780 defines unreliability as:

The probability (relative frequency) that a system or component fails (in regard to specified success criteria) during a specified time interval. This time interval is often referred to as the "mission time."

The draft NUREG definition for CCF uses the term "short period of time"; however, the draft NUREG authors used of the term was meant to be synonymous with mission time. Therefore, the CCF definition provided in the draft NUREG is not inconsistent with the definition provided in NUREG/CR-4780.

NUREG/CR-6268 does not screen out the CCF events according to the time. It applies a timing factor to weigh the events.

Timing Factor. This is a measure of how close in time multiple failures occurred. In general, the goal of the timing factor is to assign a weighting factor to the CCF event based on the time between individual failures. The acceptable input for this field is a decimal number from 0.00 to 1.00. Specific values to be used are:

- 1.00 Multiple failures that occur within the PRA mission time. For standby components whose failures were discovered during testing or observance, but within half of the testing interval, the timing factor is 1.00.
- 0.50 Multiple failures that do not occur within the PRA mission time, but within a month of each other. For standby components whose failures were discovered during testing, but within a time interval (T/2, T), the timing factor is 0.50.

Commented [HC1]: Consensus of Karl's comment is in the parameter estimation arena, not necessarily an issue with the draft Nureg.

Commented [CLA2]: There are two issues here: (1) elevated failure probability shared by multiple components, and (2) dependent failures, with a coupling mechanism to make them approximately simultaneous. The second case is traditionally solved by adding a CC basic event, a new kind of failure. The first case ought to be solved by increasing the individual failure probabilities of all the affected components, but I don't know what is done in practice.

Commented [CSH3]: If the mission time is used as the short period of time, why not just use that term instead of the ambiguous "short period of time."

Commented [CLA4]: For quarterly staggered testing, this seems inconsistent with the other possibilities below. Maybe I misunderstand "testing interval" and the meaning of T.

- 0.10 Multiple failures that occur **more than one month** apart. For standby components whose failures were discovered during testing, outside the test interval, the timing factor is 0.10. The test interval is discussed in Section 2.3.1.1.

Coupling Mechanism. In ECA space, for example during an SDP evaluation, the major goal is to estimate the potential risk due to the observed performance deficiency. The coupling mechanism is the observed performance deficiency. The potential risk due to the CCF is the failure probability of the redundant component within mission time due to the observed performance deficiency.

An example is provided in Karl Fleming's comment ([Appendix A](#)) concerning light bulb failures, which includes:

Essentially all the incandescent light bulb failures that have ever occurred have been due to the same degradation mechanism, thermal fatigue of the filament. That does not mean that they are all common cause failures. Absent a coupling mechanism two or more light bulb failures seldom if ever occur in a short interval of time. If they did there must be a coupling mechanism for them to be classified as a common cause failure.

In this example, thermal fatigue of the filament is not justified as a coupling mechanism (in accordance to the draft NUREG), because there is no observed performance deficiency. However, if the licensee has a maintenance program to replace the light bulbs according to their MTTF. And if this maintenance program was determined that it had failed and a subsequent performance deficiency was identified, then the CCF probability should be adjusted accordingly.

Commented [CLAS]: This is a good explanation. However, this failed maintenance program does not couple times of failures (unless the light bulbs are all the same age and have a pretty sharp end-of-life time.) Instead, the failed maintenance program increases the individual failure probability. In the PRA software, the probability of multiple failures is still product of the (elevated) individual failure probabilities. No CCF basic event needs to be added. I think the issue of elevated individual failure probabilities (as revealed and identified through examination of one or several individual failures) is something that we need a mechanism for handling. Because we don't have such a ready mechanism, we instead to use a tool that we DO have, CCFs, even though it doesn't really fit.

Revised April 16, 2015

2. Comments were received on the alpha factor and its relation to conditional failure probability. Specifically, comments stated that the alpha factor is not the conditional probability of a common cause failure given a member of the CCCG group has failed. The most representative comments concerning this issue was received from NEI and Steve Mays (provided in Appendix B).

Commented [HC6]: Song-hua to discuss the math with Cory and Andrew. However, the consensus is that alpha factors are estimates for conditional probabilities and the math supports this.

Draft NRC Response

$P(A \text{ and } B) = F_{A \text{ and } B} / (F_{A \text{ and } B} + S_{A \text{ and } B}) = F_{A \text{ and } B} / D_{A \text{ and } B}$ should be:

$$P(A \cap B) = \frac{F_{A \& B}}{F_{A \& B} + S_A + S_B - S_{A \& B}} = \frac{F_{A \& B}}{\text{Total Demand}}$$

$$P(A \cap B) = \frac{F_{A \& B}}{\text{Total Demand}} = \frac{F_{A \& B} / (F_A + F_B)}{\text{Total Demand} / (F_A + F_B)} = \frac{\alpha}{1/P(A)} = \alpha \cdot P(A)$$

When $P(A) = 1$, $P(A \cap B) = \alpha$

Conditional Probability: $P(B|A) = \frac{P(A \cap B)}{P(A)} \rightarrow P(A \cap B) = P(B|A) \cdot P(A)$ _____ (Eq.1)

In PRA application: CCF Probability = $\alpha \cdot Q_{\text{total}}$

$$Q_{\text{total}} = P(A) = P(B)$$

$$\text{CCF Probability} = \alpha \cdot P(A) \text{ _____ (Eq.2)}$$

From (Eq.1) and (Eq.2), alpha factor can be seen as a conditional probability of B fail given A failed.

Revised April 16, 2015

3. Comments were received concerning the data that is used in calculating alpha factors. Specifically, comments were received that the alpha factors are calculated using subjective probabilities of CCF events that did not occur. The most representative comment concerning this issue was received from Steve Mays (provided in Appendix B).

Draft NRC Response

In conventional statistics, infinite sample space is required to evaluate the probability. In the real world, the sample space is too small. Expert judgment is allowed to evaluate the probability in a Bayesian process.

$\Sigma_i (h)$ (F_A with potential CCF of B) represents the expectation of expert judgment. For example, pump A failed first and pump B failed one year later due to the same shared cause. By definition, these failures are not considered as CCFs because the time difference between failures is greater than the mission time (24 hours). However, from the statistical view point, pump A and pump B have a certain probability to fail within 24 hours. An impact factor (in this example, time factor) represents that certain probability.

Immediately after the failure of pump A, pump B is not failed, but it still is in a degraded state due to the shared cause. From the CCF view point, because of the degradation is due to the shared cause, this failure probability of pump is still different from the failure probability of pump B without the shared cause with pump A.

The NRC staff believes that applying impact factors in quantifying alpha factors is a more complete way to evaluate CCF events. It is also consistent with the Bayesian process using expert judgment.

Commented [HC7]: A fundamental change (the NUREG needed. The data does use judgment, but is reviewed and 2ndchecked internally and externally.

Commented [CLAS]: I've said above that I think that degradation really ought to be modeled by increasing the individual failure probabilities, not by adding a CCF basic event.

4. Comments were received stating that the average alpha factors do not represent a specific failure event. Specifically, the alpha factor value includes events not related to the PD; current CCF models were not designed and are not capable of assessing the increased probability of CCF that may be perceived in the review of the causes of the event; alpha factors cannot quantify the impact of organizational factors in PRA; and using the "average" alpha factor can GROSSLY overestimate or underestimate the conditional failure probability of other components in the CCG. The most representative comment concerning this issue was received from Steve Mays (provided in [Appendix C](#)).

Commented [HC9]: See previous NEI response. Mention future improvements in the future, but current state of the art is using the alpha factors as is.

Draft NRC Response

NRC staff agrees that a more detailed methodology is needed. A cause based CCF methodology and data base are developing. However, alpha factors are the best available resource for now.

NRC Response to the Appendix 1:

In general,

$$\alpha = \frac{\# \text{ of } A \text{ and } B \text{ Failure}}{\# \text{ of } A \text{ Failure} + \# \text{ of } B \text{ Failure}} = \frac{(\# \text{ of } A \text{ and } B \text{ Failure})_{PD} + (\# \text{ of } A \text{ and } B \text{ Failure})_{-PD}}{(\# \text{ of } A \text{ Failure} + \# \text{ of } B \text{ Failure})_{PD} + (\# \text{ of } A \text{ Failure} + \# \text{ of } B \text{ Failure})_{-PD}}$$

If we want to estimate α_{PD} and α_{-PD}

$$\alpha_{PD} = \frac{(\# \text{ of } A \text{ and } B \text{ Failure})_{PD}}{(\# \text{ of } A \text{ Failure} + \# \text{ of } B \text{ Failure})_{PD}} \text{ and } \alpha_{-PD} = \frac{(\# \text{ of } A \text{ and } B \text{ Failure})_{-PD}}{(\# \text{ of } A \text{ Failure} + \# \text{ of } B \text{ Failure})_{-PD}}$$

$$\alpha_2 \neq \alpha_{PD} + \alpha_{-PD}$$

α_{PD} may be greater or less than α_2 .

α_2 can be seen as the Bayesian update of α_{PD} using α_{-PD} as the prior (Bayesian update for Beta Distribution).

When data is limited, it is difficult to say whether α_2 or α_{PD} more accurately reflects the potential risk due to the potential CCF of an observed failure resulting from a performance deficiency. Without enough data points, a Bayesian process is necessary. α_{-PD} may not be the best prior to do Bayesian update for α_{PD} ; however, it is the best available for now.

If there exists better available data source, NRC staff agrees to apply it in ECA.

Commented [CSH10]: When we say better, do we mean more (quantity) or more applicable, or both? We should reward.

5. Comments were received concerning the failure memory approach and credit for verification of extent of condition. Specific issues included the use of function testing to eliminate CCF potential, the screening of certain failure mechanisms based on root cause analysis, and the crediting of positive factors that may reduce CCF potential that are not considered in the alpha factor method. The most representative comments concerning this issue were received from PWROG and Palisades (provided in Appendix D).

Draft NRC Response

Functional testing of the redundant component(s) once the first component failure observed due to a performance deficiency does not prove the likelihood of the potential CCF has not increased.

Some extent of conditions (e.g., maintenance activities performed by different maintenance personnel, with different levels of training and experience) may be reduce the risk of the potential CCF. However, currently, ECA is a kind of risk-informed application, not risk-based application. Without supporting data, it is impossible to quantitatively credit some of these "uncommon" factors presented in industry comments. However, the Ground Rule 3 of the draft NUREG (Section 1.4 ECA Ground Rules for CCF Treatment) addresses the qualitative crediting of positive programmatic actions:

"(3) Credit for programmatic actions to mitigate CCF potential (staggering equipment modifications, etc.) should be applied qualitatively during the enforcement process and not incorporated into the numerical risk result. In other words, strong defenses against coupling factors can mitigate CCF potential, but such mitigation is to be addressed qualitatively during the enforcement process rather than quantitatively in the ECA. Qualitative consideration of such factors might allow, for example, a low White finding to be changed to Green."

Commented [CSH11]: SDP is risk-informed, but not as E

Industry Comments and NRC Responses on Draft CCF NUREG

#	Comment
PWROG Comment #1a	<p>General Comments: The purpose of the draft NUREG is to assist the staff in dealing with modeling considerations of CCF in the context of an ECA. This draft NUREG is intended to replace the text that was removed in the RASP Handbook that was related to treatment of CCFs. Section 1 establishes the philosophical underpinnings supplemented by three ground rules and some examples. Thus, Section 2 provides the recommended approaches to the NRC staff. If these approaches were sufficiently robust and representative of a consensus of PRA practitioners, the draft NUREG would end there; however, Section 3 discusses a variety of issues related to current CCF modeling approaches (especially in a SPAR model) in the context of ECA. Section 4 reinforces these issues by citing the research that is currently being (or planned to be) performed to address some of the identified issues—with some of the timeframes being long-term (to be completed in more than five years). This suggests in the context of an ECA that the currently used CCF models are not sufficiently robust to support the application at hand. Perhaps some simpler, more grounded approaches are needed to deal with CCF in the context of ECA at this time. When the stated research resolves some of the identified issues, then the concept presented in this draft NUREG will be more viable.</p>
NRC Response	<p>The draft NUREG attempts to provide a best available methodology to apply in current CCF analysis in ECA. However, the best available method may still have certain limitations. This draft also provides discussion of the limitations and future research topics. Of course, if there exists better methodology and it does not have the limitations as the so-called best available method, it may be adopted to replace the method proposed in this draft NUREG.</p>
AO	<p>Section 3 is required as the basis for as the basis for when</p> <p>Emphasis that very model (even future more capable models) will have assumptions and limitations which need to be understood by those applying them. Also emphasis that the NRC is committed to the continued improvement of best practice to drive improvements to support the management of nuclear safety.</p> <p>Key Theme: N/A</p> <p>Model: N/A</p>
PWROG Comment #1b	<p>General Comments (cont.): Starting in Section 1.1 and continuing throughout Sections 1 and 2, especially the discussion in Section 1.4, is the concept that the underlying performance deficiency (e.g., poor maintenance practice) should be the basis to consider the full impact of CCF in the retrospective assessments. In a presentation made by NRC at the EPRI's Configuration Risk Management Forum (CRMF) on this draft CCF NUREG, this concept was discussed. The concept as proposed in the draft NUREG sets a dangerous precedent as there is apparently no "line" established that would limit the CCF impact to the CCCG. While the NRC recognizes the limitation of this concept, the final NUREG needs to be explicit about this limitation. Otherwise, with a performance deficiency of poor maintenance, which could potentially affect any component, without some explicit limitations in the draft CCF NUREG, the scope of the CCF impact could extend beyond the normally-considered intra-system CCF affects to include a wide range of inter-system CCF impacts that would potentially result in conservatism insights, which are not supported by CCF data.</p>
NRC Response	<p>The draft NUREG does not break the boundary of CCCG. With the identified performance deficiency, the impact of potential CCF is limited among the CCCG.</p>

#	Comment
AO	<p>Agree with industry comment. While the NRC response details the business rule based on the AFM, it does not acknowledge what the boundary condition should be from a probabilistic dependency point of view.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> Boundary conditions for dependency assessment <p>Models:</p> <ul style="list-style-type: none"> PAFM is still be restricted to the same component type in redundancy, however it will re-define CCCG to allow non-symmetrical dependencies to be modelled. GDM will expand the definition of dependency beyond the CCCG to more accurately model the system configuration. This will go outside the concept of a CCCG. However, in its current form it will be constrained to the same component level which is recorded as failures in RADS and the CCFDB. I.e organizational factors will not be considered at large.
PWROG Comment #1c	<p>General Comments (cont.): The text supporting Figure 1 needs to be clear that the A1, B1, A2, B2, etc. represent subcomponents of a single modeled component in the PRA, i.e., A1, B1, etc. are not separately modeled in the PRA. Second, it must be clear the Components A and B are in the same CCCG. Without these explicit constraints, there would be no bounds on the impact of subsequent CCFs.</p>
NRC Response	<p>See the response to PWROG Comment 1b.</p>
AO	<p>Agree with PWROG comment. This is just adjusting the comments in the figure. However the fact that PRA does not include this explicitly is a known limitation which is being addressed through proposed new models. This part of the piece part discussion.</p> <p>Key Theme. Piece part theme</p> <p>Models:</p> <ul style="list-style-type: none"> PAFM allows the next level in piece part analysis through failures due to a specific cause. However this is limited to like components. GDM will be explicit in modelling the dependency between cause conditions as per the diagram in the NUREG.
PWROG Comment #1d	<p>General Comments (cont.): With these conditions established, there is potential for being overly conservative. Using the example of "poor maintenance process" as the performance deficiency, there is no differentiation of how the maintenance practices have contributed to the observed failure. The draft CCF NUREG suggests that if Subcomponent A2 was over-torqued (leading to its failure) due to a poor maintenance procedure or poorly trained technician, then all other subcomponents are subject to failure due to poor maintenance and the entire value of CCF for all the components in the CCCG must remain in the model. This ignores the fact that there are varied forms of maintenance for which the component may be subject. All of these forms are not torquing (e.g., calibration, filling an oil reservoir, cleaning, etc.). Further, these similar and dissimilar maintenance activities may be performed by different maintenance personnel, with different levels of training and experience. Another consideration is that all maintenance procedures are not "created equal." Thus, to consider the full impact of the CCF (e.g., not reducing the alpha factor or beta factor) in light of the "uncommon" aspects of the underlying performance deficiency will over-estimate the impact of CCF on the risk metric results. Adjusting the CCF factors to account for these issues is permitted by the definition of "failure memory approach" where it states that "failure probabilities ... are conditioned as necessary to reflect the details of the event."</p>

#	Comment
NRC Response	<p>Basically, the alpha factor is a ratio of the number of common cause failure event (n) to the number of any failure event (N).</p> $\alpha = n/N$ <p>Of course, the common cause events may be classified into different set according to the details. In other words,</p> $n = n_1 + n_2 + n_3, \dots$ <p>When we classify n into detailed n_1, n_2, n_3, \dots, we also need to classify N into detailed N_1, N_2, N_3, \dots. In ECA, the potential CCF probability will be n_1/N_1 (not n_1/N). For now, because of the resource limitation, we may not have the information about $n_1, n_2, n_3, N_1, N_2, N_3, \dots$, n/N is the current best available data we may have and it may not be more conservative than n_1/N_1. When the more detailed data is available, of course, the more detailed will be adopted.</p>
AO	<p>To me this is the same discussion as piece part because it's about considering the very specifics of the scenario instead of just the fact that it was a 'design error' or 'human error'.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Boundary conditions for dependency assessment • Piece part analysis <p>Models.</p> <ul style="list-style-type: none"> • PAFM allows the next level in piece part analysis through failures due to a specific cause, but is limited to like components. • GDM allows the next two levels in the piece part argument by modelling the cause condition and dependencies can be applied across components.
PWROG Comment #1e	<p>General Comments (cont.): Focusing on the common elements, there is also an issue of "extent of condition." The draft CCF NUREG states that the failure memory concept does not acknowledge subsequent verification of extent of condition. This is overly conservative if there are some "uncommon" factors present, (e.g., different inspectors, different maintenance personnel, experience and training, etc.).</p> <p>NRC Inspection Manual Chapter 308, Attachment 3, Section 3.C specifies ten specific attributes and principles for risk-informed SDP tools. Principle 10 states that: "All technical judgments made by the staff within any probabilistic-based SDP tool should have bases that are clearly observable as 'reasonable,' as well as reasoned, based on best available information, and not purposefully biased in a conservative manner simply because of uncertainties which are applicable in both conservative and non-conservative directions. As a corollary, this also requires that staff technical or probabilistic judgments not be 'traded off' within a risk model by allowing a conservative bias in one modeling factor simply because another factor is believed to be non-conservatively biased."</p> <p>It should be ensured that this principle is maintained in the guidance for treatment of CCF in an ECA by ensuring that the process is sufficiently "reasonable" and reasoned, and not biased in a conservative manner to account for perceived uncertainties in the probabilistic treatment of CCF.</p>

#	Comment
NRC Response	<p>Without data support, it is impossible to quantitatively credit these some "uncommon" factors presented. However, the Ground Rule 3 addressed in section 1.4 ECA Ground Rules for CCF Treatment of this draft NUREG allow the analyst to take the credit qualitatively:</p> <p><i>(3) Credit for programmatic actions to mitigate CCF potential (staggering equipment modifications, etc.) should be applied qualitatively during the enforcement process and not incorporated into the numerical risk result. In other words, strong defenses against coupling factors can mitigate CCF potential, but such mitigation is to be addressed qualitatively during the enforcement process rather than quantitatively in the ECA. Qualitative consideration of such factors might allow, for example, a low "White" finding to be changed to "Green."</i></p>
AO	<p>Agree with industry's comment and with NRC response. I believe there are a number of issues to address industry's comment:</p> <p>Issue 1: "does not acknowledge subsequent verification" this is the failure memory justification</p> <p>Issue 2: "extent of condition" this is part of the piece part argument because current methods do not distinguish between propagation of the condition versus propagation of the failure.</p> <p>Issue 3: "e.g., different inspectors, different maintenance personnel" is part of the boundary conditions theme on how far these maintenance personnel will influence failures.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Boundary conditions for dependency assessment • Assumption of perfect dependent symmetry • Piece part theme <p>Models.</p> <ul style="list-style-type: none"> • PAFM overcomes the assumption of dependence within a CCCG when it doesn't exist. • GDM allows dependencies to be modelled based on system configuration (i.e. different maintenance personnel). • GDM solves some of the piece part argument.
PWROG Comment #2	<p>Missing Expressions: There are several missing expressions on Page 7, 2123, which make it difficult to follow the discussion.</p>
NRC Response	<p>Include the missing expressions.</p>
PWROG Comment #3	<p>Modeling of CCF in PRA Models: The draft CCF NUREG states Section 1.1 states that "Inter-components dependencies, which are not captured explicitly in the PRA models, span a wide range..." This type of inter-component dependencies is specifically referring to CCF. The statement appears to contradict subsequent discussion in that paragraph, and in Section 1.2, which acknowledges that CCF is included in the PRA. Such a statement may be misleading."</p>
NRC Response	<p>Provide additional clarification to explain what is meant by "not captured in the PRA models."</p> <p>JAS: I don't see that. I think what is clearly stated is that inter-component dependency is acknowledged when CCF is included in a PRA model. The purpose of including CCF events is to evaluate the dependency through empirical means. This is an acknowledgement that PRA models will never capture every dependency and that empirical methods can cover this deficiency.</p>

#	Comment
AO	<p>The sentence is ambiguous. Two meanings are:</p> <ol style="list-style-type: none"> (1) Inter-component dependencies are not captured at all in the PRA model. (PWROG's interpretation) (2) The sentence could be referring to those inter-component dependencies which are not explicit in the model (John's interpretation) <p>The sentence is restructured to mean John's interpretation. The reply should acknowledge this ambiguity.</p> <p>Key Theme: N/A</p> <p>Models: N/A</p>
PWROG Comment #4	<p>Common Cause Failure Definition: The definition of CCF (Section 1.3) states that the <i>"failure mechanisms do not have to be shared."</i> This is true to a certain extent. For example, an earthquake may cause different components to fail via different mechanisms is clearly-identified as a CCF with the same cause, e.g., the earthquake. If one component fails because the manufacturer used an under-specified sub-component and a second component in the same CCG fails due to a faulty maintenance procedure—these failures are not considered to be a CCF event. While the mechanisms differ, there is no shared cause to generate those mechanisms.</p>
NRC Response	<p>Provide one or more examples to clarify the definition of CCF.</p>
AO	<p>Agree with industry comment. Discussions of failure mechanisms are part of the piece part theme and the example of the earthquake are part of the boundary condition discussion.</p> <p>Key Theme:</p> <ul style="list-style-type: none"> • Piece part theme • Boundary conditions for dependency assessment. <p>Models: N/A</p>
PWROG Comment #5	<p>Common Mode Failure Definition: The draft CCF NUREG, as stated in this Section 1.3, does not encourage the use of the term <i>"common mode failure,"</i> which was first used in WASH-1400. The SPAR models used by the NRC to support the SDP are less detailed than the industry's PRA models and may not explicitly include failures caused by shared components or latent human errors. Such failures are included in the CCF database and used to estimate CCF parameters. The PWROGC has an ongoing program to identify such failures when the CCF data sets are reviewed.</p>
NRC Response	<p>Include a clarifying statement to indicate that disparity between the SPAR and industry's PRA models could impact the quantification results of an ECA; if failures caused by shared components and latent human errors are not treated the same way in the models.</p> <p>JAS: SPAR models are somewhat less detailed than industry models. However, the data collection effort uses component boundaries that are consistent with SPAR model component representations. The data collection does therefore capture the impact of unmodeled dependencies, and does capture the impact of latent human errors.</p>

#	Comment
AO	<p>Issue 1: SPAR model difference. John's comment. Issue 2: Latent human failures. Agree with their comment. It is not explicit but instead the synchronized failures from these causes are included within the empirical ratios of the current CCF models. See key theme Modelling Synchronized Events through CCF Issue 3: Common Mode Failure definition. No idea of their point.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> Modelling Synchronized Events through CCF <p>Models.</p> <ul style="list-style-type: none"> PAFM can better model the propensity for failure from a human cause between like components (but its still not explicit) GDM can include the propensity for failure from human causes between components.
PWROG Comment #6	<p>CCF Parameter Update: Failure probabilities are conditioned as necessary to reflect the details of an event associated with the performance deficiency as part of an ECA. As noted in the first ground rule (Section 1.4), such performance deficiencies are usually identified in the NRC's inspection reports. In the majority of cases, such events are classified as potential CCFs that have not yet entered into the CCF database. The calculation of conditional CCF probabilities (i.e., alpha factors) is based on the CCF parameters derived from events already included in the CCF database. The draft CCF NUREG does not discuss whether a Bayesian update of the CCF parameters should be performed to include the event associated with the performance deficiency. The NRC should not be updating CCF parameters on the basis of a single failure and a retrospective assessment (to determine what might have happened). The CCF database must be developed and maintained on the basis of CCF event that have actually occurred.</p>
NRC Response	<p>Include a clarifying statement to indicate whether update of the CCF parameters is necessary in performing the ECA.</p> <p>JAS: The case addressed by the draft NUREG is when a failed component is part of a CCG; CCF coupling factors have therefore been identified. When CCF coupling factors exist, CCF potential must be evaluated and the conditional probability of failure of the remaining components in the group will be greater than the case when no coupling factors exist and the components can be treated as potentially failing independently (those that actually functioned during the period/event being evaluated). The event under consideration is only rarely a candidate for inclusion in the CCF database. To consider it for inclusion, multiple failures in the group must have occurred (not potentially occurred). The only exception is when independent engineering judgements can be made that additional components in the group, would, with high likelihood, have failed if demanded during an actual PRA mission.</p> <p>The updating of CCF parameters for a specific ECA is not discussed because it is not generally called for. ECAs are normally performed using the QA'ed information in the CCF database. In a case where a CCF event has occurred and is the subject of the ECA, it might make sense to include the information in a parameter estimate specific to the ECA. This would be done using Bayesian methods, by including the event in the CCF database and recalculating parameters. The normal time scale involved in this process typically lags ECA by years. If the results were needed for a specific analysis, NRC would ask technical specialists for assistance to accelerate the process.</p>
AO	<p>Agree with their comment which I read to say that the event being assessed should be included as a failure entry in estimating the parameters. This comment agrees with the proposed NRC procedure. Review document's discussion to ensure this is clear.</p> <p>Key Theme. N/A Models. N/A</p>
PWROG Comment #7	<p>Deviations from Ground Rules: This section (Section 1.4.1) provides a caution when revising CCG boundaries, because typical performance deficiencies, which reflect organizational problems, such as poor maintenance, can couple the EDGs despite design differences.</p>

#	Comment
NRC Response	Provide a stronger statement that would permit revising CCFG boundaries, or alpha factors, for example, when "organizational problem" does reflect the design difference.
AO	I don't understand the comment. Key Theme. N/A Models. N/A
PWROG Comment #8	<p>CCF Examples: In Section 1.5 (first paragraph), there is a footnote that indicates that the events from this section would be included in "future revisions of the database." These events each involve the failure of a single component—there is no CCF to put into the database. For the purpose of an ECA, a CCF is assumed to be able to occur in the future. The database should be reserved for when a CCF event actually occurred.</p> <p>JAS: True, but the first paragraph of section 1.5 is correct. It does not say these events will be added. It says that sometimes judgements are made with respect to whether an observed single failure might become a CCF event during an actual PRA mission. When these judgements are made, a degree of believe is associated with the event characterization, and this propagates through the parameter estimation process and affects the uncertainty in any resulting CCF probability predictions. The use of judgement is necessary in characterizing the data, and it is not fair to say the data includes events that did not occur. The event characterizations receive independent review (sometimes multiple reviews) to assure the judgements are as accurate as possible.</p> <p>This is the same process as used in characterizing single failure events.</p>
NRC Response	Either delete this footnote, or add clarification to include the CCF determination process prior to inclusion in the CCF database.
AO	Agree with statement. Removing of the footnote fixes this. Key Theme. N/A Models. N/A
PWROG Comment 9	Basic Principles of CCF Treatment in ECA (Section 2.1): These principles, particularly item (6), convey that in the context of ECA, all failures are dependent failures unless proof can be shown of failure independence. This is not reflective of operating/ failure experience, and in the context of ECA will be overly conservative with the number (and nature) of dependent failure.
NRC Response	<p>See responses to PWROG Comment 1.</p> <p>JAS: This statement is absolutely not true! Section 2.1 makes the case that there is always POTENTIAL for dependent failure. What Section 2.1 should say to be more accurate, is that when CCF coupling factors exist between components, then dependency must be accounted for in the ECA. Items (1) – (6) address invalid arguments that are sometimes used to justify not accounting for dependency when the PRA model has already conceded that dependency exists (as indicated by the presence of a CCF event in the model to begin with).</p>

Commented [CSH12]: Is there a particular subsection of Comment #1 that we should be referring to?

#	Comment
AO	<p>The comment is valid and targets the assumptions around Ground Rule 1.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> Assumption of perfect symmetry Piece part theme (higher levels they are dependent, at lower levels not) <p>Models.</p> <ul style="list-style-type: none"> PAFM does not require this assumption completely. The 'actual' dependencies between components (within the same component type) are able to be accounted for (instead of a rule saying all dependencies are shared). GDM is the most accurate for modelling the system dependencies and can account for these between component types.
PWROG Comment #10	<p>Failure Memory Approach: In discussing the guidance in Section 2.1 on "<i>Basic Principles of CCF Treatment in ECA</i>," the draft CCF NUREG indicates that in using the failure memory approach in ECA no credit is given "<i>to observed successful equipment operation</i>." To determine the potential for CCF, given that one or more components within the CCCG were observed to be incapable of performing their intended function, testing of the redundant components within the CCCG may be performed. Certain limiting conditions of operation (LCO) (i.e., EDGs) for the Technical Specifications (TS) require the performance of additional tests when one component within the CCCG is observed to be in a degraded condition. Successful operability tests give assurance that the component will perform its intended function when demanded. The failure memory approach appears to be in conflict with certain LCOs. It appears that some credit should be given for successful equipment operation in the reduction of CCF potential.</p>
NRC Response	<p>Provide added clarification to demonstrate why the "<i>failure memory approach</i>" in ECA is not in conflict with certain LCOs of the plant's TS. How to quantify The reduced CCF potential may be challenging and require further research.</p> <p>JAS: The failure memory approach specifies that the operability of equipment during the event must be predicted conditional on known failures, and nothing else. This is not at odds with baseline unreliability prediction methods where the result is not conditioned on specific failures, and only those specific failures. The staggered testing scheme with requirement to test remaining trains on failure detection impact the probability of failure on demand, and this is reflected in the parameter estimation process, and ultimately in the prediction of conditional system failure probabilities when failure events are specified, as in ECA.</p>
AO	<p>Agree that additional clarification is required. The failure memory approach discussion needs to discuss how this test is considered a simulation of the system's response to an initiating event. Therefore the 'perspective' of failure memory is before this test. Further discussion is required in the failure memory approach about consideration of if the repair can be conducted within the mission period (i.e if it failed the test, could it be repaired in which case the test provides no further increase or decrease of successfully completing the mission.)</p> <p>Key Theme.</p> <ul style="list-style-type: none"> Failure memory approach <p>Models. N/A</p>
PWROG Comment #11	<p>ECA Workspace: In Section 2.2, "<i>CCF Treatment Categories</i>," the draft CCF NUREG indicates that examples are provided in Appendix C that illustrate the ECA Workspace of SAPHIRE 8. Appendix C was not included as part of the draft CCF NUREG.</p>
NRC Response	<p>Provide Appendix C. These examples need to be clarified in Appendix C or the information should be included as part of the final NUREG.</p>

#	Comment
PWROG Comment #12	BPM Symmetric Assumption (Section 3.1.2): The BPM assumes that each component in the CCG has the same failure rate or failure probability. This assumption is invalidated if one of the components within the CCG is degraded and has a failure rate or failure probability that differs for the others. SAPHIRE 8 addresses the treatment of the degraded component, but the draft CCF NUREG provides no explanation on how the degraded condition is modeled in SAPHIRE 8 when performing an ECA.
NRC Response	Provide an explanation on how SAPHIRE 8 addresses the treatment of degraded components. JAS: True, the SAPHIRE 8 approach is limited to assuming all components have the same failure rate. This is a limitation of the methodology. When SAPHIRE detects different failure rates in a CCF group, it must pick one. ??? does it pick the smallest or largest ??
AO	As per John's comment. Key Theme. N/A Models. Nil. Degradation might be early incorporated into GDM using virtual evidence (its similar to how degradation is treated in impact vectors), but this would need to be investigated more to confirm the logic/assumption is correct.
PWROG Comment #13	Treatment of Shared Components and Latent Human Errors (Section 3.2.1): The treatment of shared components and latent human errors can be a source of uncertainty in the ECA. The analyst must determine whether such treatment is implicit or explicit. To make such a determination, the analyst should obtain necessary information from the utility. This can be a source of uncertainty that may or may not be recognized the ECA analyst. The draft CCF NUREG has not discussed the potential sources of uncertainty that may be encountered in performing an ECA.
NRC Response	Include guidance that would be helpful in the identification and characterization of sources of uncertainties. JAS: Failure rate data includes a wealth of human error contribution. Explicit treatment of latent human error would introduce significant double counting.
AO	I agree that the difference between explicit and implicit modelling (not just human) needs to be addressed as CCF modeling only deals with implicit human errors. Latent human errors is a synchronization issue discussed as a key theme. Issue 1: How does the analyst determine if the cause is included in the CCF parameter or part of an explicit HRA model? I don't know the answer to this. Issue 2: Need comment that identifies how the proposed method details with uncertainty. Key Theme. Modelling Synchronized Events through CCF Models. N/A
PWROG Comment #14	Prior Distribution of Alpha Factors: The prior distributions for alpha factors are currently estimated using data from the CCF database for the 1995–2005 timeframes, as noted in this section. The latest released version of the CCF database includes events up through 2010. The NRC has an ongoing program that collects CCF events, which are used to update the CCF database. This section (Section 3.2.2) contains the following: <i>"Because it was felt that the number of complete CCF events may be under-represented, especially for large group sizes, a statistical model was developed to estimate the number of 'missing' complete events, and these were then added to the partial event counts for each group size."</i> This statement is not particularly strong in conviction. What is the basis for the "feeling" that the number of CCF events "may" be underestimated? What is the basis for a statistical program to fill in "missing" events? This appears to be an unsubstantiated and ad hoc process to develop a prior distribution.

#	Comment
NRC Response	The NUREG should discuss how updates to the CCF database will affect the prior distributions for alpha factors. Also, provide more details regarding the statistical program that was used to estimate the number of "missing" complete CCF events.
AO	<p>Agree with industry comment.</p> <p>Issue 1: The CCF database is continually updated. The NUREG states a timeframe 1995-2005 (which is not 2010). This dates the document and will make the NUREG wrong after the next update if fixed. Propose the dates are removed.</p> <p>Issue 2: 'feeling'. Agree NRC Response.</p> <p>Issue 3: I have no idea what the quote from the NUREG means (I don't have a copy so can't check the context)</p> <p>Key Theme. N/A Models. N/A</p>
PWROG Comment #15	Treatment of Staggered Testing: The discussion in this section (Section 3.2.4) indicates a question about what, if anything, should be done. A paper is referenced that states that " <i>both of these equations maybe in error.</i> " And further that the " <i>net impact on ECA of these equations being incorrect remains to be examined.</i> " This reinforces the discussion in the general comment that the premise upon which the draft CCF NUREG is based raises a number of questions about the validity of the methods proposed.
NRC Response	<p>Discusses the value of keeping the references in the NUREG.</p> <p>JAS: This definitely needs to be addressed. Cory has much to say about it.</p>
AO	<p>Agree with industry comment. The NUREG is very open regarding the limitations and possible errors with current techniques (even the ground rules need to acknowledge that they don't always reflect reality). If Cory has an agreed answer then publish this result, otherwise soften the words to say that current research is investigating the validity of the assumptions regarding staggered and non-staggered adjustments for data, and put it as future research.</p> <p>Key Theme. N/A Models. N/A</p>
PWROG Comment #16	Conditional CCF Probability: Appendix A (first paragraph) of the draft CCF NUREG states that Appendix B to the SAPHIRE 8 technical reference includes details of the conditional CCF calculations. These calculations are not available to the draft CCF NUREG reader.
NRC Response	Provide an appendix with appropriate information from the SAPHIRE 8 technical reference.
PWROG Comment #17	Table 2 of Rounding Errors: The values provided in this table and the appropriate expression from Equation A.8 is used to calculate the basic event probabilities in Table 3 of Appendix A. The values provided in Table 3 of Appendix A are rounded to two significant numbers after the decimal point. The rounded values slightly over-estimate the probabilities, for cutsets with multiple basic events, provided in Table 4 of Appendix A. Using the values provided in Table 2 of Appendix A, the calculated probability for cutset {A-S, B-R, C-R} is 6.579E-07, which is slightly lower than the calculated probability of 6.607E-07 that was obtained using the rounded values in Table 3 of Appendix A. Depending on the number of cutsets, the overall conditional probability can also be over-estimated. For the basic event unavailability cases considered in Appendix A, the calculated probabilities should be based on the actual values provided in Table 2 of Appendix A.

#	Comment
NRC Response	<p>The computed values in Table 3 should be done to the same number of significant digits as Table 2 (three after the decimal point), and then use these revised values from Table 3 to perform the computations for Table 4.</p> <p>JAS: ECA uses machine calculations at double precision. The example is close enough for illustrative purposes. Can modify to show 2 decimal precision throughout.</p>
AO	<p>It's a valid comment for those which are trying to confirm their understanding by reproducing the results in the NUREG manually. Its an easy change to make so believe the industry recommendation should be incorporated. A comment then should be added describing that this has been done for illustration purposes.</p> <p>Key Theme. N/A Models. N/A</p>
NEI Comment #1	<p>General Comments: The Nuclear Energy Institute (NEI) 1, on behalf of the nuclear energy industry, appreciates the opportunity to comment on the subject draft NUREG, "<i>Common-Cause Failure Analysis in Event and Condition Assessment: Guidance and Research, Draft Report for Comment</i>," as the main objective of this NUREG is to improve the consistency and accuracy of event condition assessments performed in support of the SDP. The treatment of conditional CCF probability estimates in SDP evaluations has been particularly problematic for the past several years, and the effort to address this via the work documented in this NUREG is an important step towards improving SDP evaluations as a whole.</p> <p>However, as written, this NUREG does not sufficiently support this objective. Specifically, the document endorses the use of the alpha factor as a proxy for the conditional probability of CCF. Such an approach is not appropriate for evaluation of a specific event, and the document should be revised to better guide those performing SDP evaluations towards accurate characterization of conditional probability of CCF. Detailed comments regarding specific approaches that should be discussed in the NUREG in lieu of inappropriately using alpha factors in event-specific assessments are included in the attachment to this letter.</p> <p>Given the extensive revisions that would be needed to support inclusion of such information, the industry believes that a public meeting on the content of the draft NUREG would be beneficial, and further suggests that another draft of this document be released for public comment prior to publication of the final NUREG. Additionally, we urge the NRC to strongly consider comments submitted by utilities and other stakeholder organizations in evaluating the content of the draft NUREG as it currently stands.</p>
NRC Response	<p>JAS: The document does NOT use alpha factors as a proxy for a conditional CCF probability. That conditional probability results can be expressed as a function of alpha factors follows from the math in Appendix E of NUREG/CR-5485. The math is correct and a consequence of using the CCF probability model recommended in the NUREG/CR.</p> <p>The only merit in this comment is in the idea that alpha factor estimates may be too general to provide insight into a specific ECA result. The alpha factors are generally specific to the system and component being evaluated, though they are not specific to the inspection finding being evaluated.</p> <p>The procedure for estimating alpha factors, and the supporting data is state-of-the-practice. The estimates are therefore the best that can be made.</p>
AO	<p>"Such an approach is not appropriate for evaluation of a specific event" is the piece part argument.</p> <p>Key Theme. Piece part theme Models. PAFM and GDM provide more specific CCF modeling given the known cause of failure.</p>

#	Comment
NEI Comment #2	Inaccuracies Associated with Simplistic Approach to Estimating CCF: The draft NUREG proposes the use of the alpha factor in developing event-specific CCF estimates, which is a simple approach that supports more rapid evaluations to support the SDP. While the desire to pursue rapid evaluations is understandable given NRC's expectations for timely completion of a final SDP evaluation, the loss of accuracy due to the fact that the alpha factor considers failure events from all observed causes is not appropriate, and pursuing more accurate estimates should be a priority.
NRC Response	See the response for NEI Comment #3. JAS: The causal alpha factor method addresses this. However, the assertion that using information aggregated from all causes is inappropriate suggests that greater precision is possible. This is simply not the case for such rarely occurring events. There will always be substantial uncertainty associated with the estimates, and the current procedures for parameter estimation capture the uncertainty using state-of-the-practice methods. Furthermore, the methods specified in the draft NUREG, and the methods used to estimate parameters are separate issues.
AO	Agree with industry comment which is why the NUREG details further research to solve this issue. "the alpha factor considers failure events from all observed causes" is in regard to the assumption of symmetry for all dependencies. Both the PAFM and GDM provide an additional level of 'casual' inclusion in the event assessment. However the argument to be more specific than a cause category is a piece part argument. Key Theme. <ul style="list-style-type: none"> • Piece part theme. • Assumption of perfect symmetry. Models. <ul style="list-style-type: none"> • PAFM can model non-symmetrical dependencies between like components. • GDM can model non-symmetrical dependencies between non-like components.
NEI Comment #3	Insufficient Discussion on Consideration of Failure Cause: The draft NUREG recommends using the alpha factor as the conditional failure probability for redundant components given that one component in the CCCG fails, even though the alpha factor is not a conditional failure probability, but rather a correlation factor of actual and potential failures to all failures. It recommends defaulting to this approach without regard to the specific attributes of the performance deficiency cause that could manifest in a CCF event. The NUREG does not acknowledge that the CCF probabilities are estimated based on causes that did not affect the component that failed. For example, if the cause is a deficient maintenance program, common cause due to environment and design do not apply. The NUREG goes on to note that conservative and non-conservative estimates can result from this approach, but does not address alternative approaches that could address this issue.

#	Comment
NRC Response	<p>In general, the alpha factor is the ratio of the number of the observed CCF event and the number of the observed failure events (including individual failure and CCF).</p> $\alpha = \frac{N_{CCF}}{N_{all}}$ <p>By this definition, it also may be seen as "Given an observed failure, the probability of the observed failure event is a CCF event".</p> <p>If we classify the failure based on causes, then:</p> $N_{CCF} = \sum_i N_{CCF_i}$ <p>, where N_{CCF_i} is the number of the observed CCF events due to the cause i.</p> $N_{all} = \sum_i N_{all_i}$ <p>, where N_{all_i} is the number of the observed failure events due to the cause i.</p> <p>Once we observed a failure due to the cause i, the probability of the observed failure event being a CCF event should be N_{CCF_i} / N_{all_i}.</p> <p>If we do not have enough resources to evaluate the value of N_{CCF_i} / N_{all_i},</p> $\frac{\sum_i N_{CCF_i}}{\sum_i N_{all_i}}$ <p>may be the best one to represent N_{CCF} / N_{all}.</p> <p>JAS: Basically the same as the previous comment. Aggregating information from all causes provides the best available insight. Specific causal data can be estimated, but will still be the result of a Bayesian process and subject to the influence of a prior, a prior that will likely be based on an aggregation of all available data.</p>

#	Comment
AO	<p>Agree with industry comment, which is why the NRC has commission research into solving this problem (PAFM and GDM for example). It should be noted however that due to the AFM being an empirical ratio of failure multiplicity, that it is the expected value of all scenarios, including:</p> <ol style="list-style-type: none"> 1. When there is no relevant coupling factor. 2. When a cause exists. <p>Due to this fact, if probabilities were calculated for multiple failures with knowledge of a failure cause, then they would be much higher than the current AFM parameters. So while the AFM is conservative (or not applicable) when the failure cause is not relevant for propagation to the other components, it is also an optimistic value when the failure is relevant for propagation to other components. This argument is around piece part and the assumption of perfect symmetry.</p> <p>Recommend this 'expected value' representation of the AFM parameters be included in the piece part theme.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Piece part theme. • Assumption of perfect symmetry. <p>Models.</p> <ul style="list-style-type: none"> • PAFM allows for non-relevant coupling factors to be considered for like components. • GDM allows for relevant and non-relevant coupling factors to be considered between all components.
NEI Comment #4	<p>Inaccuracies Due to Use of the Alpha Factor as CCF Probability: The report states that the full conditional CCF probability should be applied to all components in the group with the failed component, regardless of the details or cause associated with the failure even though the alpha factors used in PRA and SPAR models include all inter-component dependencies not captured explicitly in the models. Because of the relatively high values for CCF probabilities, it is likely that CCF will be a significant contributor and artificially drive the results into higher action categories. For example, incipient failures are included in the CCF probability calculations. Events that do not represent an actual failure, but may have been a CCF, are used in the CCF probabilities. Although not assigned a full failure, they bias the results.</p> <p>The draft NUREG acknowledges these complications, as Section 3.1 specifically notes that use of alpha factors in event condition assessments can result in conservative or non conservative estimates, yet this approach is still endorsed in the draft NUREG. This is because the approach supports rapid completion of SDP evaluations. As noted above, the potential negative effects of this approach do not justify the slight reduction in analysis time, and, as written, the document will not result in more precise treatment of CCF in SDP evaluations.</p> <p>The industry acknowledges that properly evaluating the conditional failure probability of redundant components given failure of one component due to a performance deficiency that has potential CCF implications is not a simple task. This does not change the fact that the use of the alpha factor as a surrogate for the conditional probability of failure of the redundant components due a plant specific performance deficiency is entirely inappropriate.</p> <p>A more appropriate approach would be to use the CCF database criteria in combination with expert elicitation to calculate the impact vectors for the plant specific conditions, taking into account all specific information about the condition, including successful runs or tests as well as the degree of degradation observed in redundant components. This could then be used to estimate a conditional probability of CCF that would be more representative of the actual cause.</p>

#	Comment
NRC Response	JAS: Again this appears to be a deliberate attempt to obfuscate the role of alpha factor in the process. Alpha factors are estimated using state-of-the-practice methods. The methods include a formal process for capturing uncertainty in interpreting failure information. Sometimes that does mean that failure records are recorded that represent potential failures. However, every effort is made to make sure that such judgements are as accurate as possible.
AO	<p>Industry makes a really good point here, which is essentially the piece part argument. In effect they are applying the PAFM to a higher level of detail. We cannot challenge the principle of their proposal and yet endorse the PAFM principle. However there are issues with the proposed approach which very quickly bring you back to using the AFM or PAFM style models, for example it's likely that the prior will dominate the result. Where do you get the prior from? Generic estimates of like components, and eventually you may return to a similar result. I believe this concern needs to be addressed in detail in the NUREG because the proposal from industry is fair, however the missing assumptions (like synchronized events) made in the proposed method need to be detailed.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Piece part theme. <p>Models</p> <ul style="list-style-type: none"> • PAFM allows for additional level of causal information to be included for like components. • GDM allows for additional level of causal information to be included between all components.

#	Comment
Excelon Comment #1	<p>General Comments: Exelon believes that the suggested use of the conditional CCF (i.e., the alpha-factor) in ECA might be flawed. The draft NUREG states that the full conditional CCF probability should be applied to all components in the group with the failed component, regardless of the details or cause associated with the failure. Exelon's concern with this approach is that the conditional CCF probabilities (i.e., alpha factors) used in PRA and SPAR models include all inter-component dependencies not captured explicitly in the models.</p> <p>As discussed in Section 1.1, PRA Treatment and Dependent Failure, the CCF parameters include multiple failures of components that: <i>"span a wide range, and may include common design, manufacture, testing, maintenance, environment, and many others."</i> The draft NUREG attempts to provide a supporting position to justify that the potential shared failure is at a causal level (e.g., a deficiency in a maintenance process) as opposed to a failure mechanism. While there is merit in this argument, the draft NUREG does not acknowledge that the other causes included in the CCF probabilities did not affect the component that failed. For example, if the cause is a deficient maintenance program, common-cause due to environment and design do not apply. However, the CCF probabilities include all these causes. The draft NUREG mentions that the impact of this assumption may be conservative or non-conservative, but does not seem to justify why the entire CCF probability should be used. While the draft NUREG describes that the industry is incorrect in trying to define the cause too, it suggests a method that assumes all causes of CCFs are applicable. Exelon does not necessarily agree with this assumption, since this might tend to increase the impact of common-cause.</p> <p>In using the full CCF probability, the ECA penalizes licensees in cases where the CCF probability is actually lower than the value used in the PRA model. Because of the relatively high values (see note below) for CCF probabilities, it is likely that CCF will be a significant contributor and drive the results into higher action categories (e.g., WHITE, YELLOW). Even if the CCF probability used in the ECA is non-conservative (i.e., there is a stronger causal link than average, due to the nature of the deficiency and the historic events), the underestimation of risk is expected to be less than the overestimation using the suggested approach discussed in the draft NUREG. This is because of the relatively high alpha-factor values and the corresponding numerical impacts of CCFs on the final results.</p> <p>NOTE - There appears to be some inconsistency between Section 1.1, Definitions and Discussions (page 6), first paragraph, and the information discussed above. This is based on the statement in the draft NUREG definition that the <i>"potential for failure does not need to be high."</i> CCF probabilities on the order of <0.05 should not be considered low, when compared to most independent failure probabilities (e.g., diesel generators are an exception) which are on the order of <0.001. In fact, when comparing alpha-factors to independent component failure probabilities, many alpha-factors would be considered <i>"high."</i></p> <p>Furthermore, there are several items discussed in the draft NUREG which result in higher CCF probabilities, making application of the full CCF probability to all components in the CCCG conservative:</p> <ul style="list-style-type: none"> • The inclusion of incipient failures in the CCF probability calculations. Events that do not represent an actual failure, but may have been a CCF, are used in the CCF probabilities. Although not assigned a full failure, they bias the results in a conservative direction. • The prior distributions are statistically manipulated to account for what is perceived to be fewer complete CCF events than represented by the data (referenced in Section 3.2.2). This results in the CCF probabilities being larger than the historical data indicates. <p>Finally, several statistical issues are raised on the <i>"accuracy"</i> of the CCF probabilities, which may result in conservative or non-conservative assessments. As discussed previously, the conservatism will tend to have more impact on the results than the non-conservatism. This is unfortunate in a <i>"risk-informed"</i> process that results in enforcement actions on licensees, where the result of the SDP calculation is generally used, without consideration for other factors, to determine the significance of the event.</p>

#	Comment
NRC Response	JAS: Using information resulting from all causes does not guarantee a conservative result. With respect to regulation of the industry, sometimes the predicted results might be too high. Sometimes too low. The expectation is that over time the result will average out. The causal method will address this, but that is not to say that there is anything deficient in the current process.
AO	<p>Issue 1: <i>"concern with this approach is that the conditional CCF probabilities (i.e., alpha factors) used in PRA and SPAR models include all inter-component dependencies not captured explicitly in the models".</i> This is the assumption of symmetry theme.</p> <p>Issue 2: <i>"Even if the CCF probability used in the ECA is non-conservative (i.e., there is a stronger causal link than average, due to the nature of the deficiency and the historic events), the underestimation of risk is expected to be less than the overestimation using the suggested approach discussed in the draft NUREG. This is because of the relatively high alpha-factor values and the corresponding numerical impacts of CCFs on the final results."</i> I don't understand this comment and agree with John's comment. It's the expected value so underestimation will occur as much as overestimation.</p> <p>Issue 3: <i>"probabilities on the order of <0.05 should not be considered low, when compared to most independent failure probabilities".</i> This statement does not make sense to me. They are two different probabilities and conditions. Its like comparing the probability of lighting strike on a person versus the probability of death given a person was hit by lightning. The probability of death given lighting strike is much higher, because its conditional.</p> <p>Issue 4: <i>"The inclusion of incipient failures in the CCF probability calculations. Events that do not represent an actual failure, but may have been a CCF, are used in the CCF probabilities. Although not assigned a full failure, they bias the results in a conservative direction".</i> This is a challenge on impact vector method, not the treatment of ECA. However the definition of incipient failure is that it is the start of onset of full failure if corrective action is not taken. Therefore its only a matter of time before full failure occurs and can be treated the same as failures which occurred in different, but close mission periods. This is treated through the impact vector methodology. To challenge this is to also challenge the treatment of failures which occurred in adjacent mission periods. This is the issue of synchronized events.</p> <p>Issue 4: <i>"The prior distributions are statistically manipulated to account for what is perceived to be fewer complete CCF events than represented by the data (referenced in Section 3.2.2). This results in the CCF probabilities being larger than the historical data indicates"</i> This is the synchronisation of events and partial failures discussed above.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Assumption of symmetry of dependencies. • Synchronized events. <p>Models</p> <ul style="list-style-type: none"> • PAFM allows for non-symmetrical dependencies between like components. • GDM allows for non-symmetrical dependencies between all components.

#	Comment
Fleming Comment #1	<p>Use of Alpha Factors in ROP: From my experience in supporting several utilities in the ROP of several specific events and in the review of this draft report, I think there is a need to clarify what it is we are trying to do in the ROP. I believe it would be helpful to make a clear distinction between two distinct steps that I believe are muddled together and confused in this draft report and in the application of the concepts in this report to actual events.</p> <p>Step 1 is to achieve a risk characterization of the event, i.e. to describe what happened in factual terms including how it did or did not impact plant performance or material condition of the plant. Such questions as the following should be addressed in Step 1:</p> <ul style="list-style-type: none"> • What was the root cause, and how the event is or is not represented in the existing relevant PRA models? • Was it an initiating event or did it increase the likelihood of an initiating event? • What was the sequence of events? • Did it involve failure or degradation of one or more components according to some well-defined success criteria? • What was the role of the plant operators and how did they respond? <p>I believe this step needs to be very well defined before any attempt is made to evaluate its risk significance. Also in principle this step should be largely deterministic. It is recognized that there may be uncertainties in this step but let's first start with the facts and those should include the facts documented by the plant owner in the event report and include the results of any root cause evaluations that may have been performed.</p> <p>Step 2 is to evaluate the risk significance of the event. In my mind, what this involves is a process where one asks the question: If the same event or condition were to re-occur in the future at the same plant, perhaps under different circumstances, what would be risk impact? In this step it is very important that the reoccurrence of the event be characterized as it is in Step 1 while using the existing PRA model to quantify the appropriate risk metric, which in some cases might be the conditional probability of core damage or large early release, change in annual average CDF, or incremental conditional core damage probability, depending on the nature of the event.</p> <p>In my view these two steps are muddled together in the draft report and in the way the concepts in this draft report have been used in recent significance determinations. When we are in Step 1 and are evaluating whether the event in question is a CCF or not, this process should be no different than the process used to code impact vectors in the CCF data base according to existing coding guidelines. The probability that any number of components did in fact fail or were degraded in short period of time has to be determined by the facts of the event in Step 1. The impact vector method allows for the expression of uncertainties by using a probabilistic impact vector. Application of some generic alpha factor from the CCF data base for this purpose is just plain wrong. I may have misunderstood the report in this regard, but that was the impression I was getting from the description in the report. The existing generic alpha factor estimates are averages over prior historical events in the industry and do not have anything to do with a particular new event. The only meaningful role of alpha factors from previously analyzed data should be confined to Step 2 and that would be to calculate the probability of some other CCF events that are independent of the event being analyzed but part of the existing PRA model used to calculate risk significance. The distinction between these two very different kinds of CCF treatments in Step 1 and Step 2 is completely obscured in this draft report. This makes it impossible for us to understand how the CCF models are being used in this application.</p>

#	Comment
NRC Response	<p>The processes in data collection and in ECA analysis are not same. In data collection is to justify two or more observed failure events. However, in the ECA space, usually, only one failure event is observed with an identified performance deficiency. The analysts are interested in the probability of the redundant component failed given the identified performance deficiency.</p> <p>Are the generic alpha factors good enough to estimate the potential failure rate of the redundant component given a specific performance deficiency identified? Let us forget the alpha factor, Q_{total}, and CCF for a while. If we think in the following way:</p> <p>An observed component failure was caused by an identified performance deficiency, (for example, maintenance deficiency). In order to estimate the conditional failure rate of the redundant component given the identified maintenance deficiency, we look up the database. We found N_i failures for this specific component historically due to the observed maintenance deficiency. We also found that in n_i of N_i events the redundant component failed within 24 hours due to the same maintenance deficiency.</p> <p>According to the data we estimated the conditional failure rate of the redundant component given the identified maintenance deficiency is n_i/N_i.</p> <p>However, the value of n_i and N_i of are too small to be trusted. We go back to lookup the data again. We found totally N_o failures for this specific component historically. In these N_o failures events, there are n_o failures events involved the redundant component failed within 24 hours.</p> <p>Because n_i and N_i are not large enough, we decided to apply n_o and N_o to do Bayesian update. After the Bayesian update, we found that the conditional failure rate of the redundant component given the identified maintenance deficiency is:</p> $\frac{n_i + n_o}{N_i + N_o} = \frac{n_{total}}{N_{total}}$ <p>Can anybody say that:</p> $\frac{n_i}{N_i}$ <p>is better than</p> $\frac{n_{total}}{N_{total}}$ <p>(which is the alpha factor), when we have a very limited database?</p> <p>JAS: I do not believe there is any way to estimate CCF probabilities for a specific event that does not rely on historical data. The report does not attempt to inform the parameter estimation process. It is strictly about application of methods that rely on previously estimated parameters.</p>

#	Comment
AO	<p>This is a REALLY good comment. I believe the question at the end, is too generic, "Can anybody say that X is better than Y". What is the definition of a 'better' answer? I believe the question is in regards to uncertainty surrounding the 'actual' risk. The more evidence which is available, the better our estimate of the risks should be. Therefore incorporating evidence from 'like' sources, and assessing the relevance to the scenario is exactly the approach. The challenge is providing direction on how this occurs so that's is repeatable, and having a prior which does not dominate in undesirable ways.</p> <p>It should be noted that in endorsing the use of alpha factors as a prior with updates from the specific scenario, then we are endorsing the 'more data gives more certainty in our estimate'. In doing so we also support the piece part argument, which I believe is the right answer (more on this in the piece part argument).</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Piece part argument. <p>Models</p> <ul style="list-style-type: none"> • PAFM and GDM allows for a prior specific to that cause (noting that in the absence of data the PAFM estimate probably has a generic prior too).
Fleming Comment #2	<p>Definition of Common Cause Failure: There are some issues with the definitions of CCF in the draft report and when combined with some new concepts such as the "failure memory approach" appear to be leading to a redefinition of CCF which I believe may lead to gross distortions in the evaluation of risk significance. The draft report starts with the definition of common mode failure from WASH-1400 and some definitions of dependent failures from NUREG/CR-2300, but curiously does not mention the definition from the ASME/ANS PRA Standard which the NRC has endorsed in RG 1.200. That definition is:</p> <p><i>"Common cause failure: A failure of two or more components during a short period of time as a result of a single shared cause."</i></p> <p>This definition has been fully vetted by the consensus standards process and is the definition that best matches the common cause models currently being used in PRAs including MGL and Alpha Factor. The definition given in this draft report at the beginning of Section 1.3 is:</p> <p><i>"Common cause failure: When two or more components fail within the PRA mission time window as a result of a shared cause."</i></p> <p>The introduction of a new definition that is different than the one in the standard is not helpful as it does not offer an improvement. Rather, it introduces a subtle yet significant change in the meaning. Ambiguity is introduced by the use of the term mission time. If the mission time is not short, the definition is not valid. It does not work with normally operating systems whose failure may cause or contribute to an initiating event and for which there is no short mission time defined. Mission time, if it is reasonably short such as 24 hours or less, may be ok for a kind of "rule of thumb" for analyzing data but the original concept is that the failures must occur in a sufficiently short period of time so that the occurrence cannot be satisfactorily explained as an unfortunate combination of random independent failures. When there is an argument about how short is short, the argument can be easily settled by calculating the probability of observing multiple independent failures. In some cases the condition being evaluated in the ROP can be best explained as a condition where the failure rate for independent events has increased relative to that used in the base PRA. There needs to a part of Step 1 that resolves whether this is the case without prematurely invoking a common cause description. The draft NUREG seems to convey a bias towards assuming that the event is a CCF whether it meets the definition or not. Also the use of a PRA model construct of mission time to define a physical event does not contribute to getting the facts straight in Step 1. The ASME/ANS standard definition should be used unless the authors have an improved definition that can be considered for incorporation into the standard and then subjected to the consensus vetting that other changes to the standard are subjected to.</p>

#	Comment
NRC Response	<p>CCF should not be limited by the time separated. The shared cause may not make two components failed at the exactly same time. For example, the wrong lube oil is used in two EDGs. One EDG may fail in the second test after it used the wrong lube oil, and the other EDG may fail in the fifth test after it used the wrong lube oil. If the wrong lube oil is the root cause caused the EDG failures, even if the two failures separated months, they are still CCF events.</p> <p>In the PRA space, we concern the two failures occurred within the mission time. We believe the CCF definition is not inconsistent with the reports the comment mentioned.</p> <p>NUREG/CR-4780 defines Unreliability as the probability (relative frequency) that a system or component fails (in regard to specified success criteria) during a specified time interval. This time interval is often referred to as the "mission time" (p. xix).</p> <p>The draft NUREG uses the mission time as a short period of time that is not inconsistent with the comment mentioned NUREG/CR-4780.</p> <p>NUREG/CR-6268 does not screen out the CCF events according to the time. It applies a timing factor to weigh the events.</p> <p>Timing Factor. This is a measure of how close in time multiple failures occurred. In general, the goal of the timing factor is to assign a weighting factor to the CCF event based on the time between individual failures. The acceptable input for this field is a decimal number from 0.00 to 1.00. Specific values to be used are:</p> <ul style="list-style-type: none"> 1.0 Multiple failures that occur within the PRA mission time. For standby components whose failures were discovered during testing or observance, but within half of the testing interval, the timing factor is 1.0. 0.5 Multiple failures that do not occur within the PRA mission time, but within a month of each other. For standby components whose failures were discovered during testing, but within a time interval ($T/2$, T), the timing factor is 0.5. 0.1 Multiple failures that occur more than one month apart. For standby components whose failures were discovered during testing, outside the test interval, the timing factor is 0.1. The test interval is discussed in Section 2.3.1.1. <p>JAS: The draft NUREG does not address parameter estimation at all. With respect to ECA, there is no need to characterize a specific event as a CCF event (the Part 1 mentioned above). If multiple failures are observed, the failures are mapped into the model by setting the corresponding basic events to TRUE. If multiple failures were observed, multiple events are set to TRUE. If common cause coupling factors are present, dependency must be accounted for, and it can best be accounted for by the process described in the draft NUREG, using historical data.</p> <p>The concept of mission time is provided to help clarify part of what goes into parameter estimation – to head off attempts at data manipulation that have already been accounted for during parameter estimation. Parameter estimation, which is not discussed, is a separate process that does acknowledge the intended application. In the ECA application, CCF failures must be occurring during the mission time to be meaningful, and "short period of time" is a useless concept. Failures occurring distributed in time, in standby components, are currently manifested in the fail-to-operate on demand failure modes included in the PRA model and supported by the parameter estimates. With respect to data collection, these types of failures are coded as CCF if they occur during half a test interval, further illustrating the uselessness of the "short period of time" concept.</p>

#	Comment
AO	<p>Issue 1: <i>Consistency of definitions.</i> For readability the definition should be the same as other NUREGs.</p> <p>Issue 2: <i>"If the mission time is not short, the definition is not valid."</i> There are a number of issues with this discussion which require explanation:</p> <ul style="list-style-type: none"> • The ET/FTA only deals with a Bernoulli trial of the system. There is no time element in the model, which means the 'short period of time' absolutely needs to be defined for each PRA. Therefore the addition of this term actually provides the required clarification of an area which I think is ambiguous in the past. • The definition of Mission Time is different for each industry/application of PRA. However changes in the definition of the mission time will completely change the defined CCFs in the database. For example if mission was changed to 5 min (a computer application), more of the CCF events would become single failure events. If the mission was changed to 6 years (NASA mission), more of the single failures would become CCF events. The NRC decided that it would use 24 hours as its mission time when it began recording CCF events. It cannot be easily changed now without a complete review of the data. <p>Issue 3: <i>"Mission time, if it is reasonably short such as 24 hours or less, may be ok for a kind of "rule of thumb" for analyzing data but the original concept is that the failures must occur in a sufficiently short period of time so that the occurrence cannot be satisfactorily explained as an unfortunate combination of random independent failures. When there is an argument about how short is short, the argument can be easily settled by calculating the probability of observing multiple independent failures."</i> I believe this to be incorrect. The question of CCF is about dependence. If knowledge of a single failure component in redundancy changes my belief about how likely the other components are to fail, then they are dependent, and need to be included in CCF. It has nothing to do with how short the time is, except to define the PRA and system response boundary of the basic events and FTA. For example, if I was in a space craft on a 2 year mission with 2 oxygen producing machines which are the same brand and model, with an estimated failure rate of 1 in a million years. Would an observed failure on the first machine on takeoff change my belief that the second one would fail during my mission. Absolutely, therefore despite the mission period being defined as years not 24 hours, you still need to consider CCF.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Synchronized events. <p>Models</p> <ul style="list-style-type: none"> • N/A.

#	Comment
Fleming Comment #3	<p>Expanding CCF models to Non-Common Cause Events: My biggest concern with the concepts discussed in this report, and the reason for the large disconnects we are seeing being NRC performed and industry performed significance determinations, is the apparent use of CCF models to characterize events that are not common cause events. When I read Section 1.4, in the description how the ECA process is applied to an event involving a single (independent) failure, I cannot determine whether I am in Step 1 or Step 2 of the process I outlined in the beginning of my letter. If an event only involves a single failure it is clearly not a CCF. If there are repeated failures of the same component it may suggest a problem with the maintenance process and perhaps an indication of an increased failure rate but this is not a CCF. Even if the event or conditions involve two or more failures that are not sufficiently short that they are satisfactorily explained by multiple independent failures they are not CCFs. Much of the discussion in this section appears to describe non-common cause events as CCFs. In those cases that are not CCF, when I do Step 1 the reoccurrence should be modeled as an independent failure or failures and the possibility of a CCF should only be considered in Step 2, that is the probability that there is some other failures (independent or common cause) that are in the PRA model and could occur INDEPENDENT of the Step 1 event. So in these cases where there is no CCF in Step 1 the only valid use of a CCF model would be to model some other unrelated CCF events that happen to be in the PRA model. Conversely, if there is some potential for CCF in Step 1, the methodology for treating that probabilistically is not the CCF models (e.g. MGL, Alpha) but rather the impact vector method that was introduced in NUREG/CR-4780 and later refined and used at INL to code events into the CCF database.</p> <p>A related concern is the discussion about proximate causes and programmatic actions and how CCF models are being used to address that. The CCF models that are being manipulated here were not designed and are not capable of assessing the increased probability of CCF that may be perceived in the review of the causes of the event, e.g. poor maintenance practices. In the past the NRC funded research to investigate whether one could quantify the impact of organizational factors in PRA and the conclusion of that research that I recall (I was on the peer review team for that) was that this is well beyond the state of the art of PRA. I do not think that situation has changed. As a principal author of many of these CCF models and NUREG/CR-4780 I can emphatically state that these models and the data that has been collected for use with them are not capable of quantifying the increase in CCF probability due to perceived organizational weaknesses. Certainly any existing generic alpha factor estimates derived from service data do not accomplish that. Furthermore, if one were able to do that, which we are not, it would be necessary to baseline this increase against some kind of industry average organization capabilities. In my personal opinion, this baseline is reflected in the service data.</p> <p>As a final comment I want to bring to the authors' attention some insights about the nature of causes of CCF and how those causes compare with those of independent component failures. In the early stages of the EPRI research on CCF that was conducted in the early to mid-1980s we published our first report on our analysis of experience data involving dependent events. In our report <i>"Classification and Analysis of Reactor Operating Experience Involving Dependent Events,"</i> prepared for Electric Power Research Institute, PLG-0334, January, 1984, we identified events involving dependent and independent failures and classified their causes. What we found upon collecting and analyzing several thousand events is that the causes of independent and CCFs were essentially the same. That is the root causes of CCF are not unique or distinct from the root causes of independent failure.</p> <p>One way to characterize the causes of a CCF event is to identify the root causes of the event and the coupling mechanisms that may exist to link the cause of failure to two or more components at the same time or in the same time frame. What is unique about CCF is not the root cause but rather the existence of a coupling mechanism that helps explain why the multiple failures occur at the same time. Hence the approach described of the draft NUREG of just looking for shared or common causes is not sufficient to identify CCF potential. If you are not identifying the coupling mechanisms that link the root causes to the equipment and synchronize the multiple failures, it is unlikely that focusing on shared causes will be fruitful. One can take any two failures that occur in a nuclear power plant and find shared causes, but that does not make them CCFs. Essentially all the incandescent light bulb failures that have ever occurred have been due to the same degradation mechanism, thermal fatigue of the filament. That does not mean that they are all CCFs. Absent a coupling mechanism two or more light bulb failures seldom if ever occur in a short interval of time. If they did there must be a coupling mechanism for them to be classified as a CCF.</p>

#	Comment
NRC Response	<p>We agree that "just looking for shared or common causes is not sufficient to identify CCF potential." The CCF analysis in ECA is based on the pre-condition "performance deficiency" identified. Just like the example about the incandescent light bulb failures, if there is no performance deficiency identified, it is an individual failure. However, if, for example, a group of light bulb failures are due to the wrong voltage applied to these bulbs, and the performance deficiency is identified as the wrong design to cause the voltage abnormal, then these bulb failures are CCF.</p> <p>JAS: ECA NEVER characterizes independent events as CCF events. ECA and the process described in the draft NUREG characterizes the dependency in a CCG based on the presence of CCF coupling factors and the historical strength of those coupling factors. The facts of the observed failure are generally judged to have little impact on the failure rates associated with components not observed to have failed. If conditions do point to a need to re-evaluate failure rate parameters, the analyst will get help from specialists (beyond the scope of the NUREG).</p> <p>JAS: Causal CCF will support this, but don't expect results to change. The aggregate CCF parameter estimates are based on sparse data, and dividing it further by cause will only increase the appearance of credibility, not the fact.</p> <p>JAS: the INL parameter estimation process uses the same cause characterization for both CCF and IND (although, given the subjective nature of cause identification, consistency is a problem).</p> <p>JAS: This is part of parameter estimation, not ECA. The process is state-of-the practice and not relevant to the draft NUREG. The NUREG assumes parameters are estimated properly.</p>

#	Comment
AO	<p>Issue 1: "apparent use of CCF models to characterize events that are not common cause events ...ECA process is applied to an event involving a single (independent) failure". The risk is being assessed with knowledge of a single failure, but prior to the outcome of the mission period being known. Therefore you do not know if the single failure could have resulted in a single or multiple failures at that time. This is the failure memory theme.</p> <p>Issue 2: "the methodology for treating that probabilistically is not the CCF models (e.g. MGL, Alpha) but rather the impact vector method that was introduced in NUREG/CR-4780 and later refined and used at INL to code events into the CCF database." I'm not sure of the suggested solution here. The impact vectors are used to represent the failure data to allow estimation of CCF model parameters. Impact vectors by themselves are not incorporated into the PRA.</p> <p>Issue 3: "A related concern is the discussion about proximate causes and programmatic actions and how CCF models are being used to address that." This paragraph talks about implementation of organizational factors (i.e. the performance deficiency) instead of the actual cause. The primary point of discussion here is valid and should be acknowledged in the NUREG. The discussion also talks about proximity causes, which the NRC acknowledges is the next step in advancing CCF modelling (e.g. PAFM). If the proximity cause also represents the organizational deficiency, then these two concepts combine, otherwise I believe they should be treated as difference levels of causal influence. The comment "it would be necessary to baseline this increase against some kind of industry average organization capabilities. In my personal opinion, this baseline is reflected in the service data" seems to support a PAFM style approach and to use current service data as a prior to this estimate. This is the piece part theme.</p> <p>Issue 4: The last paragraph can be split into a number of discussions:</p> <ul style="list-style-type: none"> • "root causes of CCF are not unique or distinct from the root causes of independent failure One way to characterize the causes of a CCF event is to identify the root causes of the event and the coupling mechanisms that may exist to link the cause of failure to two or more components at the same time or in the same time frame. What is unique about CCF is not the root cause but rather the existence of a coupling mechanism that helps explain why the multiple failures occur at the same time." ABSOLUTELY. As discussed in other areas, CCF is all about a dependency (coupling factor) between two components. GDM embodies this by only coupling the conditions for failure, not the failures themselves, which are independent trials (shocks). • "One can take any two failures that occur in a nuclear power plant and find shared causes, but that does not make them CCFs". I disagree. How can a cause be 'shared' if they are not coupled by a coupling factor? The 'shared' part of the CCF definition is what defines the need for a coupling factor. • "Essentially all the incandescent light bulb failures that have ever occurred have been due to the same degradation mechanism, thermal fatigue of the filament." I disagree. The failure mechanism is one of degradation which has the probability of failure change over time. The PRA does not explicitly model this and so the dependency that the degradation causes multiple failure to occur within a mission period is captured by the empirical ratios from historic evidence. The fact that the light bulbs rarely fail at the same time is due to a weak dependency on the degradation mechanism. The counter example is the degradation mechanism of tire wear out on all 4 tires on a car. Given the same condition there is definitely a higher probability of all tires failing at the same time than the independent failure rate of each tire. This is because they are coupled by degradation mechanism and age. This theme is synchronization through age. <p>Key Theme.</p> <ul style="list-style-type: none"> • Failure memory. • Synchronized events. • Piece part theme. <p>Models</p> <ul style="list-style-type: none"> • GDM addresses the description of how common cause failures should focus on coupling factors.

#	Comment
<p>Palisades Comment #1</p>	<p>Foreword: This initial discussion of the proposed approach to conduct common cause analysis under the premise that it not be constrained to the same piece part or subcomponent or the same failure mechanism, is contrary to any existing PRA methodology for conducting common cause analysis.</p> <p>This document attempts to move the concept of cross cutting issues into the PRA model which may or may not be consistent with the approach to implement common cause contribution in the model. A principal issue is the guidance provided does not include any direction to provide a basis to support the conclusion that the performance deficiency is directly tied to the component failures being observed and that all CCFs identified would be expected to occur within the PRA mission time of a single event. The approach is to elevate the definition of performance deficiency to the broadest definition that can be shown to encompass the event in question. The elevated description then makes the assertion that many other CCFs beyond those identified would be possible and not necessarily constrained to the common cause group of the component(s) failed in the event under consideration.</p> <p>For example, the following is from IM 0308 Attachment 3:</p> <p><i>"The staff is responsible to define licensee performance deficiencies. Where the proximate cause of multiple degraded conditions is the same, there is likely to be only one finding (based on the identified performance deficiency related to the proximate cause) and the risk impact of the collective degraded conditions (including any overlapping conditions) is then appropriately used as the basis for the SDP result. However, this concept could be taken to an extreme of defining all licensee performance deficiencies as 'management weakness' or something similarly fundamental. Doing so would then cause all degraded conditions to be manifestations of a single and possibly never-ending finding, would make unnecessary the need for an Action Matrix, and may require the staff to devise a continuous risk meter or similar substitute for the Action Matrix. Thus, a 'floor' was set for the implementation of this concept that is consistent with the ROP framework, in that no performance deficiency should be defined at a level associated with the ROP cross-cutting issues (i.e., human performance, safety-conscious work environment, and problem identification and resolution) or more fundamentally. Although artificially setting this 'floor' may create a philosophical inconsistency with use of a probabilistic thinking framework (i.e., if there is really a known common-cause effect taking place, then it should be explicitly acknowledged in a probabilistic model), it remains necessary for practical reasons as long as the Action Matrix continues in its present form. Concerns about possible insufficient regulatory responses arising from this approach are also mitigated as noted below."</i></p> <p>It is considered this documents premise is inconsistent with the above.</p> <p>This documents approach goes on to state, given the definition of the performance deficiency, the current assignments in the PRA model for common cause grouping may no longer be applicable, and the failure mechanisms considered as the common element of group failure are no longer a constraint on the number of components that would be the target group for CCF. The issue is that the definition of the performance deficiency at this high level (e.g., poor maintenance process) represents an unbounded characterization of commonality among a group of components. This would allow cross system groupings, and grouping of dissimilar components, into much larger common cause groups. There is no guidance that mandates the development of a technical basis that would establish the connection of the specific observed failure(s) to the entire common cause group.</p>
<p>NRC Response</p>	<p>The draft NUREG does not provide the definition of performance deficiency and it is not a guidance to identify the performance deficiency. In addition, this document does not provide the guidance to identify the relationship between the observed failure and performance deficiency either. This NUREG provides guidance to treat the CCF analysis once the performance deficiency identified.</p> <p>In general, this guidance is to provide the principles to catch the risk impact because of P(A B) changed due to the identified performance deficiency.</p>

#	Comment
AO	<p>This is the system boundary definition and scope theme.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Boundary conditions for dependency assessment <p>Models</p> <ul style="list-style-type: none"> • PAFM and GDM allow for more accurate modelling of the dependencies between components.
Palisades Comment #2	<p>Foreword: The summary discussion in the foreword also states that it describes technical issues; with the consensus CCF model used in PRAs, and the associated parameter estimates and data upon which they are based. The principal issue with this description is the industry has developed several standards (ASME/ NS) to establish a baseline consistent methodology of implementing risk assessment.</p> <p>Plants are required to undergo review by external organizations to establish the degree of implementation/compliance with these standards. The authors herein have determined that the current standards are inadequate and infer that the implementation of this approach provides a method of quantifying risk assessments that will correct these deficiencies.</p> <p>The guidance provided is a proposed means of correcting issues with the current consensus model without having been subjected to the same process of development as the current standards. Moreover, any issues with the current standards should be resolved within the standards process prior to issuing contrary guidance. If there are legitimate issues with the ASME/ANS standard process, it needs to be corrected first.</p>
NRC Response	
AO	<p>I'm not certain on what other standards state, but I suspect that the ASME/ANS standards do not have incorrect guidance which require resolution. Instead the issue is a absence or gap in guidance which this NUREG aims to address. Consider rewording 'issues' with 'gap' or 'limitation' in the NUREG.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • N/A <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #3	<p>Section 1, First Two Paragraphs: This discussion is somewhat vague. When an event happens and core damage does not occur, the conditional probability of core damage is zero. What is being computed is the likelihood that, if such an event or similar event were to occur again under the same boundary conditions that existed when the actual event occurred, that additional failures would have occurred to produce core damage. The key is the probability of what happened is not being evaluated, but what could happen if the event were to occur again.</p>
NRC Response	<p>The draft NUREG provides the guidance to evaluate the potential dependent failure caused by the same performance deficiency (the common cause). By definition, the alpha factor is the ratio of the number of the CCF and the number of the CCF and the independent. Hence, it may be seen as the failure probability of the redundant components given the first component failed. Once a component failure is justified as a potential CCF, the alpha</p>

#	Comment
AO	<p>This is a failure memory theme.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Failure memory. <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #4	<p>Section 1, 3rd Paragraph: When an event occurs and the cause of the event is determined, the conditional probability of it being a common cause failure or independent failure is either 1 or 0. There may be uncertainty in determining this, so one might assign some probability that it was a common cause using engineering judgment, but this should not be compared with CCF model parameters.</p>
NRC Response	<p>The purpose of the SDP evaluation is to assess the potential risk given the observed performance deficiency. It is not to intended to check the final status; therefore, the SDP is to evaluate the potential risk, if the same performance deficiency happened again. Even if there was no observed CCF in the event sequence, it does not mean it will never happen. The conditional probability of CCF is neither 1 nor 0. This is similar to the treatment of the frequencies of all initiating events. For example, when a PD is identified related to safety-related SSC, an analyst does not set the initiating event frequencies that have not occurred to zero.</p> <p>JAS: If a CCF event is the basis for the ECA, then multiple failures are known to have occurred; this will be a given in the problem statement. This is represented by setting the representative basic events to TRUE (either CCF or individual as provided by the inspector). If an individual failure is the basis for the ECA, the representative event is set to TRUE. In either case the failure memory concept does not allow specifying that other components (besides those specified as failed) in a CCCG operated successfully. In this case the conditional probability that a CCF not specified as occurring could have occurred is higher than in the nominal or baseline case because we know failures have occurred, but are not allowed knowing the failure(s) was(were) independent – that can only be determined using knowledge of successful operation of other components in the CCF group. This is an area where I take some exception to the party line. I am somewhat uncomfortable with the idea that “knowing” an individual failure was an independent failure is forbidden.</p>
AO	<p>This is a failure memory theme because they are using the outcome of the PRA Mission. I believe the answer to failure memory needs to be thorough as its something which needs to be water tight and fit in with the policy of estimating the risk of the plant.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Failure memory. <p>Models</p> <ul style="list-style-type: none"> • N/A

Commented [CSH13]: I tried to reword to make cleaner. Let me know if I changed the intent.

#	Comment
Palisades Comment #5	<p>Section 1, 4th Paragraph: The guidance above states that, while common cause contribution has been shown to be a significant contributor in past ECAs, there have been issues in not appropriately characterizing the common cause potential <u>perceived</u> to be associated with the observed events. The approach states the problem is related to being overly specific in the statement of the performance deficiency which restricts the focus of the risk assessment.</p> <p>Therefore, the deficiency description should be elevated and broadened to a level commensurate with the definition of the cornerstone or the general requirements of the Quality Assurance Program Elements. While this is appropriate in the context of determining the possible association of several different events into a depiction of broader organizational issues, it also raises two concerns:</p> <ol style="list-style-type: none"> 1. Statements of performance deficiencies at this level result in unbounded issues which makes it difficult to impossible to demonstrate issue resolution. 2. The association of component failures from several different events that have been encompassed by this broadened deficiency definition may not have not been shown to be connected by a direct common cause. <p>The issue is that deficiency definitions at this level are self fulfilling with respect to any group one would choose to create. The definitions become so vague that anything can be postulated to belong to the group.</p> <p>Almost all equipment failures that have ever occurred could be lumped into a single group as long as we are willing to discuss causes at the proposed level (e.g., poor maintenance processes). In addition, the depiction of the deficiency in this broader characterization to assess several different events that occurred over some extended period of time ignores any correlation that would have established the probability of the different events occurring within a single event response.</p> <p>PRA models have not been developed to accommodate this type of assessment of organizational issues and there is no data to support the quantification, as is being proposed in this document. This type of assessment has historically been a qualitative determination of the level of significance of the possible impacts of several disparate but similar events.</p> <p>Current PRA models are not developed with the capability to perform this type of assessment. To now provide a methodology that would superimpose this type of assessment onto a PRA would be subject to subjective determinations, and gross over or underestimation of the risk contribution.</p>
NRC Response	<p>This NUREG is to provide the guidance to evaluate the potential dependent failure caused by the same performance deficiency (the common cause). By definition, the alpha factor is the ratio of the number of the CCF and the number of the CCF and the independent. Hence, it may be seen as the failure probability of the redundant components given the first component failed. Once a component failure is justified as a potential CCF, the alpha</p> <p>JAS: As elsewhere, there is no intent to apply data beyond its scope</p>
AO	<p>This is the system boundary definition and scope theme.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Boundary conditions for dependency assessment <p>Models</p> <ul style="list-style-type: none"> • PAFM and GDM allow for more accurate modelling of the dependencies between components.

Commented [CSH14]: This response seems incomplete.

#	Comment
Palisades Comment #6	Section 1, 4th Paragraph: It is unclear what is meant by " <i>proximate cause</i> ". This should be better defined.
NRC Response	
AO	Agree. If term is used then the definition from previous NUREG should be included in the glossary. Key Theme. <ul style="list-style-type: none">• N/A Models <ul style="list-style-type: none">• N/A
Palisades Comment #7	Section 1.1, CCF Definition: Per the ASME/ANS PRA standard CCF is defined as: " <i>Common cause failure: a failure of two or more components during a short period of time as a result of a single shared cause.</i> " This definition brings in the concept of short time which is only implied in the WASH-1400 definition. Note that the term was changed from common mode to common cause because the cause was the key to defining the failures in the same short time interval—failure modes can be common but at different times they are not CCFs.
NRC Response	JAS: Failures must be occurring during a mission time to be relevant. Standby failures can be distributed in time and still appear as CCF on demand. The parameter estimation process includes these considerations so they do not need to be addressed by the ECA procedure
AO	See discussion on short periods of time in reply to Fleming. Key Theme. <ul style="list-style-type: none">• Synchronized events. Models <ul style="list-style-type: none">• N/A
Palisades Comment #8	Section 1.1, 4th Paragraph: Failure at the " <i>piece part</i> " level is not the same as a failure mechanism. The confusion occurs in the use of CCF models for the purposes they were not intended for.
NRC Response	JAS: CCF models were chosen to predict CCF probabilities. They are used for that purpose in the baseline PRA model. There is nothing about the ECA procedure that requires anything more from the model than that.
AO	Agree with industry comment. These two definitions are different. Am unsure of implied meaning behind second sentence, however it relates to the piece part theme. Key Theme. <ul style="list-style-type: none">• Piece part theme. Models <ul style="list-style-type: none">• N/A

#	Comment
Palisades Comment #9	Section 1.1, Last Paragraph: This discussion does not make it clear that the times of the multiple failures must be synchronized. A failure due to poor maintenance practice and noting that the maintenance practice is shared by redundant components does not meet the definition of common cause. Poor maintenance practice could just as easily lead to higher independent failure rates than increased CCF potential.
NRC Response	JAS: The ECA procedure does not need to address this as the parameter estimates already reflect these kinds of consideration.
AO	<p>The concept of accounting for CCF through 'higher independent failure rates' needs to be addressed in the NUREG. CCF is about dependency between components through coupling factors. This means that if two components fail due to poor maintenance, then the second component did not fail independently as if it was maintained by another organization. This is what synchronizes the failures.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Synchronized events. <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #10	<p>Section 1.1, Last Paragraph: In the discussion of Section 1.1, the argument is made that once the definition of the performance deficiency is elevated to a broader scope description, this is sufficient basis for expanding the existing common cause grouping to include any number of diverse components because they can be shown to be encompassed by the all-inclusive definition. Creating deficiency descriptions at this level creates a condition in which almost any failure that ever occurred could be considered part of the group because the over generalized cause statement cannot be proven incorrect. Consequently, this allows the focus to be shifted away from the actual component failures and their direct causes. Attempts to over generalize these conditions to estimate the risk of organizational weakness has not been the purview of PRA modeling and should not be.</p> <p>The PRA model focus has been, and should continue to be, on maintaining the reliability of components credited in mitigating analyzed events. At no point has there been any discussion of the need to develop a basis for the connection of these events under one common theme. While it is appropriate to characterize events similar to the examples provided as poor maintenance processes as an example for the purpose of aggregating against the ROP cornerstones, or the broadly defined QA areas, it is not necessarily true that the elements of the maintenance processes are all necessarily failed or failed to the same degree.</p> <p>Also, the failure to correctly implement a procedural requirement one time does not guarantee failure on the next occurrence. This must be demonstrated by providing evidence that the procedural requirement is routinely violated and that evidence exists in implementation of other procedures as well. Even in the case of additional examples, any suspect increase in risk should be restricted to the cases where the evidence is provided. Otherwise, the generalized statements of performance deficiency result, as was done in this document, in an overall indictment of an entire process which was not supported by any factual information. This is the very issue that was raised in the SDP process to be avoided because of the likely gross over estimation of the risk significance.</p>
NRC Response	JAS: If the data collection demonstrates this to be the case, then so be it. Existing data does not justify any such expansion, and current application is limited to data applicability.

#	Comment
AO	<p>Dependencies exist at each level and each have an impact on the reliability of the plant (e.g. to only focus on the specific failure cause is just as limiting as focusing only on the organizational factor). However the practicalities of modeling limit the extent which these dependencies can be included. As such they are currently limited to identical components at the component failure level.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> Boundary conditions for dependency assessment. <p>Models</p> <ul style="list-style-type: none"> PAFM and GDM expand the ability to more accurately model the dependencies between components.
Palisades Comment #11	Section 1.1, Figure 1: This model would apply equally well to maintenance causing increased independent failure rates or increased common cause potential. The model should include the time element.
NRC Response	JAS: The model does include the time element. It appears in the coding requirements for cataloging CCF events and is therefore implicit in the CCF model parameter estimates.
AO	<p>The probability of synchronized failures is accounted for in the AFM parameters because it is an empirical ratio.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> Synchronized Events. <p>Models</p> <ul style="list-style-type: none"> N/A
Palisades Comment #12	Section 1.2, 1st Paragraph: An equally, or more important reason, is that causes are too numerous to mention and difficult to codify. The causes described here are general cause categories and are not defined sufficiently to determine the type of cause.
NRC Response	JAS: Causes are assigned, both specific and group, to all failure events. If the point is that these causes are assigned subjectively, the point is well taken. Different experts might read the same failure record and conclude different causes are in effect. This is unavoidable, but does not invalidate the method. If anything it argues against excessive reliance on cause information. The current state of the practice is that the data coder assigns a cause, and independent review concurs, then occasion third and fourth party spot checks concur.
AO	<p>The probability of synchronized failures is accounted for in the AFM parameters because it is an empirical ratio. This is a key theme of understanding how CCF models synchronized events.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> Synchronized Events. <p>Models</p> <ul style="list-style-type: none"> N/A
Palisades Comment #13	Section 1.2, 2nd Paragraph: The idea of a conditional CCF probability is not carefully defined. Conditional CCF probability is not related to MGL or Alpha factors. Alpha factors are correlative and should not be used as surrogate conditional probability values. Moreover, as cited in this document ALPHA factors can be conservative or non-conservative. So if Alpha factors are applied as surrogate conditional probabilities, the conclusion is unclear.

#	Comment
NRC Response	JAS: As previously, alphas are not surrogates for conditional probabilities. When a formal conditional probability equation (based on Bayes formulation) is written and expressed in terms of parameters, what appears is a complicated combination of the parameters (in this case alpha factors). Different, but correct, formulations could be obtained using any parameterization of the CCF probabilities.
AO	<p>The level of analysis be it component, proximity cause or specific cause is an 'expected value' over all the factors which may influence the outcome. Any one of these approaches will over or under estimate the risk, so this is not an argument not to apply a particular method. The issue is in regards to the level at which the model supports a defensible and repeatable conclusion. The uncertainty over the conclusion can be represented by the confidence bounds of the estimate. The more specific the evidence and modelling can be done, the lower the uncertainty. This is the piece part theme.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Piece part theme. <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #14	Section 1.3, Dependent Failure Definition: Stating the dependant failures must occur within the mission time window is somewhat vague. There are situations where the mission time might be long (i.e., months). If the mission time is short and the independent failure rate is high, multiple failures in short time intervals are not necessarily CCF.
NRC Response	JAS: The PRA mission time window is exactly what is required. The parameter estimation procedures make an exception for standby components. In this case the failures must occur in half a test interval. This appears reasonable to me, as these failures will be manifested on demand as though they are occurring in the same instant (i.e., a demand occur, the failures are observed). These considerations affect failure models and parameter estimation procedures, but not the ECA process once the models are established on parameters estimated in the baseline PRA, the ECA procedure follows as stated in the draft.
AO	<p>The statement that "dependent failures must occur within the mission time window" is the undesirable effect of CCF which needs to be modeled. Dependent failures which occur outside the mission period mean the mission outcome will not be impacted. See discussion on the definition of CCF needing the mission period to be defined. This topic should be covered in the theme of synchronization of events.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Synchronization of events. <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #15	<p>Section 1.4, Rule 1: This rule does not address the time element. If redundant components share a deficiency, it does not mean that the deficiency will increase the likelihood of a CCF. For example, the incandescent light bulb:</p> <ul style="list-style-type: none"> • All light bulbs share the same deficiency which explains why almost 100% of failures occur due to the same failure mechanism – thermal fatigue of the filament. • However 99.999+% of all cases of light bulb failure due to this mechanism are independent failures. Many cases of shared deficiency can be explained by an increased failure rate.

#	Comment
NRC Response	<p>The time element is considered. The guidance is to evaluate the probability of the redundant components failed within 24 hours due to the observed performance deficiency. If the time is unlimited, the failure probability will be 1.0.</p> <p>Thermal fatigue of the filament is not a performance deficiency. However, if you have a maintenance program to set the MTTF as the time limit to replace the light bulb frequently and you did not perform this maintenance program, it will be a performance deficiency. This performance deficiency (failed to perform the maintenance program to replace the light bulb according to the MTTF) is the common cause and it increased the CCF probability.</p> <p>JAS: This example can go either way. If the individual failure rates are truly independent, and the question is will the lights be on when we enter the room, then the probability of entering a dark room will depend on the failure rates and on the test interval and policy. If the failure rate is high enough, data collection may see test results with large numbers of concurrent failures and conclude common cause failures are occurring. For example if the failure rate is so high that 80% of the bulbs are burned out when room is entered (a test is performed), then the data coder would rely on guidance that says if the redundant failure are occurring in half a test interval, code as a CCF event. These failures would manifest as demand-based CCF events, and appropriately, I think. The dependent event calculation would also give reasonable estimate for this case, give a failure event. Have not constructed test cases to demonstrate this so perhaps out on a limb here.</p> <p>Alternately, the system is continuously monitored and failed bulbs are replaced as they burn out. In this case the probability of 80% being failed when we enter the room becomes very small. Unreliability methods are capable of handling both situations without introduction of CCF. However, this presupposes that in the first case the standby failures rates can be estimated. If all that is recorded is the failure count on each test, the first case will be accurately predicted from test results evaluated assuming CCF is occurring. In fact, from the coders perspective, it is a design issue. The mean time to failure is simply not long enough.</p>
AO	<p>I disagree. The failure mechanism is one of degradation which has the probability of failure change over time. The PRA does not explicitly model this and so the dependency that the degradation causes multiple failure to occur within a mission period is captured by the empirical ratios from historic evidence. The fact that the light bulbs rarely fail at the same time is due to a weak dependency on the degradation mechanism. The counter example is the degradation mechanism of tire wear out on all 4 tires on a car. Given the same condition there is definitely a higher probability of all tires failing at the same time than the independent failure rate of each tire. This is because they are coupled by degradation mechanism and age. This theme is synchronization through age.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Synchronization of events. <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #16	<p>Section 1.4, Rule 1: The guidance states that the performance deficiency is not the degraded condition itself but it's the proximate cause of the degraded condition. Note that "<i>degraded condition</i>" has crept into the guidance. PRAs do not typically analyze the impact of degraded conditions. More importantly the guidance states that the determination of cause does not need to be based on rigorous root cause evaluation but can be based on "<i>reasonable assessment and judgment of the staff.</i>" Given the possible implications of the findings associated with the performance deficiency, a statement that rigorous evaluation is not required is not consistent with potential consequences of such a judgment.</p>

#	Comment
NRC Response	Again, the draft NUREG does not redefine the performance deficiency. This paragraph is referred to "Significance Determination Process Basis Document Inspection Manual Chapter 0308, Attachment 3."
AO	<p>I believe that ECA can be applied to each level of known information. (1) Knowledge of a failure (2) Knowledge of the failure cause (3) Knowledge of the root cause (4) Knowledge of the deficiency on other redundant components (5) Knowledge of a performance deficiency. Each one of these levels is appropriate to assess risk depending on the objective of the analysis or decision required. Therefore if the required decision can be supported without going into further detail then it's appropriate to stop at that level.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Piece part theme. <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #17	<p>Section 1.4, Rule 1: The guidance states that given the failure of one component in a CCCG, the analyst will use the conditional probability of CCF, given the observed component failure. It is recognized that while one or more additional failures do not occur during an event is not a guarantee that addition common cause failures could not have occurred. This guidance precludes any consideration of facts that could discount or substantially reduce the probability of common cause failure.</p> <p>In addition, consideration of possible random failure of components that were known to be successful during the event response is not considered the same as arriving at the conclusion that the conditions necessary for a common cause failure of multiple components is present.</p>
NRC Response	JAS: The conditions necessary for common cause failure are satisfied by the presence of common cause coupling factors in a CCCG. If a PRA model includes events for CCF in a CCCG, it is because this condition is met. In this case there is no justification for suppressing the dependency calculation.
AO	<p>Issue 1: <i>"This guidance precludes any consideration of facts that could discount or substantially reduce the probability of common cause failure."</i> This is related to the issue of assuming symmetry of all coupling factors in the CCCG.</p> <p>Issue 2: <i>"consideration of possible random failure of components that were known to be successful during the event response is not considered"</i> This is the failure memory theme.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Assumption of Symmetry • Failure memory theme. <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #18	Section 1.4, Rule 2: This is counter to the ASME/ANS standard definition of CCF. The time element is key to what makes a failure common cause.
NRC Response	

Commented [CSH15]: Which paragraph is referencing what. The draft NUREG or their comment?

#	Comment
AO	<p>See previous discussion on Mission Time and synchronization of events.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Synchronized events <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #19	<p>Section 1.4, Rule 2: The guidance regarding the impact of the time window for CCF or "chance" conditions states that consideration of the time window for CCF is irrelevant and contrary to the "failure memory concept." Further the guidance states that "simply" testing redundant components cannot provide proof that multiple dependent failures would not occur within the mission time would not occur within the mission time window.</p> <p>However, it has been long standing practice that upon discovery of a failed risk significant component, that redundant component(s) be immediately tested to verify that the failure is not present in those components. Implicit in this evaluation is an assumption that the tested components are available for the mission time. If we are to accept the premise that redundant components cannot be proven to <u>not</u> be subject to common cause failure during the mission time, then it is unclear why plants are not required to shut down immediately upon discovery of a failure of a risk significant component that can be characterized as a cause which can result in CCF.</p> <p>Further, the guidance discounts the benefit of staggered testing which is a planned evolution based on the premise that such testing provides CCF cause failure. Again the impact of staggered testing is left to the judgment of the analyst to decide whether CCFs could have occurred during the PRA mission time.</p>
NRC Response	<p>JAS: If 1-of-10 failures in a CCGG is a CCF, then knowing nothing about the other trains would yield at least a 1-in-10 chance that one of the other trains had failed when we are told that a failure has occurred (and no other information is provided – the essence of the failure memory concept). Testing the other train(s) will yield success 9-of-10 times. Not exactly of course but that is the idea and it demonstrates that little can be "proven" by a successful test. With respect to baseline unreliability, the testing scheme and follow up policy does affect the probability of seeing a failure on demand, but these aspects of the unreliability problem are not directly related to the calculation of conditional system failure probability. The impact of staggered vs non-staggered vs follow up vs no follow up do affect the choice of failure model, and the parameter estimates which do ultimately determine the dependency calc result, but not in the direct way this comment implies.</p>
AO	<p>Confusion over failure memory approach. I agree with industry comments that the justification for failure memory approach is not in the NUREG (or anywhere) and instead is directive without explanation. I believe calling it a name 'failure memory' which is only defined in the NRC draft documents here, gives the impression that this approach is 'made up' for ECA. Instead the explanation of ECA needs to be clear on what risk we are actually assessing and at what point in time, with what evidence available. In this explanation, the concept of actual (and unknown) risk of the plan for core damage, and our estimate of the risk and its uncertainty need to be separated. The actual risk of the plant only changes when something physical changes. This is a failure or change in design. The ECA assesses that risk, and the point estimate and uncertainty of that estimate changes as more evidence is available. The more evidence the more accurate the estimate. The concept of failure memory needs to be explained (preferably without a name) using these concepts.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Failure memory <p>Models</p> <ul style="list-style-type: none"> • N/A

#	Comment
Palisades Comment #20	Section 1.4, Rule 2: For normally operating systems, judgments about time windows can be made when the failures are self announced.
NRC Response	AS: Don't understand the comment. Also not sure what the point was with time windows (in the draft).
AO	<p>The time window should be the mission period which for the NRC and CCF Database is 24 hours.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Synchronized Events. <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #21	<p>Section 1.4.1, 1st Paragraph: The guidance recognizes the potential for over-estimating the risk significance of CCF by applying a particular failure mode to a CCCG in a PRA model where the failure does not apply to all components within the CCCG. It is not unusual for common cause groupings to be present in a PRA model for a limited set of failure mechanisms that apply to the group, but a full set of failure mechanisms typical of the component type may not be applicable to all components within the group.</p> <p>However, the guidance cautions against alteration of CCCG boundaries to accommodate these design differences as the characterization of the performance deficiency as a broader based problem can "couple" the components despite any design differences that could preclude CCF of components within the group.</p> <p>The Palisades model has separate CCCGs for which design differences come in to play.</p>
NRC Response	JAS: I think the point is that gerrymandering component boundaries to avoid a dependency calc is wrong. The machines are similar in many design details, so saying there is a design coupling is only mostly correct. Is this good enough? I think this judgement is better than saying the coupling does not exist because one part on one machine is different than on the others.
AO	<p>The current method can only account for complete symmetry within the CCCG or no symmetry/dependency outside the CCCG. This is a limitation of the current method which can be addressed with PAFM and GDM. Whilst the example identified in this comment shows a conservative estimate of risk, this limitation of CCCGs in most cases under estimates the risk due to not being able to model dependencies between failure modes or event non-identical components.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Assumption of perfect symmetry. <p>Models</p> <ul style="list-style-type: none"> • N/A

#	Comment
Palisades Comment #22	<p>Section 1.5, 1st Paragraph: The guidance here suggests that events described in the examples provided are not currently considered CCF in the current version of the NRC CCF database and that they will be added in a future update. This represents another example of the implication of deficiencies in other processes that are theorized to underestimate the actual CCF parameters.</p> <p>Moreover, the guidance suggests that analyses of events that involve these deficiencies will be within the SDP process via implementation of this NUREG process without having first addressed the issues in the underlying processes (ASME/ANS).</p>
NRC Response	<p>JAS: I do not interpret it that way. The events are provided as examples of cases with CCF potential (because causes and coupling align), not as CCF events that have occurred and are to be cataloged in the CCF database.</p> <p>JAS: I have no idea what this means.</p>
AO	<p>The events are assessing the probability of core damage of the plant in the presence of a failure at a certain point in time. These events are not assessed as CCF or otherwise because the answer is probabilistic as the outcome of the PRA mission is unknown. The key theme is failure memory here.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Failure memory. <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #23	<p>Section 1.5, Hatch Example: There is not enough information in this example to properly evaluate. Were the failures observed here used to revise the failure rate estimate? Evaluating the CCF parameter must also include a look at the failure rate as it is used before judging the adequacy of the model.</p>
NRC Response	
AO	<p>This comment focuses on adjusting the independent failure rate to model CCF (synchronization of event theme). The focus is on dependence between components. Furthermore event assessment can be done at different levels of available evidence as required to support the decision needed. Piece part theme.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Synchronization of events • Piece Part. <p>Models</p> <ul style="list-style-type: none"> • N/A

#	Comment
Palisades Comment #24	<p>Section 1.5, Dresden Example: In the discussion of the Dresden event, the argument by the licensee is discredited based on the elevation of the performance deficiency description to <i>"inadequate material control."</i> This description allows for the arbitrary inclusion of a broader scope of components that results in substantially higher risk significance. At issue in this example is; does any factual information to support a conclusion that the broader group of components was subject to an elevated level of risk from specific performance deficiencies which could impact their performance, exist?</p> <p>The original deficiency was appropriately characterized as a failure to order proper parts and failure to detect the problem during receipt inspection (i.e., a material control deficiency in the broader context) with respect to one diesel generator. However, all other diesel generators had the appropriate part installed and no other material control deficiencies were identified with respect to any of the other diesel generators. In fact, the example states that because of the elevated description of the deficiency all other diesel generators become suspect and assigned increased probability of failure as a group.</p> <p>The example argues that because of the elevated description, the issue is now about any other possible failure mechanisms that could result from inadequate material control <i>"not just lube oil strainers"</i> (the original issue) without having any evidence that material control deficiencies currently exist that could result in failure of the remaining diesel generators. There is a certain level of guilt by association and implication in this approach.</p>
NRC Response	<p>JAS: The observed failure aligned with known coupling factors so the dependent calc is justified. The point that a material control deficiency could extend beyond the EDG CCGG is possible, but not currently supported by any data. So fears that the method might be applied beyond the scope of the data are unfounded. To my knowledge, it has never happened.</p>
AO	<p>The industry comment has a lot of good points regarding the treatment of Dresden. It comes down to evidence and how to incorporate this into the model. There are two primary evidence elements:</p> <ul style="list-style-type: none"> - Cause deficiency on each component in the CCGG. - Organizational deficiency which could create other (unknown) causes. <p>Evidence 1: Regarding the comment on the cause being present on the other CCGGs. This is an appropriate assessment and absolutely contributes to the probability of CCF. The current models available however do not distinguish between a cause condition existing (material deficiency) and the failure occurring. So while the cause condition may have existed on multiple generators, the failures did not propagate. Due to this limitation in the AFM, knowledge of whether the deficiency existed on multiple components cannot be incorporated into the model. This may be solved with GDM which models the failure, and the presence of the cause condition separately.</p> <p>Evidence 2: Organizational deficiency. Does knowledge that a quality control deficiency mean that other failures might occur. Yes. This can be reflected through an increase in the cause occurrence. How to do this is not clear and using current methods would be subjective and not repeatable.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Boundary conditions for dependency assessment • Piece Part. <p>Models</p> <ul style="list-style-type: none"> • GDM separates the cause condition from the event of failure. This will allow the deficiency to be modelled instead of only the failure events.

#	Comment
Palisades Comment #25	<p>Section 1.5, Calvert Cliffs Example: In the Calvert Cliffs example, a diesel generator experienced a failure due to a design feature unique to that diesel. This diesel incorporates a fan cooled radiator for engine cooling. The other diesel engines are water cooled and do not experience the additional in-rush current from the radiator fans on diesel start. This design feature represents a diversity of design that offsets at least some level of contribution from CCF as a consequence of a support system failure.</p> <p>However, the guidance establishes the position that while the particular mechanism is <u>not</u> shared among the component group, it is sufficient to argue that other failure mechanisms exist between components within the group and therefore the existence of this uncorrelated failure is a basis to elevate the risk impact of CCF of the group is justifiable. If this approach holds, then any benefit from diversity of design is negated. This type of argument represents a self-fulfilling prophecy. One can always argue that while a particular failure mechanism is not shared within the CCG the presence of other failure mechanisms that could be considered shared is an appropriate basis for increasing the CCF probability of the group as a consequence of the existence of this unshared failure mechanism.</p>
NRC Response	JAS: I am actually somewhat sympathetic to this point of view. The cause of the failure did not align with a coupling factor. So I would go with nominal CCF probabilities on the remaining components in the group. I will leave it to others to defend application of the dependent event calc to this case.
AO	<p>The industry comment is correct. This is an example of where the assumptions required to create CCGs (perfect dependency) is violated and produces a very conservative result. However there are also lots of other examples where the CCG assumptions where dependency exist outside the CCG which produce an optimistic result. Whilst these points are well taken, the assumption of the AFM is perfect symmetry in the CCG and no dependency outside the CCG and so ground rule 1 is to keep the data informed analysis consistent with the assumptions of our current modelling. Ground rule 3 exists where the analysts has a sufficient case to argue that ground rule 1 is not applicable. It's this reason that the level of information which can be incorporated into the ECA is limited using current methodology.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> Assumption of symmetry. <p>Models</p> <ul style="list-style-type: none"> PAFM and GDM allow specific modeling of the dependencies between components.
Palisades Comment #26	<p>Section 1.5, Comanche Peak Example: In the Comanche Peak example, a diesel generator had been painted immediately after a successful surveillance test and apparently failed the next surveillance test due to a failure to assure that the painting did not impact the functionality of the painted components. The performance deficiency was failure to adequately implement maintenance procedure(s). This approach implements the "chance" argument. The information provided only identifies a single occurrence of the failure to implement this aspect of the procedure. The "chance" argument is predicated on the possibility that the other diesel might have been painted between subsequent diesel tests.</p> <p>Given painting of diesel components is not considered a routine activity, this appears to be an overestimation of the probability of the second diesel becoming subject to the same condition. While it cannot be argued that this is impossible, the question is how probable was it? But, the process discounts conditions which would support lower probability of a common cause event. The argument provided also assumes that the isolated occurrence of the failure to implement the procedure represents a condition that guarantees future failure, and no credit can be considered for the procedure to prevent a second occurrence of the failure.</p>
NRC Response	JAS: The current methodology would say that any time a coupling factor exists, the dependency calculation applies. Coupling factors clearly exist in this case. So the dependent calculation clearly applies. Preferably with alphas specific to the relevant coupling. What might be questionable is how applicable the alphas are. In this case the alphas would be specific to emergency power system diesel generators, but not to maintenance activities. Until the causal alpha factor method is implemented, CCF events from all causes would inform the alpha estimates. This is currently state-of-the-practice.

#	Comment
AO	<p>The industry comment is valid concern and is an example of where separating the cause condition and failure probabilities makes sense (as per Dresden). The current techniques assume perfect symmetry of dependencies and cannot distinguish between a cause condition propagating (the painter painting more than one EDG) and the failure in the presence of the cause condition. The point is well taken and shows that quantitatively we can only go so far before these more subjective considerations need to be made through ground rule 3.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Piece Part Argument • Assumption of symmetry. <p>Models</p> <ul style="list-style-type: none"> • PAFM and GDM allow specific modeling of the dependencies between components.
Palisades Comment #27	<p>Sections 1.4–1.6: Sections 1.4–.6 of the draft NUREG describe the ECA ground rules for treatment of a component failure in a CCCG. The general approach described is that any component that fails will have some impact on CCCG failure probability regardless of the cause group failure probability.</p> <p>For example, Pump A fails due to Cause X, and Pump B, a redundant pump, fails five years later due to Cause Y. Following the draft NUREG guidance, these failures could be treated as a common cause due to any performance deficiency. The performance deficiencies could be the same preventive maintenance was performed, or the pumps have a similar design, or they are in the same room, or they operate at the same temperature, etc.</p> <p>A further example could be a group of redundant components have been installed in a plant for 30 years. Over that period there have been three failures spaced 10 years apart. This data would typically be used to update the random failure probability for the components, but does not result in evidence that warrants an increase in the CCF probability simply because the components have the same design characteristics or operating environment.</p> <p>NUREG/CR-6268 and NUREG/CR-4780 when defining common cause factors state:</p> <p><i>"The concept of a shared cause of malfunction or change in component state is the key aspect of a CCF event. The use of the word 'shared' implicitly includes the concept of coupling factor or mechanism. In addition, the reference to a time interval between failures acknowledges the reliability significance of these events. Multiple component failures from a shared cause, but without affecting mission requirements, in a period required for performance are of little or no significance from a reliability point of view. It is the correlation of failure times and their simultaneity in reference to the specified mission time that carries their reliability significance. Often when the same cause is acting on multiple components, failure times are also closely correlated."</i></p> <p>NUREG/CR-6268 further defines the timing factor for announced failures as within three times the PRA mission time.</p> <p>There is no discussion in the draft NUREG of when plant specific evidence may be applied to update random failure probability when performing an ECA. The failures in the above examples would be more appropriately treated as an increase in the random failure probability. The components may constitute a CCCG, but if they are unreliable, this will be reflected in their individual random failure probabilities.</p>

#	Comment
NRC Response	<p>JAS: This is outright invention. There is no interpretation of the NUREG that would imply this. What is true is that if the pumps are in the same CCG, then coupling factors exist that require a dependency evaluation whenever one of them fails and the failure probability of the remaining must be estimated. Under current methodology, the same alpha factors would be used for all coupling paths. Alphas specific to the failure cause would be used if using the causal method.</p> <p>JAS: Mostly true, but completely irrelevant to ECA. The evidence of individual failures could inform the component total failure rate (maybe upward, maybe downward, and this would in turn affect the calculated CCF probabilities since they scale with total failure rate. Any time one component of a CCG fails, the conditional group failure probability is affected as per the NUREG. This is a function of coupling factors and related alphas and nothing in these examples affects that.</p> <p>JAS: In the above examples the evidence could be used to inform failure rates. It is very, very, rare for circumstances to justify new parameters estimates. Typically when revised parameter estimates are sought a Bayesian process is used that that relies on an industry-averaged prior that is almost never influenced by a single event, or even by a single plant's entire operating history. So such manipulations of the parameter estimates a considered beyond the scope of the NUREG.</p>
AO	<p>Issue 1: "Pump A fails due to Cause X, and Pump B, a redundant pump, fails five years later due to Cause Y. Following the draft NUREG guidance, these failures could be treated as a common cause due to any performance deficiency." It is essential that the determination of Mission Time in data collection (which results in an empirical ratio) and the way this data is used in the model are the same. Therefore the AFM parameters calculated from the CCF Database can only be used in applications where the mission time is 24 hours, and the scenario in the industry comments could not occur. If the mission period was defined as 5 years, then the AFM parameters would be much higher in their multiplicity of failure, and the estimates could be used. The key theme is how CCF models the synchronization of failures.</p> <p>Issue 2: "There is no discussion in the draft NUREG of when plant specific evidence may be applied to update random failure probability when performing an ECA." Agree. This issue is not addressed and I believe needs a detailed and water tight discussion around when it is appropriate to adjust the single failure value and when its not appropriate.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Synchronized Events. <p>Models</p> <ul style="list-style-type: none"> • N/A
Palisades Comment #28	<p>Section 2.2.1: There is no basis for the approach of using the alpha factor in the baseline PRA model as an estimate for the conditional probability that an event is a CCF. The CCF model is being implemented in a manner that it was never intended to be used for. The alpha factor is correlative and not a conditional probability. Again this surrogate use of an alpha factor may be driven by the goal of creating a fast and dirty conditional probability value but any conclusion is suspect.</p>

#	Comment
NRC Response	<p>In general, $\text{factor} = \frac{\# \text{ of CCF Events}}{\# \text{ of All Failure Events}}$, of cause, a factor can be seen as the probability of the failure event to be a CCF event given the failure occurred.</p> <p>Furthermore,</p> <p>The conditional probability</p> <p>JAS: The alpha factors are parameters of an accepted CCF probability model that is widely used by NRC and industry. The alpha factors are not used as probabilities. Algebraic reduction of the conditional probability expression for the CCCG affected by an observed failure leaves a complicated function of alpha factors, but that in no way implies the alpha factors are be treated as conditional probabilities.</p>
AO	<p>The industry comment is coming from the perspective of a piece part argument. The AFM approach to ECA allows the assessment of system risk with knowledge that there is a failure only. PAFM allows assessment of the system risk with knowledge of a failure and its proximity cause. GDM allows the assessment of system risk with knowledge of the cause condition on the other components. It is incorrect to say the AFM has no basis in this application, because it answers a question, but probably not the question the author had in mind. This highlights the importance of analysts understanding the limitations of the modelling techniques so they do not use them in the wrong application. The NUREG needs to be very detailed in this area. This is related to the piece part theme.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Piece Part Theme. <p>Models</p> <ul style="list-style-type: none"> • PAFM and GDM allow more information to be included in the ECA assessment and reduce the uncertainty in the risk estimate.
Palisades Comment #29	<p>Section 2.2.1: This treatment arbitrarily brings in some knowledge to update the PRA model and excludes others. If it is determined that the remaining components are not affected by the cause of the first failure, it should be modeled as an independent event.</p>
NRC Response	<p>JAS: Using the draft NUREG CCF methodology, the components in a CCCG are coupled through known or assumed coupling factors. If the failure cause aligns with any of the known coupling factors, then the dependent calculation is required. Treatment of the remaining component failures as independents is only acceptable if no coupling factors exist, but then the components would not have been assigned to a CCCG to begin with. The causal model would allow the possibility of coupling factors existing that don't align with the cause, in this case – What?</p>
AO	<p>This is the same comment regarding what information the model can account for and the need for a good understanding over these limitations.</p> <p>Key Theme.</p> <ul style="list-style-type: none"> • Piece Part Theme. <p>Models</p> <ul style="list-style-type: none"> • PAFM and GDM allow more information to be included in the ECA assessment and reduce the uncertainty in the risk estimate.

Commented [CSH16]: Incomplete response.

Coyne, Kevin

From: Coyne, Kevin
Sent: Tuesday, May 06, 2014 6:56 PM
To: Michael B Calley (Michael.Calley@inl.gov); James K Knudsen (james.knudsen@inl.gov)
Cc: Schroeder, John (john.schroeder@inl.gov); 'Buell, Robert F' (robert.buell@inl.gov); Appignani, Peter; Gonzalez, Michelle
Subject: May 19 Public Meeting - Use of SPAR/Licensee Models
Attachments: May 19 Public Meeting Announcement.pdf

The Announcement is publicly available as ML14125A371.
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Mike, Jim –

Here's the meeting announcement for the MAY 19th public meeting – the second topic will cover use of the SPAR models. There will also be a bridge line.

Kevin

Coyne, Kevin

From: Coyne, Kevin
Sent: Friday, April 25, 2014 6:38 PM
To: Wong, See-Meng
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

See-Meng –

Looks fine to me – Thanks!

Kevin

From: Wong, See-Meng
Sent: Friday, April 25, 2014 5:21 PM
To: Coyne, Kevin; Vaughn, Stephen; Merzke, Daniel
Cc: Weerakkody, Sunil; Ng, Ching; Marksberry, Don
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

All,

Based on your input, attached is the latest version of the May 19 Public Meeting notice. This updated version includes a 20-minute time slot for public interest groups led by Mr. Jim Riccio, Greenpeace who has accepted the invitation to participate in this meeting. I will populate the "Reference Materials" section once I received the PWROG White Paper from Roy Linthicum by April 30, 2014. We intend to issue this public meeting notice no later than May 01, 2014. Please let me know of any final comments before the issuance of this public meeting notice. Thanks.

See Meng.

From: Coyne, Kevin
Sent: Tuesday, April 22, 2014 5:34 PM
To: Wong, See-Meng; Vaughn, Stephen; Merzke, Daniel
Cc: Weerakkody, Sunil; Ng, Ching; Marksberry, Don
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

Thanks See-Meng –

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Cc: Weerakkody, Sunil; Ng, Ching; Marksberry, Don
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- (1) Reserved Room HQ-3WFN-6A28
- (2) Reserved phone line:

Meeting Information:

Call date:	MAY-19-2014 (Monday)
Call time:	12:30 PM EASTERN TIME
Duration:	5 hr
Confirmation number:	2426803
Company:	NWX-US NUCLEAR REGULATORY COM
CRC:	

Passcodes/Pin codes:

Participant passcode: 10080

For security reasons, the passcode will be required to join the conference.

Dial in numbers:

Country	Toll Free Number
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See Meng.

April XX, 2014

MEMORANDUM TO: Sunil Weerakkody, Chief
PRA Operational Support Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

FROM: Ching H Ng, Reliability and Risk Analyst
PRA Operations and Human Factors Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation.

SUBJECT: PUBLIC MEETING BETWEEN U.S. NUCLEAR REGULATORY
COMMISSION STAFF AND INDUSTRY AND PUBLIC
STAKEHOLDERS TO DISCUSS RISK ASSESSMENT ISSUES IN
THE SIGNIFICANCE DETERMINATION PROCESS (SDP)

DATE AND TIME: May 19, 2014 (Monday)
1:00 PM - 5:00 PM

LOCATION: U.S. Nuclear Regulatory Commission (NRC)
Room 3WFN-6A28
Three White Flint North
11601 Landsdown Street
North Bethesda, MD 20852

PURPOSE: The purpose of the meeting between NRC staff and external
stakeholders including the industry and public interest groups, is
to discuss specific issues related to risk assessment methods
used in the NRC Significance Determination Process (SDP).

CATEGORY 2*: This is a Category 2 meeting. The public is invited to participate in
this meeting at designated points identified on the agenda.

CONTACT: Ching Ng, NRR/DRA
(301) 415-8054
Ching.Ng@nrc.gov

* Commission's Policy Statement on "Enhancing Public Participation in NRC Meetings,"
67 Federal Register 36920, May 28, 2002

The NRC provides reasonable accommodation to individuals with disabilities where appropriate. If reasonable accommodation is needed to participate in this meeting, or if a meeting notice, transcript, or other information from this meeting is needed in another format (e.g., Braille, large print), please notify the NRC meeting contact. Determinations on requests for reasonable accommodation will be made on a case-by-case basis.

PARTICIPANTS:

NRC staff, interested stakeholders (Nuclear Energy Institute (NEI) et al.) and members of the public. Participants from the NRC include members of the Office of Nuclear Reactor Regulation (NRR) and Office of Nuclear Regulatory Research (RES).

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S. Wong, NRR
D. Merzke, NRR
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et al.

INDUSTRY

V. Anderson, NEI
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**AUDIO TELE-
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OTHER INFORMATION:

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Enclosure:
Meeting Agenda

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DISTRIBUTION:

PUBLIC
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PRMB r/f
SWeerakkody, NRR

PMNS
SWong, NRR

RidsNrrOd
JMitman, NRR

ADAMS Accession Number:

*concurring via email

OFFICE	NRR/DRA/APHB	BC: NRR/DRA/APHB
NAME	CNg	SWeerakkody
DATE	04/ /13	04/ /13

OFFICIAL RECORD

MEETING AGENDA

NRC CATEGORY 2 PUBLIC MEETING TO DISCUSS RISK ASSESSMENT ISSUES IN THE SIGNIFICANCE DETERMINATION PROCESS (SDP)

May 19, 2014
USNRC, Three White Flint North, Room 6A28

<u>TIME</u>	<u>TOPIC</u>	<u>LEAD</u>
1:00 – 1:10 p.m.	Introduction and Opening Remarks	NRC
1:10 – 1:30 p.m.	Use of CCDP metric in Significance Determination Process	NEI/PWROG
1:30 – 2:30 p.m.	Discussion	All
2:30 – 2:45 p.m.	Break	
2:45 – 3:15 p.m.	Perspectives on SPAR Models	NRC
3:15 – 3:45 p.m.	Use of licensee's PRA models in SDP Assessments	NEI
3:45 – 4:15 p.m.	Discussion	All
4:15 – 4:30 p.m.	Update on minimum HEP threshold for Dependent Human Failure Events	NEI
4:30 – 4:50 p.m.	Perspectives from Public Interest Groups	Greenpeace
4:50 – 5:00 p.m.	Closing Remarks	NRC

Reference Materials

1. NRC White Paper, "Modeling the Safety Significance of Findings that are the Proximate cause of an Initiating Event Occurrence and a Framework for Defining the Threshold for Causality to Support the Significance Determination Process (SDP)" (ADAMS Accession No. ML14080A051).

ENCLOSURE

Coyne, Kevin

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Sent: Tuesday, April 22, 2014 5:36 PM
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Sent: Monday, April 21, 2014 9:18 AM
To: Ng, Ching
Cc: Weerakkody, Sunil
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

Ching,

Thank you. Can you draft up the meeting announcement, for review, and plan on sending out the meeting announcement no later than early next week?

See Meng.

From: Ng, Ching
Sent: Monday, April 21, 2014 9:12 AM
To: Wong, See-Meng
Subject: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

- (1) Reserved Room HQ-3WFN-6A28
- (2) Reserved phone line:

Meeting Information:

Call date:	MAY-19-2014 (Monday)
Call time:	12:30 PM EASTERN TIME
Duration:	5 hr
Confirmation number:	2426803
Company:	NWX-US NUCLEAR REGULATORY COM.
CRC:	

Passcodes/Pin codes:

Participant passcode:	10080
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For security reasons, the passcode will be required to join the conference.

Dial in numbers:

Country	Toll Free Number
USA	877-620-5866

From: Wong, See-Meng
Sent: Thursday, April 17, 2014 10:48 AM
To: Weerakkody, Sunil; Coyne, Kevin; Vaughn, Stephen; Marksberry, Don; Merzke, Daniel; Nakoski, John
Cc: Ng, Ching
Subject: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

All,

Just to let everybody know that we are scheduling a NRC public meeting on May 19, 2014, 1:00-5:00 pm to discuss (and hopefully, resolve) three issues that NEI/industry would like to present their views to the NRC: (1) use of CCDP metric in SDP assessments, (2) use of licensee PRA models in SDP analyses, and (3) minimum HEP threshold for dependent Human Failure Events. We would like to have these three issues to be discussed in the order of priority in the meeting agenda. We need significant RES participation (from Kevin Coyne) on item 2 even though we have precedent NRC position on the subject. (I have discussed this possibility with Kevin yesterday). Item 3 will be a status update on industry activities on the subject (may not be resolved after I retire from NRC!)

I have talked to Roy Linthicum, PWROG who promised that he would provide the industry white paper on the use of CCDP metric to us by April 30, 2014, and he would need 20 min. to make his presentation on the subject. I have also talked to Victoria Anderson/NEI in the cafeteria yesterday on NEI's commitment to this meeting.

As part of the preparation for this meeting, we will have a teleconference call with interested SRAs sometime next week, who has views against the use of licensee PRA models in SDP analyses. (Steve Vaughn will set up this teleconference call).

Meanwhile, please let me know if you have any thoughts on how we want to set up the meeting agenda before we finalize the meeting announcement on Monday, 4/21. Incidentally, the May 19 public meeting is mentioned in the May 2014 SRA Counterpart Meeting to encourage participation of interested SRAs, and we will update the outcome and our actions of the May 19 meeting in the SRA Counterpart meeting for SRAs who were unable to attend the public meeting. If I have forgotten anything else, please let me know ASAP.

See Meng.

Coyne, Kevin

From: Coyne, Kevin
Sent: Tuesday, April 22, 2014 9:51 AM
To: Wong, See-Meng
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

<http://www.ucsus.org/about/staff/staff/dave-lochbaum.html>

From: Wong, See-Meng
Sent: Tuesday, April 22, 2014 9:45 AM
To: Coyne, Kevin; Vaughn, Stephen
Cc: Weerakkody, Sunil; Ng, Ching; Marksberry, Don
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

Kevin,

Thanks for your comments. We will reach out to external stakeholders such as Jim Riccio & David Lochbaum! Do you know the contact numbers of these individuals. Yes, we have a SRA call (set up by Steve Vaughn) prior to the meeting. As for references, we can provide licensee and NRC documents (with ML numbers) for preview by interested participants.

See Meng.

From: Coyne, Kevin
Sent: Tuesday, April 22, 2014 9:19 AM
To: Vaughn, Stephen; Wong, See-Meng
Cc: Weerakkody, Sunil; Ng, Ching; Marksberry, Don
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

See-Meng –

I agree with all of Steve's comments (and fully endorse the changes he recommended to the purpose section). Additionally, for each topic, I think the agenda should just list the topic (e.g., say "Use of Conditional Core Damage Probability for Significance Determination Process" rather than "Industry view of using CCDP metric in SDP Assessments"). I also think that there should be time allotted for the NRC viewpoint as well as the industry perspectives for each of the three topics. I'm fine with providing background on SPAR. It would also be beneficial if the meeting announcement could reference pertinent documentation so members of the public could be better informed about these topics. I'm also curious if you have reached out to other organizations to support the meeting to get broader perspectives on these issues. For example, both Jim Riccio of Greenpeace and David Lochbaum from UCS had supported earlier SDP development efforts – it would at least show some NRC interest in other views if we reached out to them for this meeting. As an example, this meeting announcement form 2002 touched on several of the above points:

<http://pbadupws.nrc.gov/docs/ML0228/ML022830813.pdf>

I'm still worried that there is not full alignment across the various NRR divisions and RES on some of these topics – I'm assuming you guys will be scheduling an alignment (or two) before the big day.

Kevin

From: Vaughn, Stephen
Sent: Tuesday, April 22, 2014 8:17 AM
To: Wong, See-Meng; Coyne, Kevin
Cc: Weerakkody, Sunil; Ng, Ching
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

See-Meng,

I am not concerned about any names, just organizations. It looks as though the meeting is between NRR (with DRA listed staff) and NEI, the PWROG, and the BWROG. The industry side looks pretty diverse and the NRC side looks pretty narrow. So for NRR we have DRA and DIRS (Sunil and Dan) and for RES we should have at least one name (probably Kevin). For this meeting it seems like the BC level is appropriate.

Steve

From: Wong, See-Meng
Sent: Tuesday, April 22, 2014 8:08 AM
To: Vaughn, Stephen; Coyne, Kevin
Cc: Weerakkody, Sunil; Ng, Ching
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

This is a NRC meeting. We can include Kevin and your name if this is OK with your permissions. If you and Kevin each want 20 minutes to talk, we can arrange on the agenda.

From: Vaughn, Stephen
Sent: Tuesday, April 22, 2014 7:41 AM
To: Wong, See-Meng; Coyne, Kevin
Cc: Weerakkody, Sunil; Ng, Ching
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

Ching,

Attached are my comments.

Thanks,

Steve

From: Wong, See-Meng
Sent: Monday, April 21, 2014 2:53 PM
To: Coyne, Kevin; Vaughn, Stephen
Cc: Weerakkody, Sunil; Ng, Ching
Subject: FW: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

Kevin, Steve,

I called you today, but left no voice mail. As we discussed previously (via email or phone), attached is the draft public meeting notice and agenda for the May 19, 2014 Public Meeting on Risk Assessment Issues in SDP. Please review and let me know of your role and availability to support this meeting. This meeting is held before the May SRA Counterpart meeting to enable SRAs to participate in this meeting in person. I would appreciate if you can let me know your comments in the next couple of days so that we can issue this meeting announcement early next week. Thanks.

See Meng.

From: Ng, Ching
Sent: Monday, April 21, 2014 12:52 PM
To: Wong, See-Meng
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

See Meng,

Attached is the DRAFT meeting announcement for your review. Please feel free to make any changes. Once we have more info related to the topics, we can update it and send it to BC for concurrence.

Sincerely,

Ching

From: Wong, See-Meng
Sent: Monday, April 21, 2014 9:18 AM
To: Ng, Ching
Cc: Weerakkody, Sunil
Subject: RE: Meeting Logistic status update - RE: NRC Public Meeting on RASP Handbook Revisions, May 19, 2014

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See Meng.

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Passcodes/Pin codes:

Participant passcode:	10080
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To: Weerakkody, Sunil; Coyne, Kevin; Vaughn, Stephen; Marksberry, Don; Merzke, Daniel; Nakoski, John
Cc: Ng, Ching
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All,

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Meanwhile, please let me know if you have any thoughts on how we want to set up the meeting agenda before we finalize the meeting announcement on Monday, 4/21. Incidentally, the May 19 public meeting is mentioned in the May 2014 SRA Counterpart Meeting to encourage participation of interested SRAs, and we will update the outcome and our actions of the May 19 meeting in the SRA Counterpart meeting for SRAs who were unable to attend the public meeting. If I have forgotten anything else, please let me know ASAP.

See Meng.

Circle, Jeff

From: Wong, See-Meng
Sent: Friday, April 18, 2014 10:45 AM
To: Vaughn, Stephen; Circle, Jeff
Subject: RE: Licensee PRA for SDP
Attachments: Letter from NEI on August 2007 Commission Meeting.pdf; NRC Response to NEI Letter of August 2007 Commission Meeting.pdf

Attachments are publicly available as ML072290362 and ML072490540.

Steve,

I will send more after I have searched ADAMS.

See Meng.

From: Vaughn, Stephen
Sent: Friday, April 18, 2014 10:35 AM
To: Circle, Jeff; Wong, See-Meng
Subject: Licensee PRA for SDP

Jeff and See-Meng,

Could either of you send me the files/MLs that document the licensee vs SPAR model debate that occurred 6-7 years ago? I want to put those files on the 5/1 meeting request so folks have access to them.

Thanks,

Steve

Coyne, Kevin

From: Coyne, Kevin
Sent: Wednesday, April 16, 2014 3:30 PM
To: Wong, See-Meng; Giitter, Joseph; Correia, Richard
Cc: Weerakkody, Sunil; Zoulis, Antonios
Subject: Re: Public meeting on use of SPAR models

See-Meng -

We did have an earlier discussion on April 4th about the process to be used by licensees to forward information about proposed SPAR model issues (prompted by a question we received from Roy Linthicum) along with some general discussion about ways to keep the industry informed about the SPAR updating process. But we had not discussed a public meeting with NEI on use of SPAR vs licensee models. In fact I was surprised to find out that Sunil reached out to NEI prior to contacting RES about the meeting, but that's water under the bridge at this point. I have a conflict with May 19 (though it could potentially be moved if need be), but I more concerned that RES appears to be getting out of the loop on issues that could have a significant on a major research program. It goes without saying that we need very good alignment between our Branches and we are trying to help -

Kevin

Sent from an NRC Blackberry
Kevin Coyne

(b)(6)

----- Original Message -----

From: Wong, See-Meng
Sent: Wednesday, April 16, 2014 02:46 PM
To: Giitter, Joseph; Correia, Richard; Coyne, Kevin
Cc: Weerakkody, Sunil; Zoulis, Antonios
Subject: RE: Public meeting on use of SPAR models

Joe,

I was at the Brunswick SERP meeting, and was unable to respond to Kevin's question as promptly.

Yes, we are planning to have a May 19 public meeting (one day before the SRA Counterpart Meeting) to discuss the NEI paper on the proposal for using licensee's PRA models for SDP assessments (30-45 min.) among two other topics: (1) use of CCDP metric for initiating event assessments, and (2) minimum joint HEP threshold for dependent Human Failure Events.

We (Sunil and I) have talked to Kevin on a conference call a couple of weeks back that we want RES participation (i.e., have Kevin talk on SPAR model quality for SDP analyses) during the May 19 public meeting. We are in the midst of making the plans and will include all stakeholders including SRAs. We do not intend to leave anybody out. We plan to have a 3-hour session to bring some closure to the stated prevailing issues.

See Meng.

-----Original Message-----

From: Zoulis, Antonios
Sent: Wednesday, April 16, 2014 1:25 PM
To: Wong, See-Meng
Cc: Weerakkody, Sunil
Subject: FW: Public meeting on use of SPAR models

See-meng,

Can you address Kevin's concern?

Thanks,
Antonios

-----Original Message-----

From: Giitter, Joseph
Sent: Wednesday, April 16, 2014 1:20 PM
To: Zoulis, Antonios
Subject: FW: Public meeting on use of SPAR models

Do you know anything about the meeting that Kevin is referring to?

-----Original Message-----

From: Giitter, Joseph
Sent: Wednesday, April 16, 2014 1:19 PM
To: Coyne, Kevin; Weerakkody, Sunil
Cc: Correia, Richard
Subject: RE: Public meeting on use of SPAR models

Hi Kevin-- Sunil (b)(6). I'm not sure what the May 19th meeting is, but I'll have Antonios, who is acting for Sunil, get back with you. I agree that you need to be in the loop.

-----Original Message-----

From: Coyne, Kevin
Sent: Wednesday, April 16, 2014 12:43 PM
To: Weerakkody, Sunil
Cc: Correia, Richard; Giitter, Joseph
Subject: Public meeting on use of SPAR models

Hi Sunil -

I've heard that NRR is setting up a public meeting with NEI for May 19 that will discuss, among other items, the industry white paper on the use of SPAR vs licensee models for the oversight process. As the program lead for SPAR, I think RES would add an important perspective on this discussion and should be involved, but we are not currently in the loop on this. Can you advise as to NRR's plans to have RES support for this meeting?

Thanks -

Kevin

Sent from an NRC Blackberry

Kevin Coyne

(b)(6)

Marksberry, Don

From: Coyne, Kevin
Sent: Tuesday, April 15, 2014 5:44 PM
To: Wong, See-Meng
Cc: Weerakkody, Sunil; Appignani, Peter; Marksberry, Don; Gonzalez, Michelle; Correia, Richard; Vaughn, Stephen; Merzke, Daniel
Subject: RE: draft answers to RIC questions.....
Attachments: W18_Unanswered_Questions_2014_RES Comments_SPAR.docx
Importance: High

See-Meng –

Thanks for the opportunity to review the RIC responses – I think this is a good opportunity to make sure we send out a consistent message on the SPAR models and on how the agency ensures we perform high quality risk assessment for reactor oversight. I made a significant number of revisions to the responses, so let me know if you have any questions. It would probably be a good idea for you guys to also have NRR/DIRS take a look since some of the proposed responses touch on process issues for the SDP.

Kevin

From: Wong, See-Meng
Sent: Tuesday, April 15, 2014 9:43 AM
To: Coyne, Kevin
Cc: Weerakkody, Sunil
Subject: FW: draft answers to RIC questions.....

Kevin,

As we discussed on the phone, I am forwarding to you Sunil's draft responses to unanswered questions that were directed to Sunil at RIC 2014. I am reviewing this draft before finalizing it. I would appreciate very much if you could provide accurate information on the responses to questions on SPAR models, their quality, etc. for SDP so that we have a clear NRC response. As always, thank you for your help.

See Meng.

From: Weerakkody, Sunil
Sent: Monday, April 14, 2014 9:53 AM
To: Lyons, Sara
Cc: Wong, See-Meng
Subject: draft answers to RIC questions.....

RIC 2014: Unanswered Questions
W18: The Promises and Perils of Risk-Informed Decision Making

Doug True

Could you give an example [of] how NRC can remove conservatism from PRA as it can be used in deciding the reduction of the 10-mile plume exposure EPZ?

Please discuss (point/counterpoint) the fire PRA conservatisms that Doug True alluded to in his presentation. [for True/Correia]

Has a formal root-cause evaluation been conducted by industry or NRC on risk-informed applications that have not been successful versus risk-informed applications that have been successful? If not, why not?

What are the industry and NRC plans to implement a risk-informed regulatory framework? What are industry challenges?

Given your insights in using risk in a more integrated manner, what is your opinion of [the NRC's] proposed areas of improvements to SDPs? Is that really risk-informed or is it still risk-based and focused on the numbers?

Regarding "A Return to Insights" emphasized in presentation, please give examples of prior risk-informed applications where insights versus "P" were emphasized. (e.g. IPEEE SMA)

You seem to imply that PRA is opposed to conservatism and point to Fukushima as an example. Please explain how a lack of conservatism serves or protects the public. Also, why are licensees making mods based on risk credit (i.e., risk-based, such as incipient fire detection systems)?

You state that we need to embrace and understand uncertainties and that PRA is more than mean number estimates. How do we improve uncertainty methods in PRA, particularly in Level 2 assessments, in your opinion? Is a more structures and integrated uncertainty assessment similar to LOCA methods a useful model to follow?

You did not mention INPO as one of the institutions to help bring about risk-informed decision making. What should INPO be doing to help risk-informed, performance-based?

Has the industry reviewed NRR's risk-informed decision making procedure LIC-504?

Richard Correia

The focus of the NRC RES fire research seems to be on experimental testing. How does the testing inform the PRA? That is, doesn't the testing typically bound conditions and is therefore less useful in fire PRA? Can the testing contribute to fire PRA conservatism?

Please discuss (point/counterpoint) the fire PRA conservatisms that Doug True alluded to in his presentation. [for True/Correia]

Many of the challenges we face in applying Risk-Informed Regulation stem from lack of knowledge in industry and NRC staff. What part can training and evaluation play in gaining alignment and resolving barriers to success? How should we proceed – specific action?

What opportunities do you see for getting better alignment at all levels of NRC staff to allow PRA to get more use and reduce the deterministic mentality that sometimes gets in the way?

Has a formal root-cause evaluation been conducted by industry or NRC on risk-informed applications that have not been successful versus risk-informed applications that have been successful? If not, why not?

What are the industry and NRC plans to implement a risk-informed regulatory framework? What are NRC challenges?

Anil Julka

Should SPAR be used as a tool for generically requiring filtered vents of a tool to validate licensee specific vent strategies?

Please speak to the issue of voluntary entry into LCOs. Should SPAR or other PRA models be used to determine whether this is a detriment to safety?

Sunil Weerakkody

What is NRC doing to update SDP risk models/process? Gaps are widening between licensee and NRC risk analysis results and is having a significant impact on findings due to excessive conservatisms when compared to licensee results.

NRC continues to update its SPAR models using information that becomes available to them. In a given year, depending upon the resources that can expended on this task we end up updating between 6 and 12 (verify with RES) per year. In spite of this effort, there will be gaps between licensees' and NRC's models. However, multiple reviews and discussions between NRC staff and licensee that occur during SDPs (e.g., information exchanges between regional Senior Reactor Analysts and the licensees' PRA staff, Regulatory Conferences,) enable the NRC to make sure that final SDPs are realistic.

The NRC takes several steps to ensure that risk assessments that support the SDP process are of high quality and reflect the as-built, as-operated plants. These measures include:

- Implementation of a SPAR Model Quality Assurance Plan

Commented [K1]: I would question the basic premise of the question – has APOB seen this "widening gap" between SPAR models and licensee models? I think some comment on this point would be appropriate – particularly if NRR has not seen a diverging trend in SPAR model fidelity. To leave this comment unchallenged is akin to accepting it as fact.

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- Use of the Risk Assessment of Operational Events Handbook (also known as the "RASP Handbook") by agency risk analysts. This Handbook helps to ensure consistency in the application of risk assessment tools. Additionally, Volume 3 of the Handbook provides detailed guidance on the conduct of model SPAR model modifications and reviews to ensure the models are of adequate quality and reflect the as-built, as-operated plant for the problem being analyzed.

- Comparisons between SPAR baseline model results and licensee model results (when voluntarily submitted by the licensee) to identify differences and correct issues as appropriate. These comparisons include comparisons of baseline CDF, conditional core damage probability for each initiator type, and top cut sets.

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- Periodic updates of SPAR models. The agency performs major updates on approximately 8-12 SPAR models per years based on feedback from Regional Senior Reactor Analysts and utility PRA analysts. Additionally, less significant model changes to roughly 20 models per year are performed to support specific risk assessment applications. Therefore, roughly a third of the SPAR models are typically updated in a given year.

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- Senior Reactor Analysts must complete a rigorous training and qualification program (described in Inspection Manual Chapter 1245, Appendix C-9) to ensure that they can adequately apply risk tools in reactor oversight applications. Each SDP analysis is peer reviewed by another SRA or headquarters analyst.

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- Significance and Enforcement Review Panel (SERP) are held for all greater than green findings to ensure appropriate risk assessment methods are applied and consistency in the oversight process. The SERP includes headquarters staff from the Office of Enforcement, the applicable Region, and NRR technical, program, and management representatives.

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- As part of the Enforcement Process, licensees are afforded an opportunity to either attend a Regulatory Conference or provide a written response for all greater than green performance issues. The NRC will conduct a review of all information provided by the licensee to ensure it is appropriately reflected in the agency's risk assessment. IMC 609, Attachment 2, also provides an appeal process for a licensee to appeal the staff's final SDP assessment.

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These measures taken together ensure that the final agency risk assessment accurately reflects the performance issue and the as-built, as-operated plant. However, it is important for licensees to provide relevant, accurate and timely information in support this process.

With regard to the questioners comment that there is a widening gap between SPAR and licensee, the NRC's experience has not validated this concern. Differences between SPAR results and licensee PRAs tend to be driven by the characterization of the event and specific assumptions for the analysis, rather than modeling differences. For this reason, the agency ensures that all agency risk analysts supporting the oversight process are thoroughly trained

and implements a number of process controls to ensure that results obtained from agency risk assessments are accurate.

I agree that most differences between SPAR and NRC models are driven by assumptions/ boundary conditions. Even when the results are closely aligned, small differences can result in different colored finding due to fairly hard thresholds. In this case, shouldn't the model which provides the best alignment with the as-built, as-operated plant be used?

We agree that models used to assess the SDP should provide the best alignment with the as-built, as-operated plant, especially if not doing so could lead to different colors as a result of lack of plant specific details in the NRC model. However, this has not been a challenge to the use of NRC models for SDPs since the communications between NRC staff and licensees during the SDP process has always enables us to receive any details that are missing from the SPAR models. To that extent, it is important to note that, when analyzing Conditions or Events, even the highly detailed licensee's models may have to be modified to model additional plant details to appropriately assess the Condition or the Event.

As described in the previous question response, the NRC implements numerous measures to ensure that risk assessments are accurate and based on the as-built, as-operated plant. Additionally, the agency follows a deliberative process (as described in IMC 609) to characterize licensee performance issues. This process includes the opportunity for licensees to provide additional information to support the staff's risk assessment and also provides an appeal process. To ensure the enforcement process remains objective and unbiased, the NRC relies on independent risk assessment and the SPAR models, rather than the licensees risk characterization. However, the collective measures described above ensure that the final agency risk characterization is realistic and timely.

Should SPAR be used as a tool for generically requiring filtered vents of a tool to validate licensee specific vent strategies?

Already answered at the RIC

Regarding SDP SERP process, when is the licensee input to the process so informal? NRC region SRA "informally" solicits licensee input, passes it to NRR SDP lead PRA and input only needs to be "considered" with no dialog with licensee PRA staff. Getting more formal involvement of licensee PRA staff would improve dialog and potentially avoid regulator conferences.

NRC regions have the lead in Inspection and Enforce, hence implementation of the ROP. Furthermore, for most SDPs, the role of the HQ analysts is to perform a peer review of the analyses performed by the regional SRA. Regional SRA's rely on already established regional processes to solicit licensee's inputs and shares them with the HQ analyst. The HQ analysts in

Commented [K2]: Would be useful to repeat the answer here for completeness.

Commented [MD3]: I don't understand this question. he mean why?

discussion with the regional SRAs, participates in some dialogues between the regional SRAs and the licensee.

As part of the inspection process, NRC inspectors and Regional SRAs will attempt to gather all relevant information that is pertinent to the issue. The NRC follows a prescribed process when assessing potential enforcement issues. This process is intended to ensure that the agency's decision making process is timely, transparent, predictable, and consistent. The Regulatory Conference provides a formal venue for the licensee to provide the staff additional information relevant to the enforcement issue and a forum for open discussion on the significance of the issue.

Speaker stated that SPAR models are of high quality. These models do not meet the PRA standard requirements applied to operating plant PRAs. Why is this acceptable for SPAR, but not for the licensee model?

The Idaho National Laboratory develops and maintains PRA models for the NRC's Office of Nuclear Regulatory Research (RES). They perform this task under a set of quality requirements specified by RES. Since we do not use NRC's models to support changes to licenses (e.g., changes to Tech Specs, NFPA 805), NRC's SPAR models do not have to support the same quality standards that we expect of licensees' models. To that end, it should be noted that the quality expectations of licensees' model vary depending on the application. For example, when licensees used their PRA models to implement the Maintenance Rule, we did not expect them to meet ANS PRA Standards.

As described in the previous responses, the NRC implements a Quality Assurance Program to ensure that the SPAR models reflect the as-built, as-operated nuclear plant. However, it should be recognized that the primary purpose of the SPAR models is to support the reactor oversight process. While the agency endeavors to ensure the models themselves meet high quality standards, it is important that a distinction be made between model quality and the implementation of the model to support a specific risk assessment. Therefore, in order to ensure that the SPAR models are correctly applied and used for a specific application, the agency implements several measures, including use of trained staff, technical peer and management reviews of risk assessments, and opportunities for licensees to provide additional information to the staff. However, it should be noted that the SPAR models are generally used to categorize and prioritize operational events and conditions, including licensee non-compliance issues with existing regulations.

On the contrary, licensee PRA models have generally been developed to support licensing basis changes and therefore must meet more stringent technical adequacy requirements (e.g., Regulatory Guide 1.200). Although the SPAR models are not required to meet the ASME PRA standards, in 2009 the NRC, with the assistance of the BWR and PWR Owner's Groups, performed industry led peer reviews of a typical BWR and a PWR SPAR model. The peer review teams (which consisted of representatives from ERIN Engineering, Constellation,

Dominion, and Florida Power and Light) noted a number of strengths for the SPAR models, including:

- The SPAR model structure is robust and well developed.
- The SPAR model fault trees are streamlined with an appropriate level of detail for its intended uses.
- The SPAR model structure and the SAPHIRE computer software are at the state of the technology.
- The SPAR model is an efficient method to develop qualitative and quantitative insights for applications, SDP evaluations, inspections, event assessments, and model evaluations.

The peer review teams also noted a number of enhancements that could be made for the SPAR models and the staff has been working to address these recommendations.

There is a significant gap in the risk models of the licensee and the NRC. This has lead to significant differences in risk assessment of events and equipment challenges. The impact has been significant number of NRC findings that are greater than green, such as white or yellow, where licensee analysis show green. What is the NRC doing to improve process or risk models to more accurately assess risk in the SDP. This has resulted in misapplication of important resources – both NRC and industry – in addressing issues that were not accurately characterized due to excessive conservatism.

NRC continues to update its SPAR models using information that becomes available to them. In a given year, depending upon the resources that can expended on this task we end up updating between 6 and 12 (verify with RES) per year. In spite of this effort, there will be gaps between licensees' and NRC's models. However, multiple reviews and discussions between NRC staff and licensee that occur during SDPs (e.g., information exchanges between regional Senior Reactor Analysts and the licensees' PRA staff, Regulatory Conferences,) enable the NRC to make sure that final SDPs are realistic.

The NRC has not observed a "significant gap" in risk models used by the licensees and the SPAR models. While divergence between initial licensee and NRC risk assessments for a specific operational event is sometimes noted, the reasons for the divergence is usually readily identified and often involves differences in key assumptions and boundary conditions rather than modeling issues. Additionally, and as discussed above, the NRC implements a number of important procedural and technical measures to ensure that agency risk assessment are accurate, timely, and reflect the as-built, as-operated plant. These measures provide a high degree of confidence that reactor oversight issues, including the risk characterization of licensee non-compliance with regulatory requirements, are appropriately categorized.

Formatted: List Paragraph, Bulleted + Level: 1 + Align 0" + Indent at: 0.25"

Commented [K4]: Again, I would question the premise the question – has NRR really seen these gaps between baseline SPAR and baselined licensee models

Circle, Jeff

From: Vaughn, Stephen
Sent: Tuesday, April 15, 2014 8:21 AM
To: Kozak, Laura; Weerakkody, Sunil; Circle, Jeff
Subject: RE: NRC path forward on industry white paper proposal to use licensee PRAs in SDP?

Laura,

For an official response I would say that currently the NRC and industry are in the very early stages of discussing the white paper (it was formally introduced on 4/2 at the ROP WG public meeting). My personal opinion is that the white paper recommendations describe the way the current process should work (i.e., sharing licensee PRA insights with the NRC early and often). The contentious part is the request to have the SDP decision based on the licensee's PRA results and checked by the SPAR model results...that is a non-starter.

Maybe Cindy could reiterate that the NRC always wants to improve the SPAR models and the licensees can help us in that effort by providing risk information to INL via RES (Pete Appignani). In addition, differences between the base licensee and SPAR models are not the concern...those differences are not that significant. The significant differences are in the assumptions used to model the finding case (e.g., exposure time, recovery credit, success criteria, physics of failure). So a more fruitful discussion would be to see if industry and the NRC could agree to some consensus models to remove all of these model uncertainties.

Steve

From: Kozak, Laura
Sent: Monday, April 14, 2014 10:28 AM
To: Weerakkody, Sunil; Vaughn, Stephen; Circle, Jeff
Subject: NRC path forward on industry white paper proposal to use licensee PRAs in SDP?

Can I get some perspectives on how the NRC is considering the recent industry proposal?

Some context – Our Regional Administrator is going to a meeting with Florida Power and Light/NextEra (apparently all RAs with utility executives) in May. One of the topics is PRA initiatives with a presentation by Anil Julka. I'd like to brief Cindy on what the NRC is discussing/doing with this proposal.

Thanks

Laura

Marksberry, Don

From: Coyne, Kevin
Sent: Monday, April 07, 2014 9:22 AM
To: Vaughn, Stephen
Cc: Appignani, Peter; Merzke, Daniel; Marksberry, Don; Wong, See-Meng; Weerakkody, Sunil; Franovich, Rani
Subject: RE: Action Item From Last Meeting
Attachments: Letter from R. Correia to D.Shumaker re: Transmitting the Hope Creek Generating Station, Units 1&2 Spar Models; RE: Action Item From Last Meeting

Thanks for the additional background Steve - I also chatted with Sunil and See-Meng on Friday and have a better picture what's been going on. I think there are two issues/questions here: (1) who do licensees contact to provide feedback on the SPAR models for their facilities (the process), and (2) making sure licensees know that we want feedback and have existing processes in place (the advertising campaign about the process). Issue (1) is very clear in my mind and should also be clear to every license - Pete Appignani is the point of contact for the program. In fact, in order to get their SPAR models, every licensee needs to ask Pete for the model (and based on SPAR distribution activity, it would be hard for me to believe that any licensee is not aware of this process). The letter that we send with every spar model (recent example attached), lets the utilities know that we are indeed interested in feedback and that they should contact Pete with any questions. For a licensee to claim that they don't know who to contact to provide model feedback seems a bit disingenuous to me, but I guess that's where issue (2) comes in with making sure the word is out that we are open for feedback on the models. We have been engaging the industry as able through routine participation in meetings like the PWROG to remind folks who to contact with feedback, but obviously there's still work to be done. I also spoke with Roy Linthicum on Friday and re-affirmed with him that Pete was the point of contact for SPAR (email also attached). So while advertising the feedback process is a good thing to do, lack of knowledge of the point of contact shouldn't be a credible reason for not letting us know about divergence between a licensee PRA and the SPAR model. Anyway, we'll continue to support you as needed to make progress on this -

Kevin

——Original Message——

From: Vaughn, Stephen
Sent: Monday, April 07, 2014 7:24 AM
To: Franovich, Rani; Coyne, Kevin; Wong, See-Meng; Weerakkody, Sunil
Cc: Appignani, Peter; Merzke, Daniel
Subject: RE: Action Item From Last Meeting

Kevin,

At the January and April ROP working group meetings industry discussed the possibility of using licensee models (instead of SPAR models) to support the SDP. We had discussions regarding ways to improve the SPAR models by getting up to date plant and PRA info from utilities...and I'm sure you've had the same conversation many times.

At the January meeting I was very clear to indicate that RES (I even mentioned your name and Pete Appignani as the points of contact) for any discussions regarding SPAR model improvement. At the April meeting (last Wed) I did not reiterate that RES staff have the lead for SPAR...I probably should have restated that you and Pete are the leads since it had been 3 months and I'm sure some folks forgot.

I had planned on emailing/calling you and Pete after the meeting Wed but was a bit slower than the PWROG...my apologies. I did not engage RES after the January meeting because the industry claims of "our models are better than SPAR so we should use them for the SDP" were just verbal; however, April 2nd they put pen to paper so their motivation is not fleeting. If you have time to chat today, tomorrow, or any time this week let me know...

Thanks,

Steve

Stephen Vaughn

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Inspection and Regional Support Performance Assessment Branch
(301) 415-3640

-----Original Message-----

From: Franovich, Rani
Sent: Friday, April 04, 2014 11:53 AM
To: Coyne, Kevin; Wong, See-Meng; Weerakkody, Sunil
Cc: Vaughn, Stephen; Appignani, Peter; Merzke, Daniel
Subject: RE: Action Item From Last Meeting

Hey Kevin,

I regret that I have no insight to share. If NRR was out of step in its interactions, I am very sorry for that.

Dan Merzke is acting for me while I am on rotation to NSIR this spring and summer... he'll look into the matter and get back to you.

Best,
Rani

From: Coyne, Kevin
Sent: Friday, April 04, 2014 10:00 AM
To: Wong, See-Meng; Franovich, Rani; Weerakkody, Sunil
Cc: Vaughn, Stephen; Appignani, Peter
Subject: RE: Action Item From Last Meeting

Yes, we did have an email exchange, but nothing more came from it and it is now April. And there was no mention of anyone directly contacting INL at that time. So, I was surprised when the PWROG recently approached us about the issue before we heard anything more from NRR.

The short answer is that there is an existing protocol for providing this information that is contained in every SPAR distribution request letter we send out – the single point of contact is Pete Appignani (though we also provide contact information for Bob Buell as a backup). However, as you are no doubt aware, we generally get very little feedback from utilities (until, of course, they are in the midst of an SDP).

-Kevin

From: Wong, See-Meng
Sent: Friday, April 04, 2014 9:14 AM
To: Coyne, Kevin; Franovich, Rani; Weerakkody, Sunil
Cc: Vaughn, Stephen; Appignani, Peter
Subject: RE: Action Item From Last Meeting

Kevin,

In the January 2014 emails to you (see attachment), I had communicated to you the industry's interest in review of plant-specific SPAR models. We wanted to make sure that RES would be involved in establishing a convenient protocol to do so, recognizing the impact of NRC resources. We would like to have an internal NRC meeting before proceeding.

See Meng.

From: Coyne, Kevin
Sent: Friday, April 04, 2014 8:53 AM
To: Franovich, Rani; Weerakkody, Sunil
Cc: Vaughn, Stephen; Wong, See-Meng; Appignani, Peter
Subject: FW: Action Item From Last Meeting

Rani, Sunil –

Can you give me some background as to why Steve Vaughn and See-Meng Wong are working with industry to develop means to communicate with RES contractor's without including us in the interaction? In no case should anyone other than the assigned contracting officer's representative be giving direction to INEL and any SPAR updating activities needs to be coordinated with RES.

Please advise as to your plans with this -

Kevin

From: SLIDER, James [mailto:jes@nei.org]<mailto:[mailto:jes@nei.org]>
Sent: Monday, March 31, 2014 5:36 PM
To: Linthicum, Roy R.:(GenCo-Nuc)
Subject: Action Item From Last Meeting

Status?

ACTION ITEM 201401-01: Mr. Wong, Mr. Vaughn and Roy Linthicum agreed to develop a summary description of ways for licensees to reach out to INEL on updates to their PRA models.

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Marksberry, Don

From: Coyne, Kevin
Sent: Friday, April 04, 2014 9:51 AM
To: roy.linthicum@exeloncorp.com
Cc: Appignani, Peter; 'Buell, Robert F' (robert.buell@inl.gov)
Subject: RE: Action Item From Last Meeting

Roy –

Pete just forwarded me your question and we definitely agree that we need to make sure folks know where to send any comments and questions on the SPAR models. The quick answer is that Pete Appignani is the single point of contact for any SPAR model issues. I know the boiler plate in cover letters can sometimes get overlooked, but the letter we include with each SPAR model distribution request includes the following information:

...We are prepared to discuss significant differences between your PRA model and the associated SPAR model and address these differences as appropriate.

...If you have questions about the SPAR models, please contact Mr. Peter Appignani at (301) 251-7608 (e-mail address: peter.appignani@nrc.gov). Questions and suggestions may also be directed to Mr. Robert Buell of the Idaho National Laboratory (INL) at (208) 526-9400 (e-mail address: robert.buell@inl.gov).

So, we do want feedback on the models and provide Pete's contact info to facilitate this. There have been a few licensees who feel more comfortable dealing directly with INL, so we also provide Bob Buell's contact information (which also gives us a backup to Pete). However, the expectation however is that INL would inform us when they receive licensee feedback (so we can prioritize the updates and make sure things that can significantly change a SPAR models get done in a timely fashion). For model updates, we will generally need some documentation from the utility on the suggested model changes as well as some supporting information (e.g., existence of procedures, training, etc.). As with anything, we sometimes get resource constrained and it may take us some time to implement the updates. But we maintain a SPAR model issue reporting system under our quality program to help identify known model issues to users until we get a chance to make appropriate updates.

I hope this addressed your question, but let me know if you need more background or have additional questions -

Kevin

Kevin Coyne, P.E., Ph.D.
Chief, Probabilistic Risk Assessment Branch
Division of Risk Analysis, Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(301) 251-7586 (work)
(b)(6) (cell)

From: Linthicum, Roy R.:(GenCo-Nuc) [mailto:roy.linthicum@exeloncorp.com]
Sent: Friday, April 04, 2014 8:21 AM
To: Appignani, Peter
Subject: FW: Action Item From Last Meeting

Pete,

At a recent ROP Task Force meeting, the topic of updating the SPAR models following plant design/procedure changes came up. Some industry reps have noted that there residents or SRAs don't always pass on model update information they get from the utility. Is there a way we can standardize communicating plant changes to ensure the SPAR models get updated. The industry would feel better if there was a common point of contact at NRC headquarters that we could use.

Roy Linthicum
Exelon Nuclear
Chairman, PWROG RMSC
(630)-657-3846

(b)(6) (Cell)

 Exelon Generation.



From: SLIDER, James [mailto:jcs@nei.org]
Sent: Monday, March 31, 2014 5:36 PM
To: Linthicum, Roy R.:(GenCo-Nuc)
Subject: Action Item From Last Meeting

Status?

ACTION ITEM 201401-01: Mr. Wong, Mr. Vaughn and Roy Linthicum agreed to develop a summary description of ways for licensees to reach out to INEL on updates to their PRA models.



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Coyne, Kevin

From: Appignani, Peter
Sent: Thursday, April 03, 2014 8:24 AM
To: Coyne, Kevin; Correia, Richard; Madden, Patrick
Cc: Sancaktar, Selim; Nakoski, John; Marksberry, Don
Subject: RE: Highlights of APHB Discussions at NRR/DIRS ROP Monthly Meeting with NEI & industry representatives

To quote Yogi Berra: "It's like déjà vu all over again"

Two comments from the previous discourse on this matter:

1. The ROP (SDP) process is an NRC process, the licensees felt it was their process.
2. If the licensee's PRAs were so good and plant management was actually using the PRA to manage risk, we wouldn't be having this discussion.

Pete

From: Coyne, Kevin
Sent: Wednesday, April 02, 2014 6:12 PM
To: Correia, Richard; Madden, Patrick
Cc: Appignani, Peter; Sancaktar, Selim; Nakoski, John
Subject: Fw: Highlights of APHB Discussions at NRR/DIRS ROP Monthly Meeting with NEI & industry representatives

See attached nei white paper on using licensee models for the sdp (needless to say, it is critical of the spar program...).

There are a number of errors in the paper, in addition to a healthy sampling of overstatements and half truths. NEI is also laboring under a number of misconceptions about the what is done to verify quality of the models, what a "standardized" model represents, and some basic concepts of the sdp process.

Anyway, wanted to let you know since this has the potential to become a significant distraction -

Kevin

Anyway, wanted to give you a heads up

Sent from an NRC Blackberry
Kevin Coyne

(b)(6)

From: Wong, See-Meng
Sent: Wednesday, April 02, 2014 04:46 PM
To: Coyne, Kevin; Marksberry, Don
Subject: FW: Highlights of APHB Discussions at NRR/DIRS ROP Monthly Meeting with NEI & industry representatives

Kevin,

As discussed on the phone, I wanted to share this information with you. As occurred 5 years ago, we may have to prepared a Commission letter to address NEI's proposal. I will keep you informed.

See Meng.

From: Wong, See-Meng
Sent: Wednesday, April 02, 2014 3:32 PM
To: Glitter, Joseph; Lee, Samson
Cc: Weerakkody, Sunil; Hamzehee, Hossein
Subject: Highlights of APHB Discussions at NRR/DIRS ROP Monthly Meeting with NEI & industry representatives

Joe/Sam,

Here are the highlights of our APHB discussions at this morning's NRR/DIRS ROP Monthly Meeting with NEI & industry representatives:

1. Public Meeting on RASP Handbook

As a follow-on action from the January 08, 2014 Public Meeting on RASP Handbook , Revision 2, we communicated our interest in having another NRC public meeting very soon to review: (a) PWROG White Paper on "Initiating Event SDP," (that was promised in March 2014), and (b) Industry examples of appropriate use of the minimum joint HEP for screening purposes in SDP analyses.

Roy Linthicum responded that the PWROG should be finalizing the industry White Paper in a PWROG/industry meeting next week, and will submit the document to NRC for review. Roy Linthicum acknowledged receipt of DIRS/Steve Vaughn's draft White Paper on the use of CCDP vs. delta CDF for SDP analyses.

2. NEI White Paper on "Use of Licensee PRA Models in SDP"

NEI presented a White Paper entitled: "Proposal for use of Licensee PRA Models in the Significance Determination Process" (see attachment). We (See Meng) requested clarification from NEI (James Slider) on the context of this White Paper in terms of whether this document is part of an incoming NEI letter to NRC providing recommendations for enhancing the ROP. NEI responded that the objective of the paper was to initiate dialogue between NRC and industry on the growing delta between plant-specific PRAs and SPAR models that are used in the regulatory processes.

See Meng reminded the meeting participants that there was a similar NEI letter (M. Fertel, dated 2007) on this subject, and NRC EDO (L Reyes, August 2007) response to this NEI letter (see attached correspondence). See Meng expressed some concerns with the objective of the current NEI White Paper, and communicated that NRC staff will review this paper internally before making any commitments to address the NEI proposed recommendations.

(Off the record, Rani Franovich indicated that DRA and DIRS staff should meet to discuss this NEI White Paper and its ramifications. More to follow).

Please let me know if you have any questions.

See Meng.

Coyne, Kevin

From: Coyne, Kevin
Sent: Thursday, April 03, 2014 8:00 AM
To: Correia, Richard; Madden, Patrick
Cc: Appignani, Peter; Sancaktar, Selim; Nakoski, John
Subject: Re: Highlights of APHB Discussions at NRR/DIRS ROP Monthly Meeting with NEI & industry representatives

Rich -

Apparently it was discussed at the monthly rop meeting yesterday. Not sure if nrr had advanced notice that it was coming though..

Kevin

Sent from an NRC Blackberry

Kevin Coyne

(b)(6)

From: Correia, Richard
Sent: Thursday, April 03, 2014 07:40 AM
To: Coyne, Kevin; Madden, Patrick
Cc: Appignani, Peter; Sancaktar, Selim; Nakoski, John
Subject: RE: Highlights of APHB Discussions at NRR/DIRS ROP Monthly Meeting with NEI & industry representatives

Thx Kevin. When did this paper come into NRC and to whom?

Rich

Richard Correia, PE
Director,
Division of Risk Analysis
Office of Nuclear Regulatory Research
US NRC

richard.correia@nrc.gov

From: Coyne, Kevin
Sent: Wednesday, April 02, 2014 6:12 PM
To: Correia, Richard; Madden, Patrick
Cc: Appignani, Peter; Sancaktar, Selim; Nakoski, John
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Kevin Coyne

(b)(6)

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Subject: FW: Highlights of APHB Discussions at NRR/DIRS ROP Monthly Meeting with NEI & industry representatives

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Sent: Wednesday, April 02, 2014 3:32 PM

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Cc: Weerakkody, Sunil; Hamzehee, Hossein

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Please let me know if you have any questions.

See Meng.

Nakoski, John

From: Marksberry, Don
Sent: Thursday, April 03, 2014 7:17 AM
To: Gonzalez, Michelle; Appignani, Peter; Helton, Donald; Sancaktar, Selim; Lane, John; Wood, Jeffery; Hunter, Christopher; Sher Song-hua; Chang, James; Kuritzky, Alan; Peters, Sean; Yeilding, Dale; Nakoski, John
Cc: Coyne, Kevin
Subject: FW: Highlights of APHB Discussions at NRR/DIRS ROP Monthly Meeting with NEI & industry representatives
Attachments: Whitepaper on PRA use in SDP - Rev a.docx; Letter from NEI on August 2007 Commission Meeting.pdf; NRC Response to N Letter of August 2007 Commission Meeting.pdf

See below

From: Wong, See-Meng
Sent: Wednesday, April 02, 2014 4:47 PM
To: Coyne, Kevin; Marksberry, Don
Subject: FW: Highlights of APHB Discussions at NRR/DIRS ROP Monthly Meeting with NEI & industry representatives

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See Meng.

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Sent: Wednesday, April 02, 2014 3:32 PM
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Cc: Weerakkody, Sunil; Hamzehee, Hossein
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(Off the record, Rani Franovich indicated that DRA and DIRS staff should meet to discuss this NEI White Paper and its ramifications. More to follow).

Please let me know if you have any questions.

See Meng.

Circle, Jeff

From: Wong, See-Meng
Sent: Wednesday, April 02, 2014 1:17 PM
To: Circle, Jeff
Cc: Weerakkody, Sunil
Subject: RE: Commission Response to NEI

Jeff,

Thanks. I am aware of these and other letters related to this old argument of SPAR vs. licensee's PRA models. NEI provided a white paper on this subject at the ROP monthly meeting this morning. I will provide a summary of this morning's meeting to the Branch in a short while.

See Meng.

From: Circle, Jeff
Sent: Wednesday, April 02, 2014 12:58 PM
To: Wong, See-Meng
Cc: Weerakkody, Sunil
Subject: Commission Response to NEI

S-M,

Sunil told me that you will be taking the lead in representing our position should industry rehash the old argument over use of SPAR vs. licensee's models for SDP. To help you in the upcoming debate, I pulled out our response that was written in the Fall of 2007 after NEI made a Commission briefing partly on this subject in August. I also included a copy of the NEI letter which brings up Tony's "de minimus" argument. As you know, this was brought up in public meetings starting in September 2006, December 2006, and in the spring of 2007 (at NEI's offices downtown) before culminating at the Commission briefing. There has been such a turnover in management here that many of the key players are no longer around so, feel free to use these letters and if you need any additional information, feel free to let me know.

Jeff.

*Jeff A. Circle
Team Leader – PRA Model Development
PRA Operations and Human Factors Branch
NRR/Division of Risk Assessment
(301) 415-1152*

Marksberry, Don

From: Littlejohn, Jennene
Sent: Thursday, March 06, 2014 4:43 PM
To: Appignani, Peter; Coyne, Kevin; Correia, Richard; Madden, Patrick; Cruz, Holly; Lorson, Raymond; Trapp, James; Schmidt, Wayne; Cahill, Christopher; Cook, William; Hughey, John; Ennis, Rick
Subject: Letter from R. Correia to D.Shumaker re: Transmitting the Hope Creek Generating Station, Units 1&2 Spar Models

Hello,

If there are any questions regarding this letter please contact Peter Appignani at 301-251-7608

[View ADAMS P8 Properties ML14049A121](#)

[Open ADAMS P8 Document \(Letter from R. Correia to D. Shumaker re: Transmitting the Hope Creek Generating Station, Units 1&2 SPAR Models\)](#)

Thank you,
Jennene Littlejohn
Administrative Assistant
Nuclear Regulatory Commission
Office-301-251-7430
Location- CSB-4A03
jennene.littlejohn@nrc.gov
Fax:301-251-7424

~~**Confidentiality Notice:** The above email message, together with any forwarded emails or attachment(s), is for the sole use of the intended recipient(s) and may contain information that is sensitive, privileged, confidential or otherwise protected from disclosure under applicable federal law. Any unauthorized use or disclosure of the email message and any associated attachment(s) is prohibited. If you believe that you have received this email in error, please notify the sender immediately and delete it from your system.~~

Circle, Jeff

From: Passehl, Dave
Sent: Tuesday, March 04, 2014 1:34 PM
To: Ferrante, Fernando; Kozak, Laura; Weerakkody, Sunil
Cc: Circle, Jeff; Zoulis, Antonios; Valos, Nicholas
Subject: RE: RIC presentation on use of licensee PRA model for SDP

Thanks for attending Fernando I am interested in what comments/questions there are. Maybe next year we need to put on our own presentation.

From: Ferrante, Fernando
Sent: Tuesday, March 04, 2014 9:56 AM
To: Kozak, Laura; Weerakkody, Sunil
Cc: Circle, Jeff; Zoulis, Antonios; Passehl, Dave; Valos, Nicholas
Subject: RE: RIC presentation on use of licensee PRA model for SDP

Laura,

Fully agree. I can add my experience with the North Anna EDG, and all the flooding findings. I think there is one specific PRA contractor who has been taking this approach to blame "conservatism" in SPAR models in order to pile on more reasons to try to sway uninformed NRC management in SDP decisions. I don't think it's working, but "campaigns" such as this can sometimes cause long lasting damage if someone takes them at face value. I will be at this RIC session.

Thanks,
Fernando

From: Kozak, Laura
Sent: Tuesday, March 04, 2014 9:49 AM
To: Weerakkody, Sunil
Cc: Circle, Jeff; Zoulis, Antonios; Ferrante, Fernando; Passehl, Dave; Valos, Nicholas
Subject: RIC presentation on use of licensee PRA model for SDP

Sunil

I saw the RIC agenda yesterday and wanted to provide some additional context to Anil Julka's presentation. We have been interacting with NextEra a lot in the past year or so because of the two white findings at Duane Arnold (EDG fuel oil leak, RCIC) and the two white findings at Point Beach (AFW, external flooding). The points in his presentation at the RIC are much the same as points made at regulatory conferences.

Baseline model differences between the licensee PRA model and the Duane Arnold SPAR model were not the reasons for why we ended up at White while the licensee believed the issue to be green. For both issues we did need to change the SPAR model – to include the TSC DG, to credit CRD for early injection, and a few others. The difference between our SDP results and the licensee assessment (green) was really about issues like exposure time, recovery potential, common cause failure, and fire risk contribution. These are typical controversial areas but really they are not about which baseline model is used. It is more about how to model the finding.

In general, I have not found the SPAR models to be conservative. In a number of cases, Duane Arnold RCIC is one of them, if we use the same input assumptions, the licensee model delta CDF results are actually

slightly higher than SPAR model results. So it seems that the blanket statement "the SPAR models are conservative" is just false. Benchmarking results also show good agreement with licensee PRAs.

Another point in the presentation is about focusing on the differences between the two models during the SDP process. I can assure you that we spend a great deal of effort reviewing, discussing and dispositioning differences in the models. So I really see no proposed change here from our current process.

I just wanted to share some thoughts on this topic. I cc'd DRA staff that were involved in these issues as well.

Laura

Circle, Jeff

From: Weerakkody, Sunil
Sent: Tuesday, March 04, 2014 1:24 PM
To: Kozak, Laura
Cc: Wong, See-Meng; Ferrante, Fernando; Circle, Jeff
Subject: RE: RIC presentation on use of licensee PRA model for SDP (ACTION to See-Meng)

Laura,

See-Meng will be the one who'll keep you informed of the status on the next step.

*Sunil D. Weerakkody
Branch Chief, PRA Operations and Human Factors Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission*

*Tel: 301-415-2870
Email: sunil.weerakkody@nrc.gov*

From: Kozak, Laura
Sent: Tuesday, March 04, 2014 11:27 AM
To: Weerakkody, Sunil
Subject: RE: RIC presentation on use of licensee PRA model for SDP (ACTION to See-Meng)

Thank you!

From: Weerakkody, Sunil
Sent: Tuesday, March 04, 2014 10:21 AM
To: Kozak, Laura
Cc: Circle, Jeff; Zoulis, Antonios; Ferrante, Fernando; Passehl, Dave; Valos, Nicholas; Wong, See-Meng
Subject: RE: RIC presentation on use of licensee PRA model for SDP (ACTION to See-Meng)

Laura,

When this miscommunication was brought to our attention a few months ago, See-Meng took proactive actions to nip it in the bud. He worked with Kevin Coyne to brief DRA management to effectively communicate to Joe Glitter about the facts that you have conveyed (There was a one hour presentation from Kevin Coyne to Joe). The next step was to have Joe communicate this to the regional directors. He was scheduled to do this at February division director counterpart meeting. However, ice and snow got in the way. See-Meng will follow up with Joe as appropriate in using a bi-weekly meeting to share this issue with the regional managers.

*Sunil D. Weerakkody
Branch Chief, PRA Operations and Human Factors Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission*

Tel: 301-415-2870

Email: sunil.weerakkody@nrc.gov

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Laura

Marksberry, Don

From: Coyne, Kevin
Sent: Wednesday, January 08, 2014 8:36 AM
To: Wong, See-Meng; Marksberry, Don
Cc: Weerakkody, Sunil; Appignani, Peter; Gonzalez, Michelle
Subject: New and Improved SPAR Quality Slides
Attachments: SPAR Quality_Jan 2014_Rev2.pptx

Categories: RASP

With See-Meng's recommended change on Slide 3 deleting word "limitations"...



Standardized Plant Analysis Risk (SPAR) Model Quality (Briefing for NRR/DRA)

Kevin Coyne, RES/DRA/PRAB

January 8, 2014



Briefing Objectives

- Inform NRR/DRA Division Director about quality-related activities for the SPAR model program.
- Provide background information to support future engagement with Regional counterparts



Outline

- SPAR Uses
- SPAR Modeling Philosophy
- Quality Activities & Guidance
 - Background
 - QA Process
 - End User Responsibilities
- Recent feedback (DAEC SPAR)
- Key Messages

3



SPAR Model Uses

- Significance Determination Process, NOEDS, MD 8.3 (NRR & Regions)
- Accident Sequence Precursor Program (RES)
- System & component studies (RES)
- Generic Issue Screening (RES)
- Special Studies (all)

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SPAR Philosophy

- Provide independent, plant-specific PRA models for use by agency risk analysts
 - SPAR program relies on licensee information, but application of models is independent of the licensee
- Use standardized modeling conventions
 - Ease of use for agency analysts
 - Efficient model maintenance and updating
- SPAR models (and SAPHIRE code) were primarily developed to support event and condition assessment (ECA) activities
 - SAPHIRE user interface structured to support ROP
 - SPAR/SAPHIRE designed to handle ECA activities (e.g., CCF, LOOP modeling)

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SPAR Philosophy

- Budget resources place limits on program (e.g., staffing, funds, travel)
 - SPAR models generally not as detailed as licensee models
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SPAR Philosophy

- SPAR benchmarked against licensee baseline model
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- Failed equipment recovery generally not modeled in baseline model (with some exceptions)

No PRA model (SPAR or licensee) can accurately capture the nuances of a real operational event without some modifications

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SPAR QA - Background

- Recommendations from 2006 OIG Audit, "Evaluation of the NRC's Use of PRA in Regulating the Commercial Nuclear Power Industry, (OIG-06-A-24)"
 - Develop and implement a formal, written process for maintaining PRA models that is sufficiently representative of the as-built, as-operated plant to support model uses.
 - Develop and implement a fully documented process to conduct and maintain configuration control of PRA software.
 - Conduct a full verification and validation of SAPHIRE Version 7

8



SPAR QA - Process

- SPAR Quality Assurance Plan (Revision 1, ML13141A333)
- RASP Handbook
 - Volume 3 – SPAR Model Reviews
- Model Maker Guidelines (MMGs)
 - SPAR-AHZ Model Maker's Guideline, Revision 1.4a, April 24, 2013 (ML11291A172)
 - SPAR-SD Model Maker's Guideline, Revision 2.3, September 2012 (ML092160242)
 - SPAR-ICM Model Makers Guideline, Revision 0, November 2012 (ML13219A311)

9



SPAR QA - Process

- SPAR PM Handbook (ML12307A427)
- Onsite verification reviews
 - Onsite reviews conducted during MSPI benchmarking activities
 - Onsite reviews conducted for new modeling elements (e.g., shutdown, fire, external hazards)
- SPAR Configuration/Version Control
- SAPHIRE Quality Assurance Plan (ADAMS ML101190497)
 - Independent Verification and Validation for SAPHIRE 8
 - NUREG/BR-0167, "Software Quality Assurance Program and Guidelines" compliant QA program, including annual audits

10



SPAR QA - Process

- SPAR benchmarking includes the following baseline model checks:
 - SPAR core damage frequency (CDF) less than $1E-4/\text{yr}$
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 - Difference between initiator specific CCDFs less than factor of 10
 - Difference in CDF of top 25 cut sets less than a factor of 5
- Licensees are provided their SPAR models upon request
 - Models are non-public and licensees are expected to protect the models against inadvertent release (using controls consistent with RIS 2005-026)
 - With each distribution, we request feedback on unresolved differences between the models
 - Ideally, differences between SPAR and licensee models could be reconciled before an SDP, but this is difficult in practice

11



SPAR QA - Process

- 2009 ASME PRA Standard Peer Reviews
 - BWROG and PWROG led peer reviews of the Peach Bottom and Comanche Peak models (ML093421138 and ML100550481)
 - Peer review team consisted of industry experts and experienced agency risk analysts (HQ and SRAs)
 - The Peer Review noted the following SPAR model strengths:
 - Model structure is robust and well developed.
 - Fault trees are streamlined with an appropriate level of detail for its intended uses.
 - Model structure and the SAPHIRE computer software are at the state of the technology.
 - Models are an efficient method to develop qualitative and quantitative insights for applications, SDP evaluations, inspections, event assessments, and model evaluations.

12



SPAR QA – End Users

- RES/INL implements QA plan for SPAR “model of record,” but agency risk analysts are responsible for any temporary model changes needed for a specific application
 - RES or INL Help Desk are available to support changes, but this does not relieve the analyst from ensuring the technical adequacy of the change
 - All temporary changes should be fully documented to support review (e.g., SERP panel, ASP review, etc.)

13

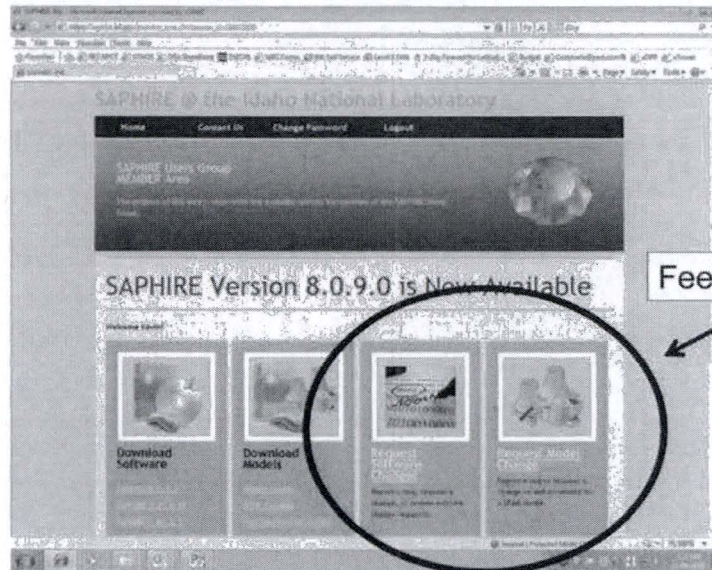


SPAR QA – End Users

- All risk analysts are expected to:
 - enter errors or improvements to a model using the SPAR Model Change request process (INL can help with this process as needed)
 - help ensure that the SPAR model represents the as-built, as operated plant when performing an analysis and providing feedback to the model development process when errors or changes to the model are identified

14

SPAR QA – End Users



Feedback Forms

15

Duane Arnold SPAR Issues

- NEXTERa recently noted two issues associated with the DAEC SPAR Model:
 - No credit given in SPAR for manually throttling RCIC stop valve following failure of governor
 - SPAR model does not credit Control Rod Drive pumps for high pressure makeup following a LOF
- NEXTERa claimed that these issues resulted in significant overestimate of risk and failure of the SPAR model to represent the as-built, as-operated plant.

16



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- RCIC Stop Valve – In general, SPAR models do not credit equipment recovery after failure since the generic estimation of a recovery probability is often not practical (RASP Handbook, Volume 1, Section 6.2)
 - SPAR equipment recovery is generally limited to EDGs and offsite power
 - For cases where equipment recovery credit is appropriate (and the circumstances regarding the failure are known), the analyst has the option to apply credit within the analysis

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 - Early CRD success criteria specifically studied in NUREG-1953 (IORV) and SPAR-ICM (LOF), using Peach Bottom MELCOR model; conscious decision not to change Mark 1/2 models to credit this based on RES/NRR/INL discussions due to plant-by-plant operational and design variations
 - SPAR success criteria balances several information sources including licensee PRA model and associated MAAP results, FSAR, results from similar plants
 - The specific circumstances of an event may warrant model changes that are otherwise not appropriate in the baseline model. However, analysts have the ability to modify success criteria when appropriate

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Duane Arnold SPAR Issues

- These issues are not SPAR model “errors”, but instead are the result of the independent SPAR modeling approach and philosophy
 - NRC analysts have the ability to adjust SPAR model logic and data when there is sufficient technical justification
 - However, even appropriate changes for a specific event or condition, may not be appropriate for the base model
- Exchange of technical PRA information between the NRC and licensees is an expected part of the significance determination process
 - Model differences between the licensee and SPAR models can be very difficult to identify in the baseline model (in the absence of a specific operational event)
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Key Messages

- No PRA (SPAR or licensee) can accurately capture every nuance of an operational event
 - Experienced risk analysts must make modeling decisions for each specific event
 - Recovery credit and success criteria may be unique to the operational event
 - Process controls include peer reviews of model results
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Key Messages

- Agency risk analysts are part of the quality process, not just end-users
 - Agency risk analysts are expected to identify and formally report model issues and needed changes
 - SPAR models are intended to be used by knowledgeable and experienced users
 - RES and INL staff are available to provide assistance
- Exchange of technical information between the NRC and licensees is an expected part of the significance determination process
- SPAR models provide an independent risk assessment tool and are fully capable of supporting ROP activities.

Coyne, Kevin

From: Coyne, Kevin
Sent: Wednesday, January 08, 2014 8:29 AM
To: Wong, See-Meng
Cc: Marksberry, Don
Subject: RE: Slides for Discussion with NRR/DRA on SPAR Model Quality

Sure, no problem... but among us friends, we should all recognize that the philosophical approach to the SPAR models does result in some limitations in their capabilities. I think we walk a fine line in making sure the Regional managers develop an appreciation for what the models can, and can't, do. And I worry that too much denial that there are some consequences (maybe that's a better word than limitations...) to the philosophical approach used for SPAR may perpetuate the belief that the models should be flawless. Anyway, it's a point well taken and the word "limitation" has been expunged from the presentation....

From: Wong, See-Meng
Sent: Wednesday, January 08, 2014 7:21 AM
To: Coyne, Kevin
Subject: RE: Slides for Discussion with NRR/DRA on SPAR Model Quality

Kevin,

On slide #3, "SPAR Model Philosophy & Limitations...." can you delete "Limitations"?

See Meng.

From: Coyne, Kevin
Sent: Tuesday, January 07, 2014 5:48 PM
To: Weerakkody, Sunil; Wong, See-Meng
Cc: Marksberry, Don; Helton, Donald; Nakoski, John; Appignani, Peter; Gonzalez, Michelle; Correia, Richard; Madden, Patrick; Coe, Doug; Kozak, Laura; Glitter, Joseph; Lee, Samson
Subject: Slides for Discussion with NRR/DRA on SPAR Model Quality

Sunil, See-Meng –

Please see attached slides for tomorrow's discussion with Joe on SPAR model quality. I very much appreciate all the feedback received from folks and made some changes that reflect these comments and insights. Please let me know if you have any questions or additional comments –

Kevin

*Kevin Coyne, P.E., Ph.D.
Chief, Probabilistic Risk Assessment Branch
Division of Risk Analysis, Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(301) 251-7586 (work)
(b)(6) (cell)*



Standardized Plant Analysis Risk (SPAR) Model Quality (Briefing for NRR/DRA)

Kevin Coyne, RES/DRA/PRAB

January 8, 2014



Briefing Objectives

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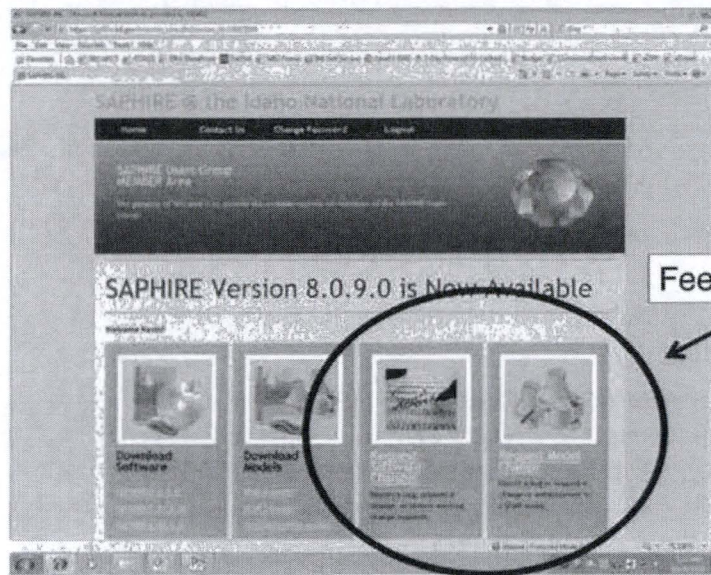


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Coyne, Kevin

From: Coyne, Kevin
Sent: Tuesday, January 07, 2014 9:31 AM
To: Kozak, Laura
Subject: RE: Communication to Regional Division Directors - SPAR Model Quality

Laura –

Thanks very much for taking a look at the slides – I will add a caveat regarding the difficulty even identifying, let alone resolving, these types of issues ahead of time. I think the main point to highlight is that the back and forth with licensees during the SDP/SERP process is the nature of what we're dealing with (and does not indicate that something is necessarily broken). With the back drop of the time limits you and the other SRAs are under, I can see why Regional management may be led to perceive the exchange of additional information "late" in the process as an issue, but really it is part of an expected process. I'll see if I can work this thought in also (in a politically correct manner of course...).

For the part on the formal feedback process, the real issue is that we've had a few situations where SRAs (not from Region 3...) have identified several issues with the SPAR models and apparently stewed about them for many weeks/months (along with telling their management that they lacked confidence in the models). When we finally became aware of the concerns and checked to see if anyone at INL or RES had been made aware of the issues (so they could be fixed), we had no record of the issues ever being reported. So, this bullet was meant more as a plug for the folks that don't routinely communicate model issues with INL (and/or RES) to stress that we do have a formal process in place to track issues as they are identified. We've asked INL to enter the issues into the system for the SRAs if that's easier, but we do want to get a handle on what's out there so we can prioritize INL work and make sure we are getting you guys what you need. I definitely don't want this to be a burden or a barrier for anyone, but I want to make sure folks are reporting the problems they find (and I think you've had pretty good experience with getting things fixed when needed – but let me know if you ever run into problems). I'll add the thought that the SRAs can request INL to formally enter the issue, the key thing is that we've got the concern captured somewhere so it doesn't get lost.

Thanks again for taking the time to review the slides and good luck with the conference this afternoon –

Kevin

From: Kozak, Laura
Sent: Tuesday, January 07, 2014 8:35 AM
To: Coyne, Kevin
Subject: RE: Communication to Regional Division Directors - SPAR Model Quality

Kevin

This presentation is good and I hope will help. I had one comment – your slide that says model issues should be ideally be identified before an SDP. While I agree it is ideal, it is very difficult as you mention in other parts of the presentation to understand all differences in the models.. The things we deal with tend to be the ones that aren't able to be identified until we have an SDP. So could you further caveat that statement in the presentation. Furthermore, given the emphasis on the 90 day clock, SRAs are often not given a whole lot of time to fully investigate all differences before taking a finding to a SERP. In this particular case, the finding was given to me on Sept. 30 and a SERP scheduled for October 31, with a government shutdown in the middle. I did not even have the chance to review licensee cut-sets before the preliminary SERP (although I knew at that time the issue was recovery, not model issues, so I was not uncomfortable moving forward).

I am guilty of not using the formal process for model feedback, but for what it's worth we have engaged INL on this issue and our previous DAEC EDG issue to make sure model changes were incorporated properly. You should know that last spring, while working the EDG issue, we requested and received licensee cut-sets for benchmarking, which INL used to update the model to revision 8.25 – the revision that was used in this analysis. We had to modify (with INL help) this revision as well, but revisions were documented in SERP packages and summarized in the inspection report. I will try to be better at using the formal process.

I hope this works, regional staff and management seem frustrated at model "differences" and our explanations just don't seem to be getting through.

FYI – if we credit CRD, our risk estimate for this finding changes from 3.5E-6/yr to about 1.7E-6/yr, so a decrease but not a change in color. I suspect that our fire risk estimate (based on IPE information incorporated into the SPAR-EE model is low, but the licensee has refused to use their NFPA 805 risk information to evaluate this issue, saying it is too conservative. Again, not enough time allotted in the process for me to gather this information myself and produce a revised risk assessment.

Thanks again

Laura

From: Coyne, Kevin
Sent: Monday, January 06, 2014 6:40 PM
To: Weerakkody, Sunil; Wong, See-Meng; Marksberry, Don; Helton, Donald; Appignani, Peter; Gonzalez, Michelle; Kozak, Laura
Cc: Nakoski, John
Subject: RE: Communication to Regional Division Directors - SPAR Model Quality
Importance: High

Hello to all -

Joe Gitter has asked for an overview of the SPAR Quality Assurance program and I've put together the attached slides. I know everyone is very busy, but I would appreciate any feedback you can provide on the slides and the overall message. The briefing is scheduled for Wednesday afternoon, so your feedback would be most helpful by close of business Tuesday.

Thanks very much for your help –

Kevin

From: Weerakkody, Sunil
Sent: Friday, December 20, 2013 10:23 AM
To: Coyne, Kevin; Wong, See-Meng
Cc: Marksberry, Don; Appignani, Peter
Subject: RE: Communication to Regional Division Directors - SPAR Model Quality

Kevin,

Thanks for your support!

Sunil

From: Coyne, Kevin
Sent: Friday, December 20, 2013 10:17 AM
To: Wong, See-Meng

Cc: Weerakkody, Sunil; Marksberry, Don; Appignani, Peter
Subject: RE: Communication to Regional Division Directors - SPAR Model Quality

See-Meng –

Sounds like a plan. We'll start thinking about the presentation – I'm assuming that this would be mid to late-January, correct?

-Kevin

From: Wong, See-Meng
Sent: Friday, December 20, 2013 10:15 AM
To: Coyne, Kevin
Cc: Weerakkody, Sunil; Marksberry, Don; Appignani, Peter
Subject: RE: Communication to Regional Division Directors - SPAR Model Quality

Kevin,

Yes, I would very much like RES support to provide a clear message to the Regional managers. Since RES is the program owner of the SPAR models, I would like RES to prepare and attend the briefing to Joe Giitter before he address the bi-weekly DD counterpart meeting. I will inform you as soon as I schedule the briefing date. It should not take more than an hour.

See Meng.

From: Coyne, Kevin
Sent: Friday, December 20, 2013 10:04 AM
To: Wong, See-Meng
Cc: Weerakkody, Sunil; Marksberry, Don; Appignani, Peter
Subject: RE: Communication to Regional Division Directors - SPAR Model Quality

See-Meng –

Could I suggest that RES lead (or support, if you prefer) the briefing on SPAR model quality since it's our responsibility and we maintain both the SPAR model quality plan and the associated contracts at INL. As far as talking points for the Regions, I think some of the SRAs get confused about their role – they are not just "end users" but they are also integral to the development and quality of the models. Our models are as good as the information they provide to us – so called "errors" in the models are just as likely due to a failure of Regional folks to communicate known issues to us than our ability to fix the models. We have been round and round with certain SRAs that claim to have found and reported model issues, but when we check with our PMs and review the electronic feedback forms, we find no previous reports of issues. Anyway, I think RES is in a good position to provide both a historical and current context for model quality and we would be more than happy to support this briefing.

Kevin

From: Wong, See-Meng
Sent: Friday, December 20, 2013 9:39 AM
To: Coyne, Kevin
Cc: Weerakkody, Sunil; Marksberry, Don; Appignani, Peter
Subject: Communication to Regional Division Directors - SPAR Model Quality

Kevin,

I have an action item to brief Joe Giitter on communication to HQ and Regional DD counterparts on "SPAR Model Quality" and our QA program to ensure quality of SPAR models for SDP and other risk-informed regulatory activities. This action is to counter licensees' complaints to NRC Regional managers on the quality of our SPAR models vs licensee PRA models. We want to stop this negative remarks from being ingrained on the minds of Regional SES managers. Can you provide some thoughts for my talking points in the briefing to Joe Giitter? Thanks.

See Meng.



Standardized Plant Analysis Risk (SPAR) Model Quality (Briefing for NRR/DRA)

Kevin Coyne, RES/DRA/PRAB
January 8, 2014



Outline

- SPAR Uses
- SPAR Modeling Philosophy & Limitations
- Quality Activities & Guidance
 - Background
 - QA Process
 - End User Responsibilities
- Recent feedback (DAEC)
- Key Messages



SPAR Model Uses

- Significance Determination Process, NOEDS, MD 8.3 (NRR & Regions)
- Accident Sequence Precursor Program (RES)
- System & component studies (RES)
- Generic Issue Screening (RES)
- Special Studies (all)

9



SPAR Philosophy

- Provide independent, plant-specific PRA models for use by agency risk analysts
 - SPAR program relies on licensee information, but application of models is independent of the licensee
- Use standardized modeling conventions
 - Ease of use for agency analysts
 - Efficient model maintenance and updating
- SPAR models (and SAPHIRE code) were primarily developed to support event and condition assessment (ECA) activities
 - SAPHIRE user interface structured to support ROP
 - SPAR/SAPHIRE designed to handle ECA activities (e.g., CCF, LOOP modeling)

4



SPAR Limitations

- Budgetary constraints place limits on program (e.g., staffing, funds, travel)
- SPAR models generally not as detailed as licensee models
- SPAR generally relies on licensee PRA modeling assumptions
 - Licensees requested to provide information voluntarily
 - However, some independent analysis has been done (e.g., NUREG-1953 success criteria) and models are cross-compared against similar plants

5



SPAR Limitations

- SPAR benchmarked against licensee baseline model
 - Impractical to benchmark against every possible event/condition combination
 - Risk significant sequences in an ECA may not be risk significant in the baseline model

No PRA model can accurately capture the nuances of a real operational event without some modifications

6



SPAR QA - Background

- Recommendations from 2006 OIG Audit, "Evaluation of the NRC's Use of PRA in Regulating the Commercial Nuclear Power Industry, (OIG-06-A-24)"
 - Develop and implement a formal, written process for maintaining PRA models that is sufficiently representative of the as-built, as-operated plant to support model uses.
 - Develop and implement a fully documented process to conduct and maintain configuration control of PRA software.
 - Conduct a full verification and validation of SAPHIRE Version 7

7



SPAR QA - Process

- SPAR Quality Assurance Plan (Revision 1, ML13141A333)
- RASP Handbook
 - Volume 3 – SPAR Model Reviews
- Model Maker Guidelines
 - SPAR-AHZ Model Maker's Guideline (MMG), Revision 1.4a, April 24, 2013 (ML11291A172)
 - SPAR-SD Model Maker's Guideline (MMG), Revision 2.3, September 2012 (ML092160242)

8



SPAR QA - Process

- SPAR PM Handbook (ML12307A427)
- Onsite verification reviews
 - Onsite reviews conducted during MSPI benchmarking activities
 - Onsite reviews conducted for new modeling elements (e.g., shutdown, fire, external hazards)
- SPAR Configuration/Version Control
- SAPHIRE Quality Assurance Plan (ADAMS ML101190497)
 - Independent Verification and Validation for SAPHIRE 8
 - NUREG/BR-0167, "Software Quality Assurance Program and Guidelines" compliant QA program, including annual audits

9



SPAR QA - Process

- 2009 ASME PRA Standard Peer Reviews
 - BWROG and PWROG led peer reviews of the Peach Bottom and Comanche Peak models (ML093421138 and ML100550481)
 - Peer review team consisted of industry experts and experienced agency risk analysts (HQ and SRAs)
 - The Peer Review noted the following SPAR model strengths:
 - Model structure is robust and well developed.
 - Fault trees are streamlined with an appropriate level of detail for its intended uses.
 - Model structure and the SAPHIRE computer software are at the state of the technology.
 - Models are an efficient method to develop qualitative and quantitative insights for applications, SDP evaluations, inspections, event assessments, and model evaluations.

10



SPAR QA – End Users

- RES/INL implements QA plan for SPAR “model of record,” but agency risk analysts are responsible for any temporary model changes needed for a specific application
 - RES or INL Help Desk are available to support changes, but this does not relieve the analyst from ensuring the technical adequacy of the change
 - All temporary changes should be fully documented to support review (e.g., SERP panel, ASP review, etc.)

11

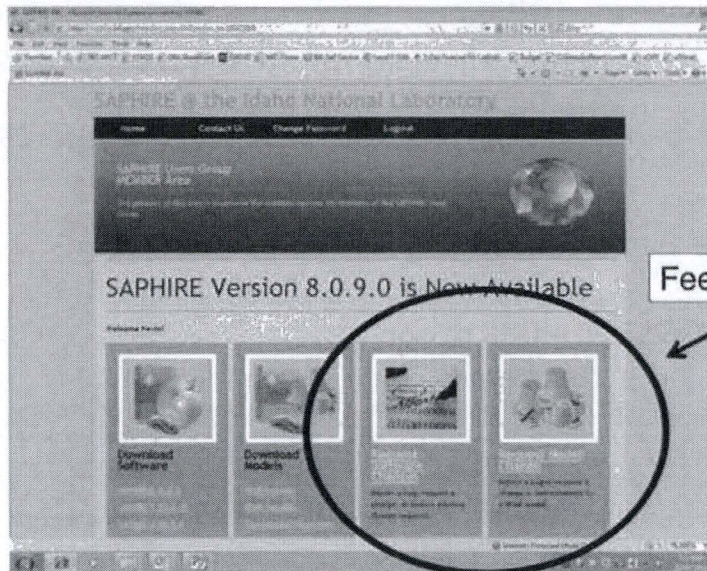


SPAR QA – End Users

- All risk analysts are expected to:
 - enter errors or improvements to a model using the SPAR Model Change request process
 - help ensure that the SPAR model represents the as-built, as operated plant when performing an analysis and providing feedback to the model development process when errors or changes to the model are identified

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SPAR QA – End Users



Feedback Forms

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Duane Arnold SPAR Issues

- NEXTERa recently noted two issues associated with the DAEC SPAR Model:
 - No credit given in SPAR for manually throttling RCIC stop valve following failure of governor
 - SPAR model does not credit Control Rod Drive pumps for high pressure makeup following a LOF
- NEXTERa claimed that these issues resulted in significant overestimate of risk and failure of the SPAR model to represent the as-built, as-operated plant.

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Duane Arnold SPAR Issues

- RCIC Stop Valve – In general, SPAR models do not credit equipment recovery after failure since the generic estimation of a recovery probability is often not practical (RASP Handbook, Volume 1, Section 6.2)
 - SPAR equipment recovery is generally limited to EDGs and offsite power
 - For cases where equipment recovery credit is appropriate (and the circumstances regarding the failure are known), the analyst has the option to apply credit within the analysis

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Duane Arnold SPAR Issues

- CRD Pumps – SPAR model does credit CRD pumps for long term cooling (following success of HPCI or RCIC)
 - SPAR success criteria balances several information sources including licensee PRA model and associated MAAP results, FSAR, results from similar plants
 - The specific circumstances of an event may warrant model changes that are otherwise not appropriate in the baseline model
 - Similar to above comment on recovery, analysts have the ability to modify success criteria when appropriate

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Duane Arnold SPAR Issues

- These issues are not SPAR model “errors”, but instead are the result of the independent SPAR modeling approach and philosophy
 - NRC analysts have the ability to adjust SPAR model logic and data when there is sufficient technical justification
 - However, even appropriate changes for a specific event or condition, may not be appropriate for the base model
 - Further, these types of issues can be very difficult to identify in the baseline model (in the absence of a specific operational event)
- Per program policy, licensees are provided their SPAR models upon request
 - With each distribution, we request feedback on unresolved differences between the models
 - Ideally, differences between SPAR and licensee models should be reconciled before an SDP

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Key Messages

- No PRA can accurately capture every nuance of an operational event
 - Experienced risk analysts must make modeling decisions for each specific event
 - Recovery credit and success criteria may be unique to the operational event
 - Process controls include peer reviews of model results
- RES maintains an active Quality Assurance Programs for SPAR and SAPHIRE
 - Process controls include issue reporting and resolution
 - Actively seek feedback on models to ensure they represent the as-built, as-operated plant

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Key Messages

- Agency risk analysts are part of the quality process, not just end-users
 - Agency risk analysts are expected to identify and formally report model issues and needed changes
 - SPAR models are intended to be used by knowledgeable and experienced users
 - RES and INL staff are available to provide assistance
- Licensees are provided their SPAR models upon request
 - RES views this as an opportunity to gain additional feedback on SPAR model

Ferrante, Fernando

From: Ferrante, Fernando
Sent: Monday, December 14, 2015 11:17 AM
To: Circle, Jeff
Subject: FW: External Website for SDP Enhancements

From: Gibbs, Russell
Sent: Monday, December 14, 2015 9:31 AM
To: Ferrante, Fernando; Patz, Andrew
Cc: Sanfilippo, Nathan; Shuaibi, Mohammed; Miller, Geoffrey; Bernhard, Rudolph; Wong, See-Meng; Kichline, Michelle; Cahill, Christopher; Gulla, Gerald; Arner, Frank; Cook, William; Weerakkody, Sunil; Mitman, Jeffrey; Circle, Jeff
Subject: RE: External Website for SDP Enhancements

Michele has been briefed noting the timeliness and resource challenges we face in the SDP are in other areas of NRR such as licensing. DRA, not DIRS will address the SPAR model issue with management.

Mo and I briefed the regional Directors last Friday on the work of the team and the results of the 17 November public meeting. As expected, we're getting feedback from the industry on the use of non-quantitative factors and the view that there would be more GTG findings.

Reminder – we have a call this week on Thursday to report on the status of assigned work. See the meeting summary for details.

Russell

From: Ferrante, Fernando
Sent: Monday, December 14, 2015 9:09 AM
To: Gibbs, Russell <Russell.Gibbs@nrc.gov>; Patz, Andrew <Andrew.Patz@nrc.gov>
Cc: Sanfilippo, Nathan <Nathan.Sanfilippo@nrc.gov>; Shuaibi, Mohammed <Mohammed.Shuaibi@nrc.gov>; Miller, Geoffrey <Geoffrey.Miller@nrc.gov>; Bernhard, Rudolph <Rudolph.Bernhard@nrc.gov>; Wong, See-Meng <See-Meng.Wong@nrc.gov>; Kichline, Michelle <Michelle.Kichline@nrc.gov>; Cahill, Christopher <Christopher.Cahill@nrc.gov>; Gulla, Gerald <Gerald.Gulla@nrc.gov>; Arner, Frank <Frank.Arner@nrc.gov>; Cook, William <William.Cook@nrc.gov>; Weerakkody, Sunil <Sunil.Weerakkody@nrc.gov>; Mitman, Jeffrey <Jeffrey.Mitman@nrc.gov>; Circle, Jeff <Jeff.Circle@nrc.gov>
Subject: RE: External Website for SDP Enhancements

FYI

Streamlining of SDP

Discussed recent Duke Energy drop-in with Mike Johnson, and their proposed use of licensee PRA models for the SDP. DIRS discussed current NRC process and various factors/inputs that are considered; the process has commanded extensive resources, trying to find a very precise result (which may not be necessary, all of the time.) Industry has expressed concern that streamlining the SDP will result in more greater than green findings. DIRS is working to modify management and staff behavior to not spend weeks of time perfecting a PRA model, gathering data, doing site checks, etc. in order to produce a risk estimate for the SDP. We want to get more timely results and evaluate the strengths, weaknesses, and uncertainties of the results and decide if we should look at other things like safety margin, defense in depth etc. as a part of our decision making process. Action for DIRS staff, is to brief Michele and possibly Mike Johnson

on the SDP streamlining initiative. Also, an action for DIRS is to determine if we have any information that compares NRC results and licensee results from SDP analyses.

From: Gibbs, Russell

Sent: Thursday, December 10, 2015 11:04 AM

To: Patz, Andrew

Cc: Sanfilippo, Nathan; Shuaibi, Mohammed; Miller, Geoffrey; Bernhard, Rudolph; Ferrante, Fernando; Wong, See-Meng; Kichline, Michelle; Cahill, Christopher; Gulla, Gerald; Arner, Frank; Cook, William

Subject: RE: External Website for SDP Enhancements

Andrew,

Please add the following document from ADAMS to the meeting folder for 17 November and notify Jim Slider of NEI that the SDP Streamlining team charter is now publically available. Alternatively, you can add to the 14 January 2016 folder, whichever is more appropriate.

ML15344A024

Thanks.

Russell

From: Patz, Andrew

Sent: Tuesday, November 24, 2015 5:21 PM

To: Gibbs, Russell <Russell.Gibbs@nrc.gov>

Subject: External Website for SDP Enhancements

Russell,

You had asked me about making an external webpage for a repository of updates to the SDP Enhancements project. External stakeholders generally check out meeting notices to determine which documents were recently discussed. The link to the public meeting notice search is:

<http://meetings.nrc.gov/pmns/mtg?do=search.form>

From this search page, you can just type in the meeting date or purpose keyword to find the meeting. Putting in 11/17/2015 for the date gives a list of public meetings on November 17th and here is the link for the ROP meeting:

<http://meetings.nrc.gov/pmns/mtg?do=details&Code=20151692>

You'll notice that the PDF of the meeting notice is at the bottom of the page. Any other documents I upload will also be on here (need to get everyone's info before I can publish the summary). As an example, here is the ROP meeting for September 2015:

<http://meetings.nrc.gov/pmns/mtg?do=details&Code=20151300>

Hope this helps,
Andrew

Andrew Patz, Engineer
U.S. Nuclear Regulatory Commission

NRR/DIRS/IPAB
O-7D19, MS 7D24
301.415.2303

Siu, Nathan

From: Correia, Richard
Sent: Monday, December 14, 2015 11:11 AM
To: Circle, Jeff; Lund, Louise; Siu, Nathan; Stutzke, Martin
Subject: RE: External Website for SDP Enhancements

Getting more interesting every day!

Rich

Richard Correia, PE
Director,
Division of Risk Analysis
Office of Nuclear Regulatory Research
US NRC.

richard.correia@nrc.gov

From: Circle, Jeff
Sent: Monday, December 14, 2015 11:08 AM
To: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>; Siu, Nathan <Nathan.Siu@nrc.gov>; Stutzke, Martin <Martin.Stutzke@nrc.gov>
Subject: FW: External Website for SDP Enhancements

Hot off the presses. I'll try to find more.

Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
BB (b)(6)

From: Ferrante, Fernando
Sent: Monday, December 14, 2015 11:06 AM
To: Circle, Jeff <Jeff.Circle@nrc.gov>
Subject: RE: External Website for SDP Enhancements

Well, DIRS neither invited me, nor told me in advance about this meeting. Hence, I don't really know what was discussed. Apparently, Duke wanted the NRC to let them calculate SDPs instead of relying on SPAR models. DIRS line on this issue is that this is an NRR/DRA problem. Mike Johnson was caught off-guard about this, so there will be a meeting to assess the damage.

From: Circle, Jeff
Sent: Monday, December 14, 2015 11:00 AM
To: Ferrante, Fernando
Subject: RE: External Website for SDP Enhancements

Fernando,

Did you hear anything further of what was discussed with respect to the SPAR vs. licensee models?

Jeff.

Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
BB (b)(6)

From: Ferrante, Fernando

Sent: Monday, December 14, 2015 9:09 AM

To: Gibbs, Russell <Russell.Gibbs@nrc.gov>; Patz, Andrew <Andrew.Patz@nrc.gov>

Cc: Sanfilippo, Nathan <Nathan.Sanfilippo@nrc.gov>; Shuaibi, Mohammed <Mohammed.Shuaibi@nrc.gov>; Miller, Geoffrey <Geoffrey.Miller@nrc.gov>; Bernhard, Rudolph <Rudolph.Bernhard@nrc.gov>; Wong, See-Meng <See-Meng.Wong@nrc.gov>; Kichline, Michelle <Michelle.Kichline@nrc.gov>; Cahill, Christopher <Christopher.Cahill@nrc.gov>; Gulla, Gerald <Gerald.Gulla@nrc.gov>; Arner, Frank <Frank.Arner@nrc.gov>; Cook, William <William.Cook@nrc.gov>; Weerakkody, Sunil <Sunil.Weerakkody@nrc.gov>; Mitman, Jeffrey <Jeffrey.Mitman@nrc.gov>; Circle, Jeff <Jeff.Circle@nrc.gov>

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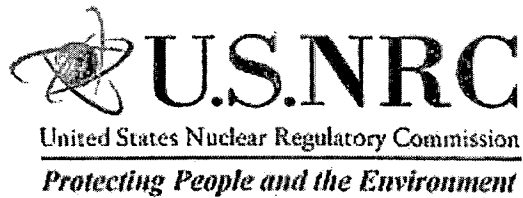
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Andrew Patz, Engineer
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O-7D19, MS 7D24
301.415.2303



Home > Public Involvement > Public Meetings > Schedule

Public Meeting Schedule: Meeting Details

[New Search]

Meeting info

Purpose

To conduct a public meeting with the industry and staff on Reactor Oversight Process (ROP) topics. Group participants will discuss performance assessment issues, reactor inspection issues, operating experience issues, potential changes to performance indicator guidance, and Frequently Asked Questions (FAQs).

Meeting Feedback

Meeting Dates and Times

11/17/15

9:00AM - 5:00PM

Meeting Location

Bethesda North Marriott Hotel and Conference Center

5701 Marinelli Road

Rockville MD

Webinar

Webinar Link: <https://global.gotomeeting.com/join/898014637>

Webinar Meeting Number: 898014637

Webinar Password: None

Contact

Andrew Patz

301-415-2303

Participation Level

Category 2

NRC Participants

N. Sanfilippo, Office of Nuclear Reactor Regulation

S. Rose, Office of Nuclear Reactor Regulation

External Participants

C. Earls, Nuclear Energy Institute (NEI)

J. Slider, Nuclear Energy Institute (NEI)

Docket Numbers - Facility Names

Related Documents

ML15343A163 - Handouts Discussed During the November 17, 2015 ROP Public Meeting(Enclosure 2)

ML15343A137 - November 2015 ROP Public Meeting Summary

ML15343A167 - Reactor Oversight Process Task Force FAQ Log- November 17, 2015. (Enclosure 3)

ML15310A343 - 11/17/2015 November 2015 Reactor Oversight Process Monthly Public Meeting

ML15344A024 - Team Charter- Streamlining the Significance Determination Process November 2015 -

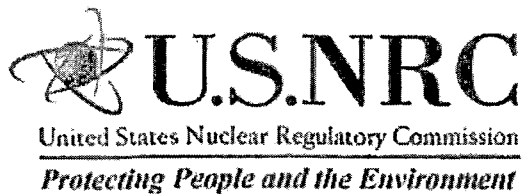
April 2016. (Public Version)

Teleconference

Bridge Number: 8882820409

Passcode: 64700

Comments



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Public Meeting Schedule: Meeting Details

[\[New Search \]](#)

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Meeting Feedback

Meeting Dates and Times

09/16/15

9:00AM - 1:00PM

Meeting Location

NRC Two White Flint North

11545 Rockville Pike

T2B1

Rockville MD

Webinar

Webinar Link: <https://global.gotomeeting.com/join/302680525>

Webinar Meeting Number: 302680525

Webinar Password: N/A

Contact

Andrew Waugh

301-415-5601

Participation Level

Category 2

NRC Participants

N. Sanfilippo, Office of Nuclear Reactor Regulation

C. Regan, Office of Nuclear Reactor Regulation

External Participants

C. Earls, Nuclear Energy Institute (NEI)

J. Slider, Nuclear Energy Institute (NEI)

Docket Numbers - Facility Names

Related Documents

ML15257A067 - Slides for September 16, 2015 Reactor Oversight Process (ROP) Working Group Discussions on Developing the ROP for New Reactors.

ML15239B190 - 09/16/2015 September 2015 Reactor Oversight Process Monthly Public Meeting

Teleconference

Bridge Number: 8886065722

Passcode: 69310#

Comments

Circle, Jeff

From: Circle, Jeff
Sent: Monday, December 14, 2015 8:37 AM
To: Correia, Richard
Subject: RE: 2 briefings

Thanks, Rich. It's on my list.

Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
BB (b)(6)

From: Correia, Richard
Sent: Monday, December 14, 2015 8:01 AM
To: Circle, Jeff <Jeff.Circle@nrc.gov>; Kuritzky, Alan <Alan.Kuritzky@nrc.gov>
Cc: Coyne, Kevin <Kevin.Coyne@nrc.gov>; Schroer, Suzanne <Suzanne.Schroer@nrc.gov>
Subject: 2 briefings
Importance: High

Jeff,

For the level 3 PRA project OD/RA briefing, set up your schedule for: 1. DRA FO pre-briefing, 2. RES FO pre-brief and 3. then the actual brief.

Same for the use of SPAR v. Licensees PRA RISC briefing.

Rich

Richard Correia, PE
Director,
Division of Risk Analysis
Office of Nuclear Regulatory Research
US NRC

richard.correia@nrc.gov

Appignani, Peter

From: Appignani, Peter
Sent: Monday, December 14, 2015 10:58 AM
To: Circle, Jeff (Jeff.Circle@nrc.gov)
Subject: SPAR vs Lic PRA powerpoint ...
Attachments: Considerations for using other than the Standardized Plant Analysis Risk (SPAR) models.pptx

See attached – 18 slides



Considerations for using other than the Standardized Plant Analysis Risk (SPAR) models

NAME, RES/DRA/PRAB

EMAIL ADDRESS

August XX, 2015



Summary of Key Considerations for using licensees' PRA Models

- Regulatory Processes
- PRA Policy Statement
- Model Quality
- Maintain independence of NRC
- Standardization of modeling and assessment techniques
- Use by the NRC staff of licensees' PRA models
- Effect on other NRC Programs
- Costs



Regulatory Processes

- Reactor Oversight Process (ROP)
 - ROP is an NRC process
- Significance Determination Process (SDP)
 - Today's SDP outcomes using NRC versus licensee PRA
 - The PRA models are often in close agreement.
 - Differences in SDP outcomes between the NRC and the licensee are driven by factors other than the baseline PRA model
 - Engineering assumptions
 - Modeling assumptions
 - Human reliability assumptions
 - Other ...
 - These issues are also applicable to the other regulatory processes and other risk-informed licensing related activities

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Regulatory Processes - continued

- MD 8.3 - NRC Incident Investigation Program
- Notice of Enforcement Discretion (NOEDs)
- Technical basis for rulemaking
- Generic issues
- Other risk-informed licensing related activities

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PRA Policy Statement

- The PRA Policy Statement encouraged the NRC to increase the use and application of PRA to the greatest extent practical.
- SPAR models are one of the key incarnations of that effort.
- Eliminating SPAR models would violate the spirit of that policy because it could undermine confidence in PRA-based findings.

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Model Quality

- SPAR models have been peer reviewed by industry led peer review teams
 - SPAR models were determined to be adequate for their intended application
 - Confidence on the part of staff and industry that the current generation of SPAR models accurately portray the plants that they model.
 - One typical BWR and one typical PWR SPAR model was peer reviewed since they are standardized. Recently completed a multi-year peer review resolution activity to address peer review findings across all SPAR models.

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Maintaining independence of NRC

- ROP provides for an independent regulatory assessment of licensee performance
- Conflict of interest issues
 - OGC will need to endorse use of licensee PRA and licensee performing the assessment
- Public confidence

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Standardization of modeling and assessment techniques

- Efficiency of standardization
 - Modeling assumptions
 - Modeling conventions
 - Naming schemes (basic events, fault trees, event trees, etc.)
 - Post processing rule construction
 - Reporting functions (built into SAPHIRE)
 - Consistency in event tree/fault tree construction
 - Single Software platform

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Standardization of modeling and assessment techniques

- **Consistency**
 - **Uniformity of assessments**
 - Risk Assessment Standardization Project (RASP) Handbooks
 - Uniform because SPAR models are standardized

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Standardization of modeling and assessment techniques

- **Automation**
 - Software platform is standardized (SAPHIRE)
 - SAPHIRE was developed and modified specifically to support the regulatory processes
 - SAPHIRE has evolved over the years to meet the needs of the NRC analyst to help them better perform their tasks when utilizing the SPAR models. These features were built directly into SAPHIRE to eliminate the analyst performing offline calculations and then placing those calculated probabilities back into the SPAR model.
 - Reporting functions (built into SAPHIRE)
 - Experience indicates the use of NRC developed standardized models supports the principles of good regulation: independence, openness, efficiency, clarity, and reliability.

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Use by the NRC staff of licensees' PRA models

- Additional logistics and resource requirements
 - Seventy (80) plus licensee PRAs
 - No standardization
 - No Standard Modeling assumptions
 - No Standard Modeling conventions
 - No Standard Naming schemes (basic events, fault trees, event trees, etc.)
 - No Standard Post processing rule construction
 - NRC Staff/SRAs will need to learn nuances of each licensee PRA

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Use by the NRC staff of licensees' PRA models

- Four (4) different commercial software platforms
 - CAFTA (EPRI)
 - WinNUPRA (Scientech)
 - Riskman (ABS Consulting)
 - Cutsets are problematic (used to gain understanding of risk insights)
 - RiskSpectrum (Lloyd's Register Consulting, Sweden)
- All lack reporting features of SAPHIRE
- All lack automation and easy to use analysis tools in SAPHIRE
- Need for additional NRC risk analysts
 - Additional staff training requirements

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Use by the NRC staff of licensees' PRA models

- Management and control of licensee models and model updates
 - Non-uniform modeling assumptions and limitations
 - Each model will need to be examined and understood
 - Availability of PRA models and supporting documentation
 - Will all of the licensees formally submit their PRA to NRC?
 - Under oath and affirmation?
 - Subject to 10 CFR 50.9?
 - How will staff ensure NRC has the latest licensee model?
 - RASP Handbook provides for uniformity of assessments
 - Assumes models are standardized and well understood
 - Will necessitate a complex revision

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Effect on other NRC Programs

- Accident Sequence Precursor (ASP) program
 - Abnormal occurrence report to Congress
- Industry trends/operating experience programs
- New Reactors (PRA & licensing)
- Inspection programs
 - Inspection resources
 - Inspection decisions will become reactive based on deterministic criteria alone
- Use of SPAR models to support system and component studies
 - Would inhibit our ability to develop tailored models when new situations arise.
- SPAR models are used to develop Plant Information Risk eBooks (PRIBS) — superseded the SDP Notebooks

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SPAR Models used for other purposes

- Answer Commission questions
- Japan Lesson Learned related issues (flooding, vents, seismic)
 - SPAR model results (CDFs) used to assist in the resolution of Fukushima NTTF Rec. 5.2 (containment venting for plants other than BWR with Mark I and Mark II containments), and Rec. 6 (hydrogen control and mitigation).
 - SPAR model data (equipment failure rates) supported the risk evaluation of Fukushima NTTF Rec. 5.1 (containment venting in BWR Mark I and Mark II plants)
- SPAR-EE models supported GI-199 (updated seismic hazard curves for plants east of the Rocky Mountains)
- Gain understanding of key basic events in the SPAR fire PRA models
- SPAR models used to identify the most likely core-damage sequences for SOARCA analysis, as well as other important input.
- SPAR models and data (equipment failure rates) supported staff's analysis of containment accident pressure (CAP) credit in BWR plants.
- Gain understanding of CDFs as estimated by SPAR (supported work for Commissioner Apostolakis, 2013).
- NRR made heavy use of the SPAR models (event trees) while reviewing the Browns Ferry extended power uprate (EPU) license amendment request.

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Costs

- Costs to both NRC & Industry
- Current NRC Costs \approx \$2M/year
- Estimated NRC cost to use licensee PRAs:
 - Initial costs \approx \$7.8M
 - Annual costs \approx \$2.7M +
 - Does not account for technical support

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COSTS

- Costs to NRC
 - Licensee model reviews
 - NRC Staff/SRAs will need to learn nuances of each licensee PRA
 - Continuing effort as plants make modifications and update/revise their PRA.
 - Logistics requirements
 - Control and distribution of licensee models
 - Training
 - Training on multiple software platforms
 - Potential impact on SRA qualifications
 - Potential impact on established NRC PRA and PRA related training programs
 - Commercial Software licenses
 - Multiple versions used by the industry
 - Commercial PRA software typically requires additional software (licenses) to be comparable to SAPHIRE (e.g. CAFTA/FTREX)
 - Additional analyst staff
 - Other

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COSTS

- Costs to Industry
 - Cost for licensee to submit their PRA to NRC
 - Will ALL licensees voluntarily submit their PRA to NRC?
 - If not, we will need to maintain limited number of SPAR models.
 - Need for complete documentation of licensee PRA, could be extensive
 - Cost for a minimum of model standardization
 - Cost to implement a single RG 1.200 compliant standardized modeling approach across multiple analysis platform
 - Re-invent a RASP Handbook for uniformity of assessments
 - Cost to implement SAPHIRE reporting features and other automation tools
 - How will industry provide support to NRC Analysts?
 - INL is currently responding to approximately 2 requests for assistance per day via the Technical Support contract
 - Other

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Appignani, Peter

From: Marksberry, Don
Sent: Thursday, December 10, 2015 1:49 PM
To: Appignani, Peter
Subject: RE: Preparation for a POP for Mike Weber

Thanks for the info. Please keep See-Meng informed along the way. He is preparing a similar briefing for NRR management.

From: Appignani, Peter
Sent: Wednesday, December 09, 2015 10:51 AM
To: Marksberry, Don <Don.Marksberry@nrc.gov>
Subject: FW: Preparation for a POP for Mike Weber

Don

FYI, see the attachments

From: Appignani, Peter
Sent: Wednesday, December 09, 2015 7:55 AM
To: Circle, Jeff <Jeff.Circle@nrc.gov>
Cc: Correia, Richard <Richard.Correia@nrc.gov>
Subject: RE: Preparation for a POP for Mike Weber

Jeff

Attached are:

1. Kevin's Key talking points
2. My more detailed outline
3. Cost Comparison in Excel and Adobe Acrobat

The cost comparison uses the FTE values provided by Ben Beasley

Pete

From: Circle, Jeff
Sent: Tuesday, December 08, 2015 7:44 AM
To: Appignani, Peter <Peter.Appignani@nrc.gov>
Subject: Preparation for a POP for Mike Weber

Pete,

We need to meet with Mike Weber, possibly this week, regarding our use of licensees' models. Last week, I've asked all our internal stakeholders here in RES to send any comments on the subject to you. Have you gotten any?

Let's carve out some time over the next two days to go over it and how we're going to structure the discussion for Mike.

Thanks,
Jeff.

Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
BB [REDACTED]

Circle, Jeff

From: Circle, Jeff
Sent: Thursday, December 10, 2015 6:42 AM
To: Marksberry, Don
Cc: Appignani, Peter
Subject: Re: Use of Licensee's Models - Results

Don,

Some SRAs would like to have a complete copy of the licensee's model to use alongside the SPAR but, I think that in the end, our models will be the primary source.

As for the owners' groups, I spoke with Roy Linthicum (PWROG) yesterday and he said flat out "no!" - however, Exelon would gladly run their models for us for SDP findings. My response was "thanks but, no thanks".

Jeff.

From: Marksberry, Don
Sent: Wednesday, December 09, 2015 10:43 AM
To: Circle, Jeff
Cc: Appignani, Peter
Subject: Re: Use of Licensee's Models - Results

Jeff

Interesting results. What does the use of both mean? The use of PRAs to calibrate SPAR? SRAs using PRAs and SPAR or licensees providing their results of an SDP for comparison to the SRA's SPAR results? The latter two options sound like it will cost more to perform an SDP analysis.

The important parts of the feasibility analysis are the licensee's willingness to (1) provide the model and updates to NRC, (2) provide timely modifications to the model to fit the condition, and (3) help us to use the model (even on a weekend for MD 8.3 assessments). What do the owners groups think about this? I don't think NEI has been discussing this with their membership.

Another part is the use of PRAs in other NRC applications, such as updates to reliability trends, generic issues, and system studies. Of course, this is all mute if all licensees are not willing to provide us with their models.

Some thoughts.

Don

From: Circle, Jeff
Sent: Wednesday, December 9, 2015 8:38 AM
To: Demers, Jerrod; Gibbs, Russell; Hartle, Brandon; Kichline, Michelle; Leech, Matthew; Lyons, Sara; Mitman, Jeffrey; Ng, Ching; Spore, Candace; Weerakkody, Sunil; Wong, See-Meng; RES_DRA_PRB; Coyne, Kevin; Arner, Frank; Bernhard,

Rudolph; Cahill, Christopher; Cook, William; Deese, Rick; Freeman, Scott; Hanna, John; Kozak, Laura; Loveless, David; MacDonald, George; Replogle, George; Valos, Nicholas; Appignani, Peter; Ferrante, Fernando; Gonzalez, Michelle; Helton, Donald; Hudson, Daniel; Kuritzky, Alan; Leschek, Walter; Li, Ming; Ning, Lauren (Killian); Sancaktar, Selim; Wessels, Steven; Wood, Jeffery
Cc: Correia, Richard; Lund, Louise
Subject: Use of Licensee's Models - Results

Dear PRA Colleagues,

As you recall, I had sent out a rudimentary email vote via Outlook with three simple questions regarding the future of our use of SPAR models. It was sent to 59 addressees and I got back 33 responses. I had to wait for some last minute responders to the vote but, as promised, here are the results to date:

Use SPAR Model only	Use Licensee Model only	Use Both Models
19	0	14

I have the vote breakdown and found that everyone who voted from NRR felt that we should use only our SPAR models. For those who wanted to use both models, it was a mix between RES and some regional SRAs. As predicted, no one wanted to use only licensees' models.

As an update to our involvement, I heard that Bill Dean favors organizing an internal panel to review these. Currently, I believe that an option for consideration may be to integrate that into the Risk-Informed Steering Committee (RISC). Regardless, I am working with Pete Appignani in developing a presentation for our division management (Rich Correia and Louise Lund) and then for our office management (Mike Weber and Steve West). Pete (working with Ben Beasley) has put together economic analyses of some of the options and we have a helpful set of talking points from Kevin Coyne. When Pete and I complete our first draft of a presentation, I'll pass it along to you and will appreciate any substantive comments you may have.

Jeff.

Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
B6 (b)(6)

From: Circle, Jeff

Sent: Monday, November 30, 2015 1:47 PM

To: Demers, Jerrod <Jerrod.Demers@nrc.gov>; Gibbs, Russell <Russell.Gibbs@nrc.gov>; Hartle, Brandon <Brandon.Hartle@nrc.gov>; Kichline, Michelle <Michelle.Kichline@nrc.gov>; Leech, Matthew <Matthew.Leech@nrc.gov>; Lyons, Sara <Sara.Lyons@nrc.gov>; Mitman, Jeffrey <Jeffrey.Mitman@nrc.gov>; Ng, Ching <Ching.Ng@nrc.gov>; Spore, Candace <Candace.Spore@nrc.gov>; Weerakkody, Sunil <Sunil.Weerakkody@nrc.gov>; Wong, See-Meng <See-Meng.Wong@nrc.gov>; RES_DRA_PRB <RESDRAPRB@nrc.gov>; Coyne, Kevin <Kevin.Coyne@nrc.gov>; Arner, Frank <Frank.Arner@nrc.gov>; Bernhard, Rudolph <Rudolph.Bernhard@nrc.gov>; Cahill, Christopher <Christopher.Cahill@nrc.gov>; Cook, William <William.Cook@nrc.gov>; Deese, Rick <Rick.Deese@nrc.gov>; Freeman, Scott <Scott.Freeman@nrc.gov>; Hanna, John <John.Hanna@nrc.gov>; Kozak, Laura <Laura.Kozak@nrc.gov>; Loveless, David <David.Loveless@nrc.gov>; MacDonald, George <George.MacDonald@nrc.gov>; Replogle, George <George.Replogle@nrc.gov>; Valos, Nicholas <Nicholas.Valos@nrc.gov>; Appignani, Peter <Peter.Appignani@nrc.gov>;

Ferrante, Fernando <Fernando.Ferrante@nrc.gov>; Gonzalez, Michelle <Michelle.Gonzalez@nrc.gov>; Helton, Donald <Donald.Helton@nrc.gov>; Hudson, Daniel <Daniel.Hudson@nrc.gov>; Kuritzky, Alan <Alan.Kuritzky@nrc.gov>; Leschek, Walter <Walter.Leschek@nrc.gov>; Li, Ming <Ming.Li@nrc.gov>; Ning, Lauren (Killian) <LaurenKillian.Ning@nrc.gov>; Sancaktar, Selim <Selim.Sancaktar@nrc.gov>; Wessels, Steven <Steven.Wessels@nrc.gov>; Wood, Jeffery <Jeffery.Wood@nrc.gov>

Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>

Subject: Use of Licensee's Models

Dear PRA Colleagues,

Most of you know, as part of fiscal belt tightening (Project AIM 2020 and re-baselining), the agency is currently looking into various areas to reduce our budget. One area that has come up every couple of years, and has been a source of contention, is the feasibility of using licensee's PRA models in lieu of our SPAR models for SDP findings and possibly ASP. In support of that, a pilot program has been proposed to investigate its feasibility. RES is preparing to make a presentation to NRR management touching on various areas of consideration should the decision be made to embark on such a pilot program. This presentation is not intended to be forcing an opinion on whether or not to proceed but, will be advice on how to proceed with a program.

Over here in RES, I have heard conflicting opinions of what the internal stakeholders believe is the direction the agency should take on this topic. To that end, I'm sending his email out with a voting option with three selections – use only SPAR models, use only licensee's models, or use both. I would greatly appreciate it if you each took the time and voted. And, since some of us are not wallflowers and have more to say than just vote, please feel free to take the opportunity to comment on the return email to me. This will help greatly in support to our end users.

I'm looking forward to hearing from you.

Jeff.

Jeff A. Circle
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RES /Division of Risk Analysis
(301) 415-1152
BB (b)(6)

Circle, Jeff

From: Circle, Jeff
Sent: Wednesday, D cember 09, 2015 3:13 PM
To: Drouin, Mary
Subject: Re: Use of Licensee's Models - Results

Mary,

Thanks for your offer and I will keep you in the loop. As you know, I've done these in the licensee world as well. Additionally, I bear the scars of inheriting an entire fleet of different models and having to toss them out since they weren't cost effective.

Jeff.

From: Drouin, Mary
Sent: Wednesday, December 09, 2015 02:13 PM
To: Circle, Jeff
Subject: RE: Use of Licensee's Models - Results

Jeff,

I will be very interested in looking and providing you comments on the cost analyses. I have tremendous knowledge from working on numerous PRA efforts in the private section, managing the IPE/IPEE programs, managing the BETA program, working on standards, and providing input on the needed resources for the Level 3 PRA project.

Tks, mary

From: Circle, Jeff
Sent: Wednesday, December 09, 2015 8:39 AM
To: Demers, Jerrod; Gibbs, Russell; Hartle, Brandon; Kichline, Michelle; Leech, Matthew; Lyons, Sara; Mitman, Jeffrey; Ng, Ching; Spore, Candace; Weerakkody, Sunil; Wong, See-Meng; RES_DRA_PRB; Coyne, Kevin; Arner, Frank; Bernhard, Rudolph; Cahill, Christopher; Cook, William; Deese, Rick; Freeman, Scott; Hanna, John; Kozak, Laura; Loveless, David; MacDonald, George; Replogle, George; Valos, Nicholas; Appignani, Peter; Ferrante, Fernando; Gonzalez, Michelle; Helton, Donald; Hudson, Daniel; Kuritzky, Alan; Leschek, Walter; Li, Ming; Ning, Lauren (Killian); Sancaktar, Selim; Wessels, Steven; Wood, Jeffery
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Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>

Subject: Use of Licensee's Models

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I'm looking forward to hearing from you.

Jeff.

Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
BB (b)(6)

Appignani, Peter

From: Ferrante, Fernando
Sent: Wednesday, December 09, 2015 9:04 AM
To: Circle, Jeff; Appignani, Peter; Gonzalez, Michelle; Helton, Donald; Hudson, Daniel; Kuritzky, Alan; Leschek, Walter; Li, Ming; Ning, Lauren (Killian); Sancaktar, Selim; Wessels, Steven; Wood, Jeffery
Cc: Correia, Richard; Lund, Louise; Nakoski, John
Subject: RE: Information Only: NRC SPAR models

Jeff, Pete,

One additional item for your consideration on the SPAR presentation (at a minimum, to be aware of):

- One of the "impediments" to continuing the use of SPAR models typically used by NRR management is that it costs too much and it takes too long to develop SPAR models for external events (including internal fire modeling to reflect NFPA805-compliant PRA). This is a red herring and a Catch-22 rolled up into one and needs to be addressed, as it features prominently in discussions to only rely on licensee models. The fallacy of this argument is two-fold:

- (1) We don't need to have all SPAR models with fully complete all hazards modeling (although this is the ultimate goal). We never have SDPs/ASPs for all plants and several of them have never been the subject of one. As part of a prioritization effort for SPAR-AHZ models while I was in NRR, I noted that there are specific plants that typically go on "heavy rotation" for SDPs and, therefore, it makes no sense to try to rush the development of SPAR models for all plants in a short period of time. In addition, most plants in the US don't have (and most likely) will never have fully developed seismic, high winds, external flooding, and other external events. Hence, we will still rely on IPEEE information for years to come, whether people like it or not, and we have shown that we can develop a model relatively quickly (within a month or two) with good coordination between NRR and RES, if needed. Hence, SPAR models can continue to provide sufficient support for our regulatory activities even without all models and all hazards fully developed (this is the key point). We can also adapt SPAR models as needed to develop specific models for specific sites at the request of NRR and to consider a holistic approach to complete more models faster (which we are indeed considering in RES for the revised SPAR-AHZ contract).
- (2) The last sentence points to the Catch-22 in this argument. It is up to NRR and the Regions, via user need agreement, to identify how they want the SPAR program to be developed via annual updates and SPAR-AHZ development. If NRR wanted, we could develop several SPAR-AHZ models in-house, relatively quickly and cheaply, with support from various staff with experience through NRC PRA classes (as well as augment them as NFPA805 submittals are reviewed and NTTF actions lead to some additional seismic PRAs, provided NRR gains access to licensee models and shares it with RES). I know this can be done because (1) we have modeled NFPA805 plants in SPAR successfully, and (2) SPAR-AHZ models have been developed with IPEEE information by staff developing their PRA skills under senior supervision (a win-win effort that creates more PRA models and supports professional and technical staff development). If the goal of NRR management was to have more/accelerated SPAR-AHZ modeling, they could request it and we would allocate more resources appropriately (I just don't believe this is their ultimate motive, however). Hence, they will point at the "slow" pace of SPAR-AHZ development as a reason to eliminate the SAPHIRE/SPAR program but will also not provide a path forward to supporting an accelerated or alternative approach to complete more SPAR-AHZ modeling (hence, leading back to the idea that a more complete suite of SPAR-AHZ models takes too long to develop). This is usually propagated by staff with cursory (at best) knowledge of how SPAR models are developed and maintained.

Thanks,
Fernando

From: Ferrante, Fernando

Sent: Thursday, December 03, 2015 10:18 AM

To: Circle, Jeff <Jeff.Circle@nrc.gov>; Appignani, Peter <Peter.Appignani@nrc.gov>; Gonzalez, Michelle <Michelle.Gonzalez@nrc.gov>; Helton, Donald <Donald.Helton@nrc.gov>; Hudson, Daniel <Daniel.Hudson@nrc.gov>; Kuritzky, Alan <Alan.Kuritzky@nrc.gov>; Leschek, Walter <Walter.Leschek@nrc.gov>; Li, Ming <Ming.Li@nrc.gov>; Ning, Lauren (Killian) <LaurenKillian.Ning@nrc.gov>; Sancaktar, Selim <Selim.Sancaktar@nrc.gov>; Wessels, Steven <Steven.Wessels@nrc.gov>; Wood, Jeffery <Jeffery.Wood@nrc.gov>

Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>; Nakoski, John <John.Nakoski@nrc.gov>

Subject: RE: Information Only: NRC SPAR models

Jeff, Pete,

I would be glad to help on this effort and I would like to attend the meeting if possible. Off-the-cuff, here are some topics we need to take head on:

- Use or non-use of independent tools by the NRC
 - o We need to do a check on how true it is that licensing never uses independent tools. I don't think this is accurate. We had independent assessments made to verify licensing issues (e.g., Oconee flooding) and we also had independent tools for the Yucca Mountain project. I think it is fair to ask when an independent tool is needed or not; but I think this statement is thrown around without careful consideration of what it really means and when it should/should not be used.
- Licensing versus oversight
 - o Related to the topic above, the question usually raised by anti-SPAR circles is the fact that risk-informed licensing activities do not rely on independent tools. There are many reasons for this, including the differences between the nature and philosophy behind licensing and oversight. I can provide more info if need be, but here are some facts:
 - Licensing relies on the PRA standard heavily which is appropriate for baseline issues. Oversight challenges the assumptions in the baseline PRA, hence there will never be a "certified" PRA for oversight, even if licensees were willing to spend the resources to get it.
 - Licensing assumes licensing bases conditions are being met and ultimately relies on defense-in-depth, safety margin, etc. In oversight, since performance deficiencies and license violations are being assessed, we are already starting from a lower point than licensing.
 - Licensing deals with licensee-initiated actions where the full onus is on the licensee to provide all the documentation in a timely manner. Oversight is an NRC-initiated process in which we are under strict timelines to make a decision on NRC specific actions.
 - The timelines for licensing can be protracted and can take years for closure. The timelines in oversight are measured in months and there is no time for extended formal requests for additional information and transfer of material on the docket.
 - In oversight, sequences that were not important for baseline changes can now get magnified (e.g., SBO sequences if an EDG is assumed to be failed) and assumptions on these sequences may get challenged.
 - Due to the emergent nature of oversight actions, the existing PRAs many times do not have specific portions of the model developed in advance (e.g., certain external events, consequential LOOP). In the case of the Catawba consequential LOOP SDP, the licensee was forced to do work because the NRC was doing it already (note that they never shared their model with us and that their result was WHITE but for different reasons that what our model was indicating; highlighting the challenge to make decisions in these circumstances). If a licensee has to evaluate a finding that results in a preliminary greater than green result,

it would be reasonable to expect they would want more time or would sharpen the pencil in unanticipated ways; increasing time and effort needed to review.

- Risk-informed versus risk-based
 - o This mantra has been distorted to the point it means radically different things for different people. It has been used recently to mean that we can rely more on the licensee's results, and get rid of SPAR models. We need to address what this means with respect to SPAR models and the fact that (1) having direct access to risk tools is critical if the Agency truly means what it says with regards to being more risk-informed, and (2) maintaining the internal capabilities that come with direct access to insights and hands-on training would be eroded without this access.
- Independence
 - o We need to be careful when we bring this up. Licensing folks will outright reject the need for SPAR for independence because of their framework which relies on PRA standard and peer reviews (I believe part of the challenge is that existing SPAR models threaten their status quo). But it needs to be brought up.
- PRA maturity
 - o This is also being seriously distorted. PRA has been in the literature for a while and has become state-of-practice for certain hazards/applications but this is not the point. The point is to what extent we can rely solely on the licensee's PRA for oversight. While PRA can be considered mature to some extent, it should also be noted that:
 - There is subjectivity involved with PRA modeling
 - The PRA standard is a beneficial advance in this field, but it's not a panacea; peer-reviewed PRAs can still have errors that can get magnified in oversight.
 - We have not resolved CCF, HRA framework issues that are important in oversight. The PRA framework does not prescribe methods and baseline changes that may not be sensitive for their purposes.
 - There is a misguided view that licensee PRAs will essentially be "all-knowing" and "all-doing" that has been propagated via meetings between NRC and industry managers. I.e., the industry has been promising they will have PRAs that will cover all aspects and to such a level of quality that they will far surpass SPAR models. This is just not true. While most licensees have internal events models; external events and shutdown PRA use is still sparse. The Fukushima activities in seismic will only produce a subset of licensees with higher quality seismic PRAs, most will still not have any; and the flooding activities simply do not require a PRA at all. Hence, when an SDP that can be affected by such a hazard occurs, we will depend on the good faith of the licensees to provide information if we don't have a forcing function. In fact, under the SPAR-AHZ effort, we observed that many licensees have crude if not simply non-existent hazard modeling for issues such as internal flooding and high winds.
 - It should be noted that this statement is disingenuous at its core. For example, no one would argue that Computational Fluid Dynamics is a "mature" field. However, no credible expert would deny that there are specific phenomena that is incredibly difficult to model and predict. Hence, the idea that PRA is so mature makes as much sense as saying CFD is so mature that we don't need to ask any more questions about it.
 - It should also be noted that parts of the Agency is incoherent in its public message of PRAs. On one hand, parts of NRR state that PRA technology is extremely mature, while other part of NRR state that PRAs have so much uncertainty and assumptions that they cannot be relied on to make a risk-informed decision.
- Quality of SPAR models
 - o This continues to be thrown around as an excuse to get rid of SPAR models. We need to address this head on by discussing the recent SPAR workshop, the fact that most issues in SDP don't involve modeling issues but input conditions (e.g., exposure time, CCF assumptions), and the fact that licensees that have been exposed to the SPAR models under the SPAR-AHZ effort did not

have major issues with the models. We need to highlight that there is no technical issue that prevents modeling of specific internal and external events in SPAR and that most of the time the complaints about SPAR model "inaccuracies" is because a licensee is getting an SDP finding they don't like.

- Cost
 - o The cost of SPAR models continues to be raised as an impediment. I have yet to see a clear, transparent discussion on how much of the budget SPAR represents and whether this justifies the elimination of a program with significant consequences. If this is a cost we need to eliminate, I think it is worth asking what other programs are on the table or not, and whether their importance supersedes the benefits gained by SPAR.
- Training
 - o SPAR provides a critical tool to train and educate staff on the intricacies of PRA. The Grow Your Own PRA highlighted the key benefits in having an in-house tool. The result of moving away from SPAR could well be a degradation of the knowledge and readiness in a critical capability at the Agency; eventually resulting in uninformed staff reviewing PRA-standard peer-reviews without any knowledge of the intricacies and "soft spots" of PRAs to actually ask good questions.
- The alternatives
 - o We need to press hard on what do people want instead of SPAR. I have heard multiple times that we would have access to licensee models and NRC staff would become proficient in PRAs for individual plants. I don't believe this is the end goal of many anti-SPAR proponents. I believe they want a framework similar to licensing, where the actual PRAs are never shared with the staff and that results and sensitivities need to be asked via formal processes (i.e., licensees would run models, tell us the results, and the onus would be on us to ask questions to check their validity). I think this is supported by the fact that sharing the licensee models with NRC is fraught with a wide range of problems:
 - Legal aspects, including having PRAs shared in some formal manner, since there is no legal requirement to do so even for new reactors.
 - Multitude of PRA software, modeling approaches; which would require NRC staff to become familiar with various platforms and would expend more resources on training and acquiring software
 - Lack of standardization, which is a major benefit of SPAR
 - Loss of control on being able to request changes and software upgrades to INL on SAPHIRE, as we would then become dependent on the licensees' vendors
 - Loss of timeliness, efficiency and transparency; as we would depend on the licensees' goodwill to provide changes to their models if we disagree with a specific approach or input. This could potentially impact meeting timeliness goals in SDP, as well as losing control of our decisionmaking.
- The cost of performing a pilot
 - o This is a non-trivial issue that must be raised. NRR has launched into multiple non-budgeted activities recently, including the failed Risk Prioritization Initiative and the SDP Streamlining effort, which tend to cycle NRC and industry resources and achieve little to nothing. Clearly, this pilot is being entered into with an uninformed perspective of all the challenges involved (most likely due to an expectation that the goal is so worthy of it, that details don't matter). We need to plant the seed that there are legitimate, serious concerns about this so that all individuals and organizations involved know what, how, when, and who will be responsible.

Thanks,
Fernando

From: Circle, Jeff

Sent: Wednesday, December 02, 2015 8:30 AM

To: Appignani, Peter <Peter.Appignani@nrc.gov>; Ferrante, Fernando <Fernando.Ferrante@nrc.gov>; Gonzalez, Michelle <Michelle.Gonzalez@nrc.gov>; Helton, Donald <Donald.Helton@nrc.gov>; Hudson, Daniel <Daniel.Hudson@nrc.gov>; Kuritzky, Alan <Alan.Kuritzky@nrc.gov>; Leschek, Walter <Walter.Leschek@nrc.gov>; Li, Ming <Ming.Li@nrc.gov>; Ning, Lauren (Killian) <LaurenKillian.Ning@nrc.gov>; Sancaktar, Selim <Selim.Sancaktar@nrc.gov>; Wessels, Steven <Steven.Wessels@nrc.gov>; Wood, Jeffery <Jeffery.Wood@nrc.gov>
Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>; Nakoski, John <John.Nakoski@nrc.gov>

Subject: FW: Information Only: NRC SPAR models

PRABers,

FYI.

In reference to what we heard on Monday, I had a conversation this morning with George MacDonald (R-II) and one yesterday with Laura Kozak (R-III) who both feel that we need to retain SPAR models. Checking the email thread below, Vic feels that there can be a reduction in funding for SPAR model updates. He is basing this opinion that regional SRAs have an intimate knowledge of licensees' models, which is not necessarily true. I'm assuming that the term SPAR model "inaccuracies" refers to lag in performing model updates due to reduced funding.

We need to put together documentation in support for a meeting with NRR on this subject and it should also cover the proposed development of a pilot project. I would appreciate it if any of you can forward Pete Appignani information that you feel can help us with our meeting. There will be more to follow on this topic.

Thanks,
Jeff.

*Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
BB (b)(6)*

From: MacDonald, George

Sent: Wednesday, December 02, 2015 7:56 AM

To: Circle, Jeff <Jeff.Circle@nrc.gov>

Subject: FW: Information Only: NRC SPAR models

From: McCree, Victor

Sent: Tuesday, December 01, 2015 7:11 PM

To: Hanna, John <John.Hanna@nrc.gov>

Cc: Bernhard, Rudolph <Rudolph.Bernhard@nrc.gov>; MacDonald, George <George.MacDonald@nrc.gov>

Subject: Re: Information Only: NRC SPAR models

Hi John!

It's great to hear from you and I appreciate your timely insights.

During a very free flowing discussion today, we debated the wisdom of accepting a recommended cost reduction that could delay (not eliminate) updates to SPAR models. I opined that some reasonable delay in updating SPAR models would likely not represent a significant handicap due to Regional SRA familiarity with licensee risk models (and their strengths and limitations) relative to the SPAR. I offered that this could mitigate the impact of SPAR model "inaccuracies."

Your thoughts?

Vic

On: 01 December 2015 15:07, "Hanna, John" <John.Hanna@nrc.gov> wrote:

Vic,

The purpose of this e-mail is to provide you some background about NRC SPAR models and hopefully address some inaccurate information that may be circulating in HQ.

We had recently heard anecdotally that some views are being shared at your level that assert that the SRAs are in favor of eliminating the SPAR models and using the licensee's CAFTA models. This is not the opinion of the Region II SRAs. George MacDonald will be polling some of the other SRAs in different regions and sending you a separate e-mail, but we strongly suspect that they are also not in favor of eliminating SPAR models. If we are actively considering eliminating the SPAR models as a cost savings measure, I would recommend that we have a panel to discuss this option and all of the positives and negatives.

I have attached some additional information to this e-mail regarding this topic. (I developed this outline in support of some risk training for SES managers.) If you desire a bit more detail and why moving towards only using the licensee models would have some adverse effects, please read the attached document. The **highlights and key messages** are in **bolded type** so you can scan it quickly.

I normally would not send an e-mail like this directly to you and would follow the normal protocol for communicating up the chain. However I thought the topic was significant enough and urgent enough that you should hear the "unfiltered" message promptly. I have not vetted this message with Region II management and am only representing the views of the SRAs.

Thanks. Hope all is well with you in Headquarters and that the transition up there went smoothly...

John

John David Hanna
Senior Reactor Analyst
US NRC, Region II Office
John.Hanna@nrc.gov
[404-997-4552](tel:404-997-4552)

Circle, Jeff

From: MacDonald, George
Sent: Wednesday, December 09, 2015 8:43 AM
To: Circle, Jeff
Subject: RE: Use of Licensee's Models - Results

Thanks for the update, both John and myself sent Vic emails on why dropping SPAR would be bad. I also said a pilot without input from the end users before a decision is rendered would be counterproductive and hurt our ability to be timely. Hope you are well Dude!

From: Circle, Jeff
Sent: Wednesday, December 09, 2015 8:39 AM
To: Demers, Jerrod <Jerrod.Demers@nrc.gov>; Gibbs, Russell <Russell.Gibbs@nrc.gov>; Hartle, Brandon <Brandon.Hartle@nrc.gov>; Kichline, Michelle <Michelle.Kichline@nrc.gov>; Leech, Matthew <Matthew.Leech@nrc.gov>; Lyons, Sara <Sara.Lyons@nrc.gov>; Mitman, Jeffrey <Jeffrey.Mitman@nrc.gov>; Ng, Ching <Ching.Ng@nrc.gov>; Spore, Candace <Candace.Spore@nrc.gov>; Weerakkody, Sunil <Sunil.Weerakkody@nrc.gov>; Wong, See-Meng <See-Meng.Wong@nrc.gov>; RES_DRA_PRB <RESDRAPRB@nrc.gov>; Coyne, Kevin <Kevin.Coyne@nrc.gov>; Arner, Frank <Frank.Arner@nrc.gov>; Bernhard, Rudolph <Rudolph.Bernhard@nrc.gov>; Cahill, Christopher <Christopher.Cahill@nrc.gov>; Cook, William <William.Cook@nrc.gov>; Deese, Rick <Rick.Deese@nrc.gov>; Freeman, Scott <Scott.Freeman@nrc.gov>; Hanna, John <John.Hanna@nrc.gov>; Kozak, Laura <Laura.Kozak@nrc.gov>; Loveless, David <David.Loveless@nrc.gov>; MacDonald, George <George.MacDonald@nrc.gov>; Replogle, George <George.Replogle@nrc.gov>; Valos, Nicholas <Nicholas.Valos@nrc.gov>; Appignani, Peter <Peter.Appignani@nrc.gov>; Ferrante, Fernando <Fernando.Ferrante@nrc.gov>; Gonzalez, Michelle <Michelle.Gonzalez@nrc.gov>; Helton, Donald <Donald.Helton@nrc.gov>; Hudson, Daniel <Daniel.Hudson@nrc.gov>; Kuritzky, Alan <Alan.Kuritzky@nrc.gov>; Leschek, Walter <Walter.Leschek@nrc.gov>; Li, Ming <Ming.Li@nrc.gov>; Ning, Lauren (Killian) <LaurenKillian.Ning@nrc.gov>; Sancaktar, Selim <Selim.Sancaktar@nrc.gov>; Wessels, Steven <Steven.Wessels@nrc.gov>; Wood, Jeffery <Jeffery.Wood@nrc.gov>
Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>
Subject: Use of Licensee's Models - Results

Dear PRA Colleagues,

As you recall, I had sent out a rudimentary email vote via Outlook with three simple questions regarding the future of our use of SPAR models. It was sent to 59 addressees and I got back 33 responses. I had to wait for some last minute responders to the vote but, as promised, here are the results to date:

Use SPAR Model only	Use Licensee Model only	Use Both Models
19	0	14

I have the vote breakdown and found that everyone who voted from NRR felt that we should use only our SPAR models. For those who wanted to use both models, it was a mix between RES and some regional SRAs. As predicted, no one wanted to use only licensees' models.

As an update to our involvement, I heard that Bill Dean favors organizing an internal panel to review these. Currently, I believe that an option for consideration may be to integrate that into the Risk-Informed Steering Committee (RISC). Regardless, I am working with Pete Appignani in developing a presentation for

our division management (Rich Correia and Louise Lund) and then for our office management (Mike Weber and Steve West). Pete (working with Ben Beasley) has put together economic analyses of some of the options and we have a helpful set of talking points from Kevin Coyne. When Pete and I complete our first draft of a presentation, I'll pass it along to you and will appreciate any substantive comments you may have.

Jeff.

Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES / Division of Risk Analysis
(301) 415-1152
BB (b)(6)

From: Circle, Jeff

Sent: Monday, November 30, 2015 1:47 PM

To: Demers, Jerrod <Jerrod.Demers@nrc.gov>; Gibbs, Russell <Russell.Gibbs@nrc.gov>; Hartle, Brandon <Brandon.Hartle@nrc.gov>; Kichline, Michelle <Michelle.Kichline@nrc.gov>; Leech, Matthew <Matthew.Leech@nrc.gov>; Lyons, Sara <Sara.Lyons@nrc.gov>; Mitman, Jeffrey <Jeffrey.Mitman@nrc.gov>; Ng, Ching <Ching.Ng@nrc.gov>; Spore, Candace <Candace.Spore@nrc.gov>; Weerakkody, Sunil <Sunil.Weerakkody@nrc.gov>; Wong, See-Meng <See-Meng.Wong@nrc.gov>; RES_DRA_PRB <RESDRAPRB@nrc.gov>; Coyne, Kevin <Kevin.Coyne@nrc.gov>; Arner, Frank <Frank.Arner@nrc.gov>; Bernhard, Rudolph <Rudolph.Bernhard@nrc.gov>; Cahill, Christopher <Christopher.Cahill@nrc.gov>; Cook, William <William.Cook@nrc.gov>; Deese, Rick <Rick.Deese@nrc.gov>; Freeman, Scott <Scott.Freeman@nrc.gov>; Hanna, John <John.Hanna@nrc.gov>; Kozak, Laura <Laura.Kozak@nrc.gov>; Loveless, David <David.Loveless@nrc.gov>; MacDonald, George <George.MacDonald@nrc.gov>; Replogle, George <George.Replogle@nrc.gov>; Valos, Nicholas <Nicholas.Valos@nrc.gov>; Appignani, Peter <Peter.Appignani@nrc.gov>; Ferrante, Fernando <Fernando.Ferrante@nrc.gov>; Gonzalez, Michelle <Michelle.Gonzalez@nrc.gov>; Helton, Donald <Donald.Helton@nrc.gov>; Hudson, Daniel <Daniel.Hudson@nrc.gov>; Kuritzky, Alan <Alan.Kuritzky@nrc.gov>; Leschek, Walter <Walter.Leschek@nrc.gov>; Li, Ming <Ming.Li@nrc.gov>; Ning, Lauren (Killian) <LaurenKillian.Ning@nrc.gov>; Sancaktar, Selim <Selim.Sancaktar@nrc.gov>; Wessels, Steven <Steven.Wessels@nrc.gov>; Wood, Jeffery <Jeffery.Wood@nrc.gov>
Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>
Subject: Use of Licensee's Models

Dear PRA Colleagues,

Most of you know, as part of fiscal belt tightening (Project AIM 2020 and re-baselining), the agency is currently looking into various areas to reduce our budget. One area that has come up every couple of years, and has been a source of contention, is the feasibility of using licensee's PRA models in lieu of our SPAR models for SDP findings and possibly ASP. In support of that, a pilot program has been proposed to investigate its feasibility. RES is preparing to make a presentation to NRR management touching on various areas of consideration should the decision be made to embark on such a pilot program. This presentation is not intended to be forcing an opinion on whether or not to proceed but, will be advice on how to proceed with a program.

Over here in RES, I have heard conflicting opinions of what the internal stakeholders believe is the direction the agency should take on this topic. To that end, I'm sending his email out with a voting option with three selections – use only SPAR models, use only licensee's models, or use both. I would greatly appreciate it if you each took the time and voted. And, since some of us are not wallflowers and have more to say than just vote, please feel free to take the opportunity to comment on the return email to me. This will help greatly in support to our end users.

I'm looking forward to hearing from you.

Jeff.

Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
BB (b)(6)

**Cost Estimate Using Licensee Models
Cost Based on NRR Rebaselining Values**

Initial costs in \$	Initial costs in FTE	Ongoing Annual costs in \$	Ongoing Annual costs in FTE	Activities
\$5,621,918	32.88			1. Review Licensee PRAs (assumes 80 different PRAs) - A typical Level 1 industry peer review takes approximately 75 person/days (5 people for about 3 weeks)
				Staff will need to gain an in-depth understanding of each unique model, including
				• Modeling assumptions
				• Modeling conventions
				• Naming schemes (basic events, fault trees, event trees, etc.)
				• Post processing rule construction
				• Other ...
				Note: loss of standardization may require additional SRAs - see item 8 below
		\$562,192	3.29	Review updated/revised PRAs (assume 10%/year)
\$974,466	5.70	\$487,233	2.85	2. Coordinate logistics with industry and staff (assumes 4 FTE initially, then 2 FTE ongoing)
				Receive and process submittal (assumes the models will be proprietary)
				Create and manage reference library (assumes both digital and hardcopy)
				Coordinate review of revised PRA
				Duplicate and distribute models and software
				Industry User Groups (software, others)
				Provide limited Technical Support to SRAs
\$730,849	4.27	\$365,425	2.14	3. RASP Handbook Revisions- Provides for uniformity of assessments - based on the Standardized SPAR Model
				Assumes 3 FTE for initial major revision and 1.5 FTE for at least the first few years
				4. Software Licensee's
\$10,000		\$10,000		CAFTA (EPRI) - includes FTREX, actual current cost
\$10,000		\$10,000		WinNUPRA (Sciencetech) - estimated
\$10,000		\$10,000		Riskman (ABS Consulting) - estimated
\$10,000		\$10,000		RiskSpectrum (Lloyd's Register Consulting, Sweden) - estimated (may not be needed)
	0.23		0.23	
				5. Training on new software (initial training assume 5 days each for 25 staff)
\$117,123	0.68	\$23,425	0.14	CAFTA (EPRI)
\$117,123	0.68	\$23,425	0.14	WinNUPRA (Sciencetech)
\$117,123	0.68	\$23,425	0.14	Riskman (ABS Consulting)
\$117,123	0.68	\$23,425	0.14	RiskSpectrum (Lloyd's Register Consulting, Sweden) (may not be needed)
		\$168,658	0.99	6. Loss of SAPHIRE reporting features and other automation tools (assume 36 in-depth SDPs/year)
				Additional time required to perform and document each analyses (assumes 40 extra hours per evaluation)
				Includes offline computation reviews
		\$0		7. Technical support - similar to current support provided by INL ** Too many unknowns to estimate
\$7,835,726	45.82	\$1,717,205	10.04	TOTAL assuming no additional SRAs
		\$974,466	5.70	8. One additional SRA per Region
\$7,835,726	45.82	\$2,691,671	15.74	Total if additional SRAs are required
			15.74	
Assumptions:				
\$117.12 per hour				
1460 hours = 1 FTE				
From NRR Rebaselining assumptions				
1 FTE =	\$171,000			

**Cost Estimate Using Licensee Models
Cost Based on NRR Rebaselining Values**

Initial costs in \$	Initial costs in FTE	Ongoing Annual costs in \$	Ongoing Annual costs in FTE	Activities
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				Staff will need to gain an in-depth understanding of each unique model, including
				• Modeling assumptions
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				• Post processing rule construction
				• Other ...
				Note: loss of standardization may require additional SRAs - see item 8 below
		\$562,192	3.29	Review updated/revised PRAs (assume 10%/year)
\$974,466	5.70	\$487,233	2.85	2. Coordinate logistics with industry and staff (assumes 4 FTE initially, then 2 FTE ongoing)
				Receive and process submittal (assumes the models will be proprietary)
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				Coordinate review of revised PRA
				Duplicate and distribute models and software
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				Provide limited Technical Support to SRAs
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				4. Software Licensee's
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		\$168,658	0.99	6. Loss of SAPHIRE reporting features and other automation tools (assume 36 in-depth SDPs/year)
				Additional time required to perform and document each analyses (assumes 40 extra hours per evaluation)
				Includes offline computation reviews
		\$0		7. Technical support - similar to current support provided by INL ** Too many unknowns to estimate
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\$7,835,726	45.82	\$2,691,671	15.74	Total if additional SRAs are required
			15.74	
Assumptions:				
\$117.12 per hour				
1460 hours = 1 FTE				
From NRR Rebaselining assumptions				
1 FTE =	\$171,000			

Current SPAR Model Costs	
	Per year costs
Base Resources (i.e., minimum requirements for the program):	
• SPAR Model Configuration/Quality Control and User Support Help Desk ~\$500k/year	\$500,000
- Help desk handles ~ 2 calls/day from SRAs	
- Ensures model version control and maintains INL Website	
- Performs model updates to support specific SDP/ASP activities (~30 models were updated to support a specific analysis in FY2015). These updates are often highly specific to the event/condition that occurred and would also need to be performed for a licensee PRA model	
• SAPHIRE QA and User Support ~\$300k/year	\$300,000
- Maintain NUREG/BR-0167 QA program	
- User help desk Support	
SUBTOTAL	\$800,000
Resources needed to Support Specific User Enhancements:	
• Model Updates to Reflect Significant Plant Changes (~12 models/year) - ~\$250k	\$250,000
- Incorporate station blackout EDGs	
- Battery charging generators	
- Significant model upgrades	
• External Hazard and Fire Models - ~ \$400k/year	\$400,000
- Add NFPA 805 fire modeling	
- Add seismic and high wind model capabilities	
• SAPHIRE Enhancements ~\$300k /year	\$300,000
- New reporting features and code capabilities	
• Data Updates (performed every 3 years) - ~\$500k (every three years)	\$166,667
- Upgrade SPAR models to reflect most recent operating data	
- Update model documentation and Plant Risk Information eBooks (PRIBs)	
- General model cleanup/improvements	
SUBTOTAL	\$1,116,667
TOTAL	\$1,916,667

Appignani, Peter

From: Appignani, Peter
Sent: Tuesday, December 08, 2015 7:52 AM
To: Circle, Jeff
Subject: Re: Preparation for a POP for Mike Weber

Jeff

I have an outline. The latest version is on my computer at work.
I'll give you a copy first thing tomorrow morning
I have not received the cost info from Ben Beasley yet, I will pulse him again.

Pete

From: Circle, Jeff
Sent: Tuesday, December 8, 2015 7:43 AM
To: Appignani, Peter
Subject: Preparation for a POP for Mike Weber

Pete,

We need to meet with Mike Weber, possibly this week, regarding our use of licensees' models. Last week, I've asked all our internal stakeholders here in RES to send any comments on the subject to you. Have you gotten any?

Let's carve out some time over the next two days to go over it and how we're going to structure the discussion for Mike.

Thanks,
Jeff.

Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES/Division of Risk Analysis
(301) 415-1152
BB (b)(6)

Appignani, Peter

From: Circle, Jeff
Sent: Tuesday, December 08, 2015 1:17 PM
To: Appignani, Peter
Subject: RE: Help ASAP please

Great, thanks!

Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
BB (b)(6)

From: Appignani, Peter
Sent: Tuesday, December 08, 2015 10:14 AM
To: Circle, Jeff <Jeff.Circle@nrc.gov>
Subject: FW: Help ASAP please

Jeff

I now have the cost info from Ben and will revise my cost estimate for using licensee models using his values.

Pete

From: Beasley, Benjamin
Sent: Tuesday, December 08, 2015 8:20 AM
To: Appignani, Peter
Subject: FW: Help ASAP please

Pete,

I am sorry to take so long to get this to you. The FY17 conversion rate is \$171,000 per FTE.

A review of my spreadsheet confirmed that I used 1460 hours as an FTE for NRC staff.

Ben

From: Helton, Shana
Sent: Wednesday, October 07, 2015 10:55 AM
To: Orf, Tracy <Tracy.Orf@nrc.gov>
Cc: Beasley, Benjamin <Benjamin.Beasley@nrc.gov>
Subject: RE: Help ASAP please

Thanks.

From: Orf, Tracy
Sent: Wednesday, October 07, 2015 10:54 AM
To: Helton, Shana
Subject: Re: Help ASAP please

it's now \$171 K. Last year it was \$166K.

From: Helton, Shana
Sent: Wednesday, October 7, 2015 10:53 AM
To: Orf, Tracy
Subject: Help ASAP please

Hi Trace,

What's the FTE conversion rate? I.e., 1 FTE = \$?

Thank you,
Shana

*Shana Helton, Branch Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation
Work phone: 301-415-7198
Blackberry: (b)(6)*

Weber, Michael

From: Weber, Michael
Sent: Tuesday, December 08, 2015 6:53 AM
To: Tracy, Glenn
Cc: Foster, Jack; West, Steven
Subject: FYI - Summary of NRR ET/LT ,meeting of December 7th, 2015 - items of potential interest to RES

Good morning, Glenn. Just wanted to call to your attention the problem with the dropped control rods at Indian Point 2. I had not heard about this complication until I read Ed's notes from the NRR ET/LT meeting last night. Note that the notes reflect what Ed could discern from the discussion at the NRR meeting.

From: O'Donnell, Edward
Sent: Monday, December 07, 2015 12:52 PM
To: Weber, Michael <Michael.Weber@nrc.gov>; West, Steven <Steven.West@nrc.gov>; Thomas, Brian <Brian.Thomas@nrc.gov>; Brock, Kathryn <Kathryn.Brock@nrc.gov>; Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>; Case, Michael <Michael.Case@nrc.gov>; Coffin, Stephanie <Stephanie.Coffin@nrc.gov>
Cc: Boyce, Tom (RES) <Tom.Boyce@nrc.gov>
Subject: Summary of NRR ET/LT ,meeting of December 7th, 2015 - items of potential interest to RES

NRR ET/LT meeting Monday December 7th, 2015. Items of potential interest to RES

DSS

- Working up closure memo for GI 193. Goes to Weber. Closure by end of the year.
- Meeting with Hackett this week regarding how ACRS review drags out the schedule.
- McGinty is in Taiwan.

DORL

- Will be briefing Bill Dean and Michelle Evans on decommissioning trust fund issues.
- Chairman Burns visiting Indian Point this week. It was planned before the problem with 11 dropped control rods in Indian Point unit 2. That happened at 5.30 pm on Saturday night. The problem was caused by short in a control box. DC power only held for 10 minutes. Don't have confirmation of rod position. Injected boron for shut condition. Region I is preparing a one pager for the Chairman as background.
- Working with NEI for public meeting December 18th [subject not given].
- South Texas working on emergent amendment for control rod issue.
- Watts Bar 2 loading fuel. Began Saturday at 8 o'clock. 193 fuel bundles installed. Expect to complete by midnight today.
- Testing at Beaver Valley last week indicated a higher-than-allowed amount of air leaking in from the outside." Beaver Valley was given 90 days to fix the problem.

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DLR

- Draft SLR GALL got comments. OPA has press release prepared.
- SRP being reviewed by ADM. Expect to go out for public comment February 29th. They plan two public meetings.
- Regarding SLR there was some back and forth on when the Commission wanted it out.

Dean briefed the Commission in the summer and the only thing new is GALL report being out. They are hoping for 2017 rather than 2016. The 2016 date was mentioned by EDO staff member in the room. The Commission planning session will be held in January and it only goes to July. The timing can be brought up for that meeting.

- On Wednesday mechanical engineers from NRR/NRO will meet. This was initiated by NRO Branch Chiefs to address the coming NRR/NRO merger.

DRA

- Last Wednesday public meeting with BWR owner's group ECCS suction strainer committee to discuss the 2015 year-end progress for all ECCS suction strainer potential issues and to establish 2016 initiatives. Meeting went well.
- Last week GSI 193 meeting went well. Will document 193 audit in February.

JLD

- Last week Indian Point audit found some minor issues.
- Farley audit this week.
- Have 2 votes on Tier 2-3

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DPR

- SHINE dry run Wednesday and Thursday.
- EDO 9.30 am meeting for alignment on Commission prioritization meeting.
- RMRS package ready for delivery to EDO.

OCA

Last Thursday the **House Energy and Commerce Environment and the Economy**

Subcommittee held a hearing on "The Nuclear Waste Fund: Budgetary, Funding, and Scoring Issues."

Last Tuesday NMSS and OCA briefed staff of the **Senate Energy and Natural Resources Committee** on how NRC considers risk in regulation the transportation, storage, and disposal of waste.

OGC

- Filing a response to the November 4th State of Vermont submission.
- SHINE electronic docket tomorrow.

OE

- Cited a control room issue with Palisades.
- River Bend not enough cooling capacity. Not Appendix N.

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EDO

- Brett Klukan [on rotation in the Chairman's office] request briefing on a petition for rule for staff to have training on digital I & C and to incorporate digital I & C into the rule. The petition may have come from a company with vested interest in digital I & C. The petition would apply to fuel cycle facilities as well as reactors.

Dean

- Dean will be out of the office Thursday afternoon through Monday.
- Lots of e-mail traffic last week regarding SPAR model and project AIM. Dean said there would be a meeting of the agency's Risk Committee in January and the pros & cons would be discussed. "We need to lay out the issues in a well informed manner."

Lubinski

- Thursday Commission meeting on Project AIM.

Edward O'Donnell, Ph.D., Senior Geologist
Regulatory Guidance and Generic Issues Branch
Office of Nuclear Regulatory Research
Telephone 301-415-3317 Office TWFN 9F-30
e-mail exo@nrc.gov

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Regulatory Guidance and Generic Issues Branch
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Telephone 301-415-3317 Office TWFN 9F-30
e-mail exo@nrc.gov

Weber, Michael

From: Weber, Michael
Sent: Tuesday, December 08, 2015 6:55 AM
To: O'Donnell, Edward
Cc: Brock, Kathryn; Thomas, Brian; West, Steven; Cruz, Holly (Holly.Cruz@nrc.gov)
Subject: RESPONSE - Summary of NRR ET/LT ,meeting of December 7th, 2015 - items of potential interest to RES

Thanks, Ed. Very useful insights. The details/complications associated with the Indian Point trip was especially interesting. I appreciate your sharing these notes to keep us connected with our colleagues in NRR and elsewhere in the agency!

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From: O'Donnell, Edward
Sent: Monday, December 07, 2015 12:52 PM
To: Weber, Michael <Michael.Weber@nrc.gov>; West, Steven <Steven.West@nrc.gov>; Thomas, Brian <Brian.Thomas@nrc.gov>; Brock, Kathryn <Kathryn.Brock@nrc.gov>; Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>; Case, Michael <Michael.Case@nrc.gov>; Coffin, Stephanie <Stephanie.Coffin@nrc.gov>
Cc: Boyce, Tom (RES) <Tom.Boyce@nrc.gov>
Subject: Summary of NRR ET/LT ,meeting of December 7th, 2015 - items of potential interest to RES

NRR ET/LT meeting Monday December 7th, 2015. Items of potential interest to RES

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- On Wednesday mechanical engineers from NRR/NRO will meet. This was initiated by NRO Branch Chiefs to address the coming NRR/NRO merger.

DRA

Nakoski, John

From: Correia, Richard
Sent: Monday, December 07, 2015 6:09 PM
To: Lund, Louise; Nakoski, John; Circle, Jeff; Coyne, Kevin
Subject: From Bill Dean

Dean

· Dean will be out of the office Thursday afternoon through Monday.

· Lots of e-mail traffic last week regarding SPAR model and project AIM. Dean said there would be a meeting of the agency's Risk Committee in January and the pros & cons would be discussed. "We need to lay out the issues in a well informed manner."

Rich

Send by BlackBerry

Coyne, Kevin

From: Coyne, Kevin
Sent: Monday, December 07, 2015 11:07 AM
To: Krsek, Robert
Subject: SPAR...
Attachments: 20070417.pdf

Publicly available at: www.nrc.gov/reading-rm/doc-collections/commission/tr/2007/20070417

u may find the discussion on pages 41-42 interesting...

Ning, Lauren (Killian)

From: Leschek, Walter
Sent: Monday, December 07, 2015 7:17 AM
To: Circle, Jeff; Demers, Jerrod; Gibbs, Russell; Hartle, Brandon; Kichline, Michelle; Leech, Matthew; Lyons, Sara; Mitman, Jeffrey; Ng, Ching; Spore, Candace; Weerakkody, Sunil; Wong, See-Meng; RES_DRA_PRB; Coyne, Kevin; Arner, Frank; Bernhard, Rudolph; Cahill, Christopher; Cook, William; Deese, Rick; Freeman, Scott; Hanna, John; Kozak, Laura; Loveless, David; MacDonald, George; Replogle, George; Valos, Nicholas; Appignani, Peter; Ferrante, Fernando; Gonzalez, Michelle; Helton, Donald; Hudson, Daniel; Kuritzky, Alan; Li, Ming; Ning, Lauren (Killian); Sancaktar, Selim; Wessels, Steven; Wood, Jeffery
Cc: Correia, Richard; Lund, Louise
Subject: Commissioner McGaffigan Favored Use of NRC SPAR Models and Opposed Use of Licensee's PRA Models
Attachments: 20070417.pdf

To All

With reference to information in the attached publicly available document dated April 17, 2007, please note that:

- The late Commissioner Edward McGaffigan, Jr., favored the use of NRC SPAR Models and opposed the use of Licensee's PRA Models.
 - To find Commissioner McGaffigan's comments, just open the document and search for SPAR.

There are more documents on the NRC Public Website concerning Commissioner McGaffigan's favored the use of NRC SPAR Models.

These can be found by going to the NRC Public Website and typing:

- McGaffigan SPAR

Take care,
Walt

From: Circle, Jeff
Sent: Monday, November 30, 2015 1:47 PM
To: Demers, Jerrod <Jerrod.Demers@nrc.gov>; Gibbs, Russell <Russell.Gibbs@nrc.gov>; Hartle, Brandon <Brandon.Hartle@nrc.gov>; Kichline, Michelle <Michelle.Kichline@nrc.gov>; Leech, Matthew <Matthew.Leech@nrc.gov>; Lyons, Sara <Sara.Lyons@nrc.gov>; Mitman, Jeffrey <Jeffrey.Mitman@nrc.gov>; Ng, Ching <Ching.Ng@nrc.gov>; Spore, Candace <Candace.Spore@nrc.gov>; Weerakkody, Sunil <Sunil.Weerakkody@nrc.gov>; Wong, See-Meng <See-Meng.Wong@nrc.gov>; RES_DRA_PRB <RESDRAPRB@nrc.gov>; Coyne, Kevin <Kevin.Coyne@nrc.gov>; Arner, Frank <Frank.Arner@nrc.gov>; Bernhard, Rudolph <Rudolph.Bernhard@nrc.gov>; Cahill, Christopher <Christopher.Cahill@nrc.gov>; Cook, William <William.Cook@nrc.gov>; Deese, Rick <Rick.Deese@nrc.gov>; Freeman, Scott <Scott.Freeman@nrc.gov>; Hanna, John <John.Hanna@nrc.gov>; Kozak, Laura <Laura.Kozak@nrc.gov>; Loveless, David <David.Loveless@nrc.gov>; MacDonald, George <George.MacDonald@nrc.gov>; Replogle, George <George.Replogle@nrc.gov>; Valos, Nicholas <Nicholas.Valos@nrc.gov>; Appignani, Peter <Peter.Appignani@nrc.gov>; Ferrante, Fernando <Fernando.Ferrante@nrc.gov>; Gonzalez, Michelle <Michelle.Gonzalez@nrc.gov>; Helton, Donald <Donald.Helton@nrc.gov>; Hudson, Daniel <Daniel.Hudson@nrc.gov>; Kuritzky, Alan <Alan.Kuritzky@nrc.gov>; Leschek, Walter <Walter.Leschek@nrc.gov>; Li, Ming <Ming.Li@nrc.gov>; Ning, Lauren (Killian) <LaurenKillian.Ning@nrc.gov>; Sancaktar, Selim <Selim.Sancaktar@nrc.gov>; Wessels, Steven <Steven.Wessels@nrc.gov>; Wood, Jeffery <Jeffery.Wood@nrc.gov>
Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>
Subject: Use of Licensee's Models

Dear PRA Colleagues,

Most of you know, as part of fiscal belt tightening (Project AIM 2020 and re-baselining), the agency is currently looking into various areas to reduce our budget. One area that has come up every couple of years, and has

been a source of contention, is the feasibility of using licensee's PRA models in lieu of our SPAR models for SDP findings and possibly ASP. In support of that, a pilot program has been proposed to investigate its feasibility. RES is preparing to make a presentation to NRR management touching on various areas of consideration should the decision be made to embark on such a pilot program. This presentation is not intended to be forcing an opinion on whether or not to proceed but, will be advice on how to proceed with a program.

Over here in RES, I have heard conflicting opinions of what the internal stakeholders believe is the direction the agency should take on this topic. To that end, I'm sending his email out with a voting option with three selections – use only SPAR models, use only licensee's models, or use both. I would greatly appreciate it if you each took the time and voted. And, since some of us are not wallflowers and have more to say than just vote, please feel free to take the opportunity to comment on the return email to me. This will help greatly in support to our end users.

I'm looking forward to hearing from you.

Jeff.

Jeff A. Circle
Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
BB (b)(6)

Wood, Jeffery

From: Ferrante, Fernando
Sent: Friday, December 04, 2015 9:31 AM
To: Circle, Jeff; Appignani, Peter; Gonzalez, Michelle; Helton, Donald; Hudson, Daniel; Kuritzky, Alan; Leschek, Walter; Li, Ming; Ning, Lauren (Killian); Sancaktar, Selim; Wessels, Steven; Wood, Jeffery
Cc: Correia, Richard; Lund, Louise; Nakoski, John
Subject: RE: Information Only: NRC SPAR models

Jeff, Pete,

I had another idea:

I think we should have an internal NRC seminar about SAPHIRE and SPAR models. The logic behind this is that we can advertise it internally to all stakeholders and have an open forum under RES control to dispel untruths being thrown around about this effort. I know we had the public workshop recently and we invited the key players, but that effort was too easy to ignore for them. If we have an internal seminar and indicate that the value of SPAR and SAPHIRE will be part of the discussion; this would attract several people that will probably get to hear directly about the program, instead of from an NRR upper management perspective. Of course, we don't need to advertise it as being part of an argument; but as a logical sequence of the recent seminars about the history of RES and WASH-1400. Just a suggestion.

Thanks,
Fernando

From: Ferrante, Fernando
Sent: Thursday, December 03, 2015 10:18 AM
To: Circle, Jeff <Jeff.Circle@nrc.gov>; Appignani, Peter <Peter.Appignani@nrc.gov>; Gonzalez, Michelle <Michelle.Gonzalez@nrc.gov>; Helton, Donald <Donald.Helton@nrc.gov>; Hudson, Daniel <Daniel.Hudson@nrc.gov>; Kuritzky, Alan <Alan.Kuritzky@nrc.gov>; Leschek, Walter <Walter.Leschek@nrc.gov>; Li, Ming <Ming.Li@nrc.gov>; Ning, Lauren (Killian) <LaurenKillian.Ning@nrc.gov>; Sancaktar, Selim <Selim.Sancaktar@nrc.gov>; Wessels, Steven <Steven.Wessels@nrc.gov>; Wood, Jeffery <Jeffery.Wood@nrc.gov>
Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>; Nakoski, John <John.Nakoski@nrc.gov>
Subject: RE: Information Only: NRC SPAR models

Jeff, Pete,

would be glad to help on this effort and I would like to attend the meeting if possible. Off-the-cuff, here are some topics we need to take head on:

- Use or non-use of independent tools by the NRC
 - o We need to do a check on how true it is that licensing never uses independent tools. I don't think this is accurate. We had independent assessments made to verify licensing issues (e.g., Oconee flooding) and we also had independent tools for the Yucca Mountain project. I think it is fair to ask when an independent tool is needed or not; but I think this statement is thrown around without careful consideration of what it really means and when it should/should not be used.
- Licensing versus oversight
 - o Related to the topic above, the question usually raised by anti-SPAR circles is the fact that risk-informed licensing activities do not rely on independent tools. There are many reasons for this,

including the differences between the nature and philosophy behind licensing and oversight. I can provide more info if need be, but here are some facts:

- Licensing relies on the PRA standard heavily which is appropriate for baseline issues. Oversight challenges the assumptions in the baseline PRA, hence there will never be a "certified" PRA for oversight, even if licensees were willing to spend the resources to get it.
- Licensing assumes licensing bases conditions are being met and ultimately relies on defense-in-depth, safety margin, etc. In oversight, since performance deficiencies and license violations are being assessed, we are already starting from a lower point than licensing.
- Licensing deals with licensee-initiated actions where the full onus is on the licensee to provide all the documentation in a timely manner. Oversight is an NRC-initiated process in which we are under strict timelines to make a decision on NRC specific actions.
- The timelines for licensing can be protracted and can take years for closure. The timelines in oversight are measured in months and there is no time for extended formal requests for additional information and transfer of material on the docket.
- In oversight, sequences that were not important for baseline changes can now get magnified (e.g., SBO sequences if an EDG is assumed to be failed) and assumptions on these sequences may get challenged.
- Due to the emergent nature of oversight actions, the existing PRAs many times do not have specific portions of the model developed in advance (e.g., certain external events, consequential LOOP). In the case of the Catawba consequential LOOP SDP, the licensee was forced to do work because the NRC was doing it already (note that they never shared their model with us and that their result was WHITE but for different reasons than what our model was indicating; highlighting the challenge to make decisions in these circumstances). If a licensee has to evaluate a finding that results in a preliminary greater than green result, it would be reasonable to expect they would want more time or would sharpen the pencil in unanticipated ways; increasing time and effort needed to review.

- Risk-informed versus risk-based

- o This mantra has been distorted to the point it means radically different things for different people. It has been used recently to mean that we can rely more on the licensee's results, and get rid of SPAR models. We need to address what this means with respect to SPAR models and the fact that (1) having direct access to risk tools is critical if the Agency truly means what it says with regards to being more risk-informed, and (2) maintaining the internal capabilities that come with direct access to insights and hands-on training would be eroded without this access.

- Independence

- o We need to be careful when we bring this up. Licensing folks will outright reject the need for SPAR for independence because of their framework which relies on PRA standard and peer reviews (I believe part of the challenge is that existing SPAR models threaten their status quo). But it needs to be brought up.

- PRA maturity

- o This is also being seriously distorted. PRA has been in the literature for a while and has become state-of-practice for certain hazards/applications but this is not the point. The point is to what extent we can rely solely on the licensee's PRA for oversight. While PRA can be considered mature to some extent, it should also be noted that:
 - There is subjectivity involved with PRA modeling
 - The PRA standard is a beneficial advance in this field, but it's not a panacea; peer-reviewed PRAs can still have errors that can get magnified in oversight.
 - We have not resolved CCF, HRA framework issues that are important in oversight. The PRA framework does not prescribe methods and baseline changes that may not be sensitive for their purposes.
 - There is a misguided view that licensee PRAs will essentially be "all-knowing" and "all-doing" that has been propagated via meetings between NRC and industry managers. I.e., the

industry has been promising they will have PRAs that will cover all aspects and to such a level of quality that they will far surpass SPAR models. This is just not true. While most licensees have internal events models; external events and shutdown PRA use is still sparse. The Fukushima activities in seismic will only produce a subset of licensees with higher quality seismic PRAs, most will still not have any; and the flooding activities simply do not require a PRA at all. Hence, when an SDP that can be affected by such a hazard occurs, we will depend on the good faith of the licensees to provide information if we don't have a forcing function. In fact, under the SPAR-AHZ effort, we observed that many licensees have crude if not simply non-existent hazard modeling for issues such as internal flooding and high winds.

- It should be noted that this statement is disingenuous at its core. For example, no one would argue that Computational Fluid Dynamics is a "mature" field. However, no credible expert would deny that there are specific phenomena that is incredibly difficult to model and predict. Hence, the idea that PRA is so mature makes as much sense as saying CFD is so mature that we don't need to ask any more questions about it.
- It should also be noted that parts of the Agency is incoherent in its public message of PRAs. On one hand, parts of NRR state that PRA technology is extremely mature, while other parts of NRR state that PRAs have so much uncertainty and assumptions that they cannot be relied on to make a risk-informed decision.

- Quality of SPAR models

- o This continues to be thrown around as an excuse to get rid of SPAR models. We need to address this head on by discussing the recent SPAR workshop, the fact that most issues in SDP don't involve modeling issues but input conditions (e.g., exposure time, CCF assumptions), and the fact that licensees that have been exposed to the SPAR models under the SPAR-AHZ effort did not have major issues with the models. We need to highlight that there is no technical issue that prevents modeling of specific internal and external events in SPAR and that most of the time the complaints about SPAR model "inaccuracies" is because a licensee is getting an SDP finding they don't like.

- Cost

- o The cost of SPAR models continues to be raised as an impediment. I have yet to see a clear, transparent discussion on how much of the budget SPAR represents and whether this justifies the elimination of a program with significant consequences. If this is a cost we need to eliminate, I think it is worth asking what other programs are on the table or not, and whether their importance supersedes the benefits gained by SPAR.

- Training

- o SPAR provides a critical tool to train and educate staff on the intricacies of PRA. The Grow Your Own PRA highlighted the key benefits in having an in-house tool. The result of moving away from SPAR could well be a degradation of the knowledge and readiness in a critical capability at the Agency; eventually resulting in uninformed staff reviewing PRA-standard peer-reviews without any knowledge of the intricacies and "soft spots" of PRAs to actually ask good questions.

- The alternatives

- o We need to press hard on what do people want instead of SPAR. I have heard multiple times that we would have access to licensee models and NRC staff would become proficient in PRAs for individual plants. I don't believe this is the end goal of many anti-SPAR proponents. I believe they want a framework similar to licensing, where the actual PRAs are never shared with the staff and that results and sensitivities need to be asked via formal processes (i.e., licensees would run models, tell us the results, and the onus would be on us to ask questions to check their validity). I think this is supported by the fact that sharing the licensee models with NRC is fraught with a wide range of problems:
 - Legal aspects, including having PRAs shared in some formal manner, since there is no legal requirement to do so even for new reactors.

- Multitude of PRA software, modeling approaches; which would require NRC staff to become familiar with various platforms and would expend more resources on training and acquiring software
 - Lack of standardization, which is a major benefit of SPAR
 - Loss of control on being able to request changes and software upgrades to INL on SAPHIRE, as we would then become dependent on the licensees' vendors
 - Loss of timeliness, efficiency and transparency; as we would depend on the licensees' goodwill to provide changes to their models if we disagree with a specific approach or input. This could potentially impact meeting timeliness goals in SDP, as well as losing control of our decisionmaking.
- The cost of performing a pilot
- o This is a non-trivial issue that must be raised. NRR has launched into multiple non-budgeted activities recently, including the failed Risk Prioritization Initiative and the SDP Streamlining effort, which tend to cycle NRC and industry resources and achieve little to nothing. Clearly, this pilot is being entered into with an uninformed perspective of all the challenges involved (most likely due to an expectation that the goal is so worthy of it, that details don't matter). We need to plant the seed that there are legitimate, serious concerns about this so that all individuals and organizations involved know what, how, when, and who will be responsible.

Thanks,
Fernando

From: Circle, Jeff

Sent: Wednesday, December 02, 2015 8:30 AM

To: Appignani, Peter <Peter.Appignani@nrc.gov>; Ferrante, Fernando <Fernando.Ferrante@nrc.gov>; Gonzalez, Michelle <Michelle.Gonzalez@nrc.gov>; Helton, Donald <Donald.Helton@nrc.gov>; Hudson, Daniel <Daniel.Hudson@nrc.gov>; Kuritzky, Alan <Alan.Kuritzky@nrc.gov>; Leschek, Walter <Walter.Leschek@nrc.gov>; Li, Ming <Ming.Li@nrc.gov>; Ning, Lauren (Killian) <LaurenKillian.Ning@nrc.gov>; Sancaktar, Selim <Selim.Sancaktar@nrc.gov>; Wessels, Steven <Steven.Wessels@nrc.gov>; Wood, Jeffery <Jeffery.Wood@nrc.gov>
Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>; Nakoski, John <John.Nakoski@nrc.gov>
Subject: FW: Information Only: NRC SPAR models

PRABers,

FYI.

In reference to what we heard on Monday, I had a conversation this morning with George MacDonald (R-II) and one yesterday with Laura Kozak (R-III) who both feel that we need to retain SPAR models. Checking the email thread below, Vic feels that there can be a reduction in funding for SPAR model updates. He is basing this opinion that regional SRAs have an intimate knowledge of licensees' models, which is not necessarily true. I'm assuming that the term SPAR model "inaccuracies" refers to lag in performing model updates due to reduced funding.

We need to put together documentation in support for a meeting with NRR on this subject and it should also cover the proposed development of a pilot project. I would appreciate it if any of you can forward Pete Appignani information that you feel can help us with our meeting. There will be more to follow on this topic.

Thanks,
Jeff.

Jeff A. Circle

Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
BB (b)(6)

From: MacDonald, George
Sent: Wednesday, December 02, 2015 7:56 AM
To: Circle, Jeff <Jeff.Circle@nrc.gov>
Subject: FW: Information Only: NRC SPAR models

From: McCree, Victor
Sent: Tuesday, December 01, 2015 7:11 PM
To: Hanna, John <John.Hanna@nrc.gov>
Cc: Bernhard, Rudolph <Rudolph.Bernhard@nrc.gov>; MacDonald, George <George.MacDonald@nrc.gov>
Subject: Re: Information Only: NRC SPAR models

Hi John!

It's great to hear from you and I appreciate your timely insights.

During a very free flowing discussion today, we debated the wisdom of accepting a recommended cost reduction that could delay (not eliminate) updates to SPAR models. I opined that some reasonable delay in updating SPAR models would likely not represent a significant handicap due to Regional SRA familiarity with licensee risk models (and their strengths and limitations) relative to the SPAR. I offered that this could mitigate the impact of SPAR model "inaccuracies."

Your thoughts?

Vic

On: 01 December 2015 15:07, "Hanna, John" <John.Hanna@nrc.gov> wrote:

Vic,

The purpose of this e-mail is to provide you some background about NRC SPAR models and hopefully address some inaccurate information that may be circulating in HQ.

We had recently heard anecdotally that some views are being shared at your level that assert that the SRAs are in favor of eliminating the SPAR models and using the licensee's CAFTA models. This is not the opinion of the Region II SRAs. George MacDonald will be polling some of the other SRAs in different regions and sending you a separate e-mail, but we strongly suspect that they are also not in favor of eliminating SPAR models. If we are actively considering eliminating the SPAR models as a cost savings measure, I would recommend that we have a panel to discuss this option and all of the positives and negatives.

I have attached some additional information to this e-mail regarding this topic. (I developed this outline in support of some risk training for SES managers.) If you desire a bit more detail and why moving towards only using the licensee models would have some adverse effects, please read the attached document. The **highlights and key messages** are in **bolded type** so you can scan it quickly.

I normally would not send an e-mail like this directly to you and would follow the normal protocol for communicating up the chain. However I thought the topic was significant enough and urgent enough that you should hear the "unfiltered" message promptly. I have not vetted this message with Region II management and am only representing the views of the SRAs.

Thanks. Hope all is well with you in Headquarters and that the transition up there went smoothly...

John

John David Hanna
Senior Reactor Analyst
US NRC, Region II Office
John.Hanna@nrc.gov
404-997-4552

Weber, Michael

From: Weber, Michael
Sent: Thursday, December 03, 2015 10:43 PM
To: Holahan, Gary
Subject: Response - SPAR models

Thanks, Gary. This topic will clearly benefit from a full airing! Not so simple, not so fast...

From: Holahan, Gary
Sent: Thursday, December 03, 2015 12:56 PM
To: Dean, Bill; Weber, Michael; West, Steven
Cc: Johnson, Michael; Tracy, Glenn; Lubinski, John; Glitter, Joseph; Evans, Michele; Uhle, Jennifer
Subject: RE: SPAR models

Bill,

I see the SPAR question as "not so simple", so I support the idea of a multi-office working group. Southern Company would be an interesting volunteer for a pilot activity since they have both operating and new reactors (under construction). I will discuss with Jennifer on her return from travel.

Gary

From: Dean, Bill
Sent: Thursday, December 03, 2015 5:36 AM
To: Weber, Michael <Michael.Weber@nrc.gov>; West, Steven <Steven.West@nrc.gov>
Cc: Johnson, Michael <Michael.Johnson@nrc.gov>; Tracy, Glenn <Glenn.Tracy@nrc.gov>; Lubinski, John <John.Lubinski@nrc.gov>; Glitter, Joseph <Joseph.Glitter@nrc.gov>; Evans, Michele <Michele.Evans@nrc.gov>; Uhle, Jennifer <Jennifer.Uhle@nrc.gov>; Holahan, Gary <Gary.Holahan@nrc.gov>
Subject: SPAR models

Mike

I saw an email that I was not on distribution for from you indicating some rancor in the RES ranks over NRR's consideration of no longer sustaining the large infrastructure and expenses involved in our SPAR model program.

In the spirit of Project AIM I have targeted this as a possible efficiency gain in our long term plans. I also know there is a lot of staff who are resistant to this potential move. In order to move from a concept to an actuality will require some strategic thinking from many corners of the agency and in the final analysis may or may not be an appropriate approach to take. But we won't know unless we evaluate it.

I saw in your email your intent for RES to lead an effort to assess the efficacy of such an approach. I would offer that a better approach would be that NRR and NRO as the primary users of the SPAR models would form a working group, including RES and regional representation to develop the Pros and cons, barriers and opportunities, and strategies to address any barriers and challenges sometime after the beginning of the new year.

I have already reached out to southern company as to their interest in piloting an approach whereby we would use their PRA model in lieu of the SPAR model for one of their sights thru my interactions with Danny Bost on

the Risk Informed Steering Committee. I see this "proof of concept" activity as vital to understanding if this makes sense or not. They are amenable to doing such a pilot.

I am back in the office next Monday and we can certainly talk at length about this then.

Bill Dean
Director
Office of Nuclear Reactor Regulation

Weber, Michael

From: Weber, Michael
Sent: Thursday, December 03, 2015 7:55 AM
To: Tracy, Glenn
Subject: RESPONSE - SPAR models

OK. Are you attending this morning's EEO Commission briefing? Perhaps we could discuss on the margins. Alternatively, I will be attending Jesse Arildsen's farewell and we could discuss there.

From: Tracy, Glenn
Sent: Thursday, December 03, 2015 7:35 AM
To: Weber, Michael <Michael.Weber@nrc.gov>
Subject: RE: RESPONSE - SPAR models

Let's discuss please at a time convenient.

From: Weber, Michael
Sent: Thursday, December 03, 2015 6:18 AM
To: Dean, Bill <Bill.Dean@nrc.gov>; West, Steven <Steven.West@nrc.gov>
Cc: Johnson, Michael <Michael.Johnson@nrc.gov>; Tracy, Glenn <Glenn.Tracy@nrc.gov>; Lubinski, John <John.Lubinski@nrc.gov>; Giitter, Joseph <Joseph.Giitter@nrc.gov>; Evans, Michele <Michele.Evans@nrc.gov>; Uhle, Jennifer <Jennifer.Uhle@nrc.gov>; Holahan, Gary <Gary.Holahan@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>; Correia, Richard <Richard.Correia@nrc.gov>
Subject: RESPONSE - SPAR models

Sounds good. I support.

From: Dean, Bill
Sent: Thursday, December 03, 2015 6:15 AM
To: West, Steven <Steven.West@nrc.gov>; Weber, Michael <Michael.Weber@nrc.gov>
Cc: Johnson, Michael <Michael.Johnson@nrc.gov>; Tracy, Glenn <Glenn.Tracy@nrc.gov>; Lubinski, John <John.Lubinski@nrc.gov>; Giitter, Joseph <Joseph.Giitter@nrc.gov>; Evans, Michele <Michele.Evans@nrc.gov>; Uhle, Jennifer <Jennifer.Uhle@nrc.gov>; Holahan, Gary <Gary.Holahan@nrc.gov>
Subject: Re: SPAR models

Bingo!

Bill Dean
Director
Office of Nuclear Reactor Regulation

On: 03 December 2015 11:52, "West, Steven" <Steven.West@nrc.gov> wrote:

If my memory is correct, Bill also suggested his approach (multi-office NRC working group and industry input) at the last internal Risk-Informed Steering Committee (RISC) meeting, with a promise to explore further at future internal and external RISC meetings. The NRC RISC members (myself included) agreed with Bill's proposal.

Presumably, building on this, the RISC would be involved in directing the working group and assessing its work, as well as any industry input. Thus, appropriate and cross-cutting senior management involvement would be assured.

Steve

Steven West, Deputy Director
Office of Nuclear Regulatory Research
U.S. NRC

From: Dean, Bill
Sent: Thursday, December 03, 2015 11:36 AM
To: Weber, Michael; West, Steven
Cc: Johnson, Michael; Tracy, Glenn; Lubinski, John; Glitter, Joseph; Evans, Michele; Uhle, Jennifer; Holahan, Gary
Subject: SPAR models

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Bill Dean
Director
Office of Nuclear Reactor Regulation

Coyne, Kevin

From: Lund, Louise
Sent: Wednesday, December 02, 2015 6:42 PM
To: Correia, Richard; Nakoski, John; Circle, Jeff; Coyne, Kevin
Subject: FW: FYI - Information Only: NRC SPAR models
Attachments: Notes for EDO on NRC SPAR Models.docx

For awareness

From: Weber, Michael
Sent: Wednesday, December 02, 2015 6:32 PM
To: Tracy, Glenn <Glenn.Tracy@nrc.gov>; Johnson, Michael <Michael.Johnson@nrc.gov>
Cc: Chen, Yen-Ju <Yen-Ju.Chen@nrc.gov>; Evans, Michele <Michele.Evans@nrc.gov>; Lubinski, John <John.Lubinski@nrc.gov>; Uhle, Jennifer <Jennifer.Uhle@nrc.gov>; Holahan, Gary <Gary.Holahan@nrc.gov>; West, Steven <Steven.West@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>
Subject: FYI - Information Only: NRC SPAR models

Good evening, Gents. Following Monday morning's RES all staff meeting, our internal risk community has been a buzz about perceived misunderstandings about the use of risk information, the value of SPAR models maintained and developed by NRC in support of the ROP, and potential shift to place greater reliance on licensee PRAs. There is a concern that senior management has already decided the issue and that such a decision has not been based on a complete understanding of the issue and alternatives. On Tuesday, one of the SRAs emailed Vic regarding these concerns about reliance on licensee PRA models. That message is the original one at the end of the chain below. I am forwarding for your awareness only. The email chain also confirms our discussion yesterday that the Charlie item on SPAR models identified on the Common Prioritization table has limited impact on the agency's ability to maintain and refine the SPAR models, as we discussed at the Aim Steering Committee yesterday afternoon.

RES is initiating an effort to pull together the various NRC internal stakeholders to discuss the merits on placing greater reliance on licensee PRA or continued maintenance and development of NRC's SPAR models. We expect the SRAs and Regions will be involved in this dialogue, as well as RES, NRR, OGC, and others. We expect that this will help inform the discussions and could ultimately support on agency decision on how we should proceed.

From: Circle, Jeff
Sent: Wednesday, December 02, 2015 9:46 AM
To: Coyne, Kevin <Kevin.Coyne@nrc.gov>
Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>
Subject: RE: Information Only: NRC SPAR models

Kevin,

Thanks for the info. I agree that slowing down the rate of update will not create an unmanageably large information gap between SPAR and licensees' models. What I am concerned over - and you correctly notice this as well - is the assumption that SRAs are very familiar with licensees' models. Call it paranoia on my part but, I see in it the formation of the logic that we can use their models in lieu of SPAR since our SRAs already know them so well.

Jeff.

Jeff A. Circle

Chief (acting)
Probabilistic Risk Assessment Branch
RES /Division of Risk Analysis
(301) 415-1152
BB (b)(6)

From: Coyne, Kevin
Sent: Wednesday, December 02, 2015 8:53 AM
To: Circle, Jeff <Jeff.Circle@nrc.gov>
Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>
Subject: RE: Information Only: NRC SPAR models

Jeff –

You need to be aware that we did offer up a modest reduction in funding for routine updates to SPAR – this was a relatively small amount of funding placed in the rebaselining category “c” to go from doing 12 updates a year to 6. As you are aware, you maintain a help desk and can make a wide variety changes when needed to deal with a specific assessment. So, it is likely that the move to reduce the number of routine updates each year would result in some inefficiencies, but I generally agree with Vic’s assessment that it would not result in a significant handicap since we would still ensure that the SPAR model reflects the as-built, as-operated plant each time we use them for an assessment (and that is why it was offered up as part of the AIM rebaselining cuts – in fact, this was a proposed reduction that was essentially non-negotiable with NRR/DRA) –the reasons are different than what Vic cited (i.e., the assistance INL can help with updating a SPAR model when needed, not the SRAs familiarity with licensee models).

Obviously this is a different animal than simply cutting the program (as has also been kicked around), but keep in mind that this particular proposed reduction for routine updates has been vetted through the RES organization.

Kevin

From: Circle, Jeff
Sent: Wednesday, December 02, 2015 8:30 AM
To: Appignani, Peter <Peter.Appignani@nrc.gov>; Ferrante, Fernando <Fernando.Ferrante@nrc.gov>; Gonzalez, Michelle <Michelle.Gonzalez@nrc.gov>; Helton, Donald <Donald.Helton@nrc.gov>; Hudson, Daniel <Daniel.Hudson@nrc.gov>; Kuritzky, Alan <Alan.Kuritzky@nrc.gov>; Leschek, Walter <Walter.Leschek@nrc.gov>; Li, Ming <Ming.Li@nrc.gov>; Ning, Lauren (Killian) <LaurenKillian.Ning@nrc.gov>; Sancaktar, Selim <Selim.Sancaktar@nrc.gov>; Wessels, Steven <Steven.Wessels@nrc.gov>; Wood, Jeffery <Jeffery.Wood@nrc.gov>
Cc: Correia, Richard <Richard.Correia@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>; Nakoski, John <John.Nakoski@nrc.gov>
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Cc: Bernhard, Rudolph <Rudolph.Bernhard@nrc.gov>; MacDonald, George <George.MacDonald@nrc.gov>
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