Krsek, Robert

From: Krsek, Robert
Sent: Wednesday, September 16, 2015 10:33 AM
To: Powell, Amy
Subject: Project Aim Briefing Transcript - Discussion of SPAR Models and Lowering Baseline

Transcript is already publicly available as ML#15254A306.

Page 42, Line 13 of the Transcript starts the question from the Chairman.

http://pbadupws.nrc.gov/docs/ML1525/ML15254A306.pdf

Thanks,

Robert G. Krsek
Technical Assistant for Reactors
Office of Commissioner Baran
U.S. Nuclear Regulatory Commission
301.415.1766

Krsek, Robert

From:	Krsek, Robert
Sent:	Monday, September 21, 2015 11:45 AM
To:	Baran, Jeff; Powell, Amy
Subject:	Letter to NEI on SPAR Models
Attachments:	Letter to NEI on use of SPAR Models_ML072490540.pdf
	Attachment is already publicly available as ML#072490540.

Amy was absolutely correct, I had not sent the Luis Reyes letter on SPAR Models to NEI.

The letter is attached.

Robert G. Krsek
Technical Assistant for Reactors
Office of Commissioner Baran
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301.415.1766

Martin, Jody

From: Powell, Amy
Sent: Tuesday, September 22, 2015 12:03 PM
To: Baran, Jeff
Cc: Martin, Jody; Krsek, Robert; Shane, Raeann
Subject: NEI list re: AIM
Attachments: NEI public comments on AIM.pdf

Attachment is already publicly available as ML#15279A048.

Per our chat, here is NEI's wishlist for Aim. Cc'ing Jody, Rob, Raeann as this will likely keep coming up.

AP

Briefing on Strategic Programmatic Overview of the New Reactors Business Line Questions

Order of Questions: KLS, WCO, JMB, SGB

NRC Staff Panel

Mark Satorius, Executive Director for Operations
Glenn Tracy, Director, NRO
Frank Akstulewicz, Director, Division of New Reactor Licensing, NRO
Michael Mayfield, Director, Division of Advanced Reactors and Rulemaking, NRO
Laura Dudes, Deputy Regional Administrator for Construction, Region II
Michael Cheok, Director, Division of Construction Inspection & Operational Programs, NRO

Non Responsive

- Glenn, the staff uses standardized plant risk analyses, or SPAR, models to verify licensees' probabilistic risk assessment results for current operating reactors. These models provide an independent regulatory assessment of licensee performance in the Reactor Oversight Process.

  Has NRO worked with the Office of Research to develop SPAR models for the AP1000, ESBWR, and other certified designs, which are required to have Level 1 and 2 PRAs? If so, will these models be ready when Vogtle and Summer are prepared to operate? What do you see as the value of having SPAR models for the new reactors being built?

- Non Responsive

- Non Responsive

Krsek, Robert

From:	Krsek, Robert
Sent:	Friday, September 11, 2015 3:02 PM
To:	Baran, Jeff; Powell, Amy
Subject:	SPAR Model Fact Sheet...
Attachments:	SPARModelDevelopmentProgram.pdf

Attached is a comprehensive SPAR model Fact Sheet that describes the background, objectives and approach of the SPAR models. Most importantly though, it is an independent, NRC developed and maintained risk tool that the NRC staff can use to independently assess and verify licensee or industry results.

If you would like additional detail on any particular topic discussed in the fact sheet, I can pull that.

Thanks,

Robert G. Krsek
Technical Assistant for Reactors
Office of Commissioner Baran
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301.415.1766

SPAR MODEL DEVELOPMENT PROGRAM

Background

For assessing public safety and developing regulations for nuclear reactors and materials, the NRC traditionally used a deterministic approach that asked "What can go wrong?" and "What are the consequences?" Now, the development of risk assessment methods and tools allows the NRC to also ask "How likely is it that something will go wrong?" These risk tools also allow the NRC to consider multiple hazards and combinations of equipment and human failures that go beyond what is traditionally considered. By making the regulatory process risk-informed (through the use of risk insights to focus on those items most important to protecting public health and safety), the NRC can focus its attention on those design and operational issues most important to safety.

In the reactor safety arena, risk-informed activities occur in five broad categories: (1) rulemaking, (2) licensing process, (3) Reactor Oversight Process (ROP), (4) regulatory guidance, and (5) development of risk analysis tools, methods, and data. Activities within these categories include revisions to technical requirements in the regulations; risk-informed technical specifications; a new framework for inspection, assessment, and enforcement actions; guidance on risk-informed in-service inspections; and improved standardized plant analysis risk models.

The Standardized Plant Analysis Risk (SPAR) models, Systems Analysis Programs for Hands-on Integrated Reliability Evaluation (SAPHIRE) software and the Risk Assessment Standardization Project (RASP) Handbook, developed by the NRC's Office of Nuclear Regulatory Research (RES), provide the staff with the Probabilistic Risk Assessment (PRA) tools to support these risk-informed activities.

Objective

SPAR MODEL APPLICATIONS

SPAR models and the SAPHIRE software are used to support the following activities:

INSPECTION PROGRAM (E.G., SIGNIFICANCE DETERMINATION PROCESS (SDP) PHASE 3)

Determining the risk significance of inspection findings or of events to decide the allocation and characterization of inspection resources, the initiation of an inspection team, or the need for further analysis or action by other agency organizations.

MANAGEMENT DIRECTIVE (MD) 8.3, "NRC INCIDENT INVESTIGATION PROGRAM"

Estimating the risk significance of events and conditions at operating plants so that the agency can analyze and evaluate the implications of plant operating experience in order to compare the operating experience with the results of the licensees' risk analysis, identify risk conditions that need additional regulatory attention, identify risk insignificant conditions that need less regulatory attention, and evaluate the impact of regulatory or licensee programs on risk.

ACCIDENT SEQUENCE PRECURSOR (ASP) PROGRAM

Screening and analyzing operating experience data in a systematic manner in order to identify those events or conditions which are precursors to severe accident sequences.

GENERIC SAFETY ISSUES

Providing the capability for resolution of generic safety issues, both for screening (or prioritization) and conducting more rigorous analysis to determine if licensees should be required to make a change to their plant or to assess if the agency should modify or eliminate an existing regulatory requirement.

LICENSE AMENDMENT REVIEWS

Enabling the staff to make risk-informed decisions on plant-specific changes to the licensing basis as proposed by licensees, and provide risk perspectives in support of the agency's reviews of licensees' submittals.

PERFORMANCE INDICATORS VERIFICATION (E.G., MITIGATING SYSTEM PERFORMANCE INDEX (MSPI) NUREG-1816)

Assisting in the identification of threshold values for risk-based performance indicators and in the development of an integrated performance indicator.

SPECIAL STUDIES (E.G., LOSS OF OFFSITE POWER AND STATION BLACKOUT, NUREG/CR-6890 VOLUMES 1 & 2)

Performing various studies in support of regulatory decisions as requested by the Commission, Nuclear Reactor Regulation and other NRC Offices.

Approach

The SPAR models and the SAPHIRE software are used by NRC staff in support of risk-informed activities related to the inspection program, incident investigation program, license amendment reviews, performance indicator verification, accident sequence precursor program, generic safety issues, and special studies. These tools also support and provide rigorous and peer reviewed evaluations of operating experience, thereby demonstrating the agency's ability to analyze operating experience independently of licensees' risk assessments and enhancing the technical credibility of the agency.

The SPAR models integrate systems analysis, accident scenarios, component failure likelihoods, and human reliability analysis into a coherent model that reflects the design and operation of the plant. The SPAR model gives risk analysts the capability to quantify the expected risk of a nuclear power plant in terms of core damage frequency and the change in that risk given an event or an anomalous condition or a change in the design of the plant. More importantly, the model provides the analyst with the ability to identify and understand the attributes that significantly contribute to the risk and insights on how to manage that risk.

Currently, 78 SPAR models representing the 104 operating commercial nuclear plants in the United States are used for analysis of the core damage risk (i.e., Level 1 analysis) from internal events at operating power. The Level 1 SPAR model includes core damage risk resulting from general transients (including anticipated transients without scram), transients induced by loss of a vital alternating current or direct current bus, transients induced by a loss of cooling (service) water, loss-of-coolant accidents, and loss of offsite power. The SPAR models use a standard set of event trees for each plant design class and standardized input data for initiating event frequencies, equipment performance, and human performance, although these input data may be modified to be more plant- and event-specific, when needed. The system fault trees contained in the SPAR models are generally not as detailed as those contained in licensees' PRA models.

In fiscal year 2010, the 78 SPAR models were revised and augmented to take advantage of the new features and capabilities of SAPHIRE Version 8. SAPHIRE Version 8 was made available to the staff in April 2010. This new version of the SAPHIRE software provides enhanced user interface tools, as well as improved modeling and analysis methods that support the development and use of the SPAR models. Model enhancements included improved modeling of common-cause failure events, handling of recovery rule linking, analysis documentation, and parameter data updates.

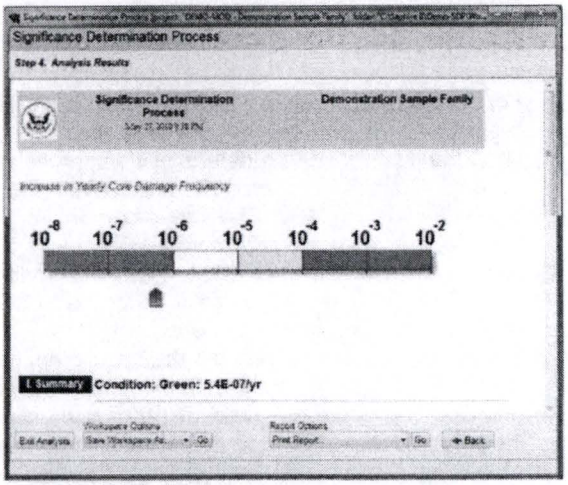

Figure 5.8 Example Significance Determination Process Analysis Results with SAPHIRE Version 8

To more accurately model plant operation and configuration and to identify the significant differences between the licensees' PRA and SPAR logic, detailed cut-set level reviews have been accomplished on all 78 models. In addition to the internal event at-power models, the staff has developed 15 external event models based on the licensee responses to Generic Letter 88-20, Supplement 4 "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities" (1991), 7 low power/shutdown models, and 3 extended Level 1 models supporting large early-release frequency (LERF) and Level 2 modeling. The external event models were recently used to identify and evaluate severe accident sequences for the consequential steam generator tube rupture project in support of the NRC's Steam Generator Action Plan.

One significant upcoming activity is the incorporation of internal fire scenarios from the National Fire Protection Association (NFPA) 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," pilot applications into the SPAR models. In addition, the staff continues to provide technical support for SPAR model users and risk-informed programs. The staff also completes approximately a dozen routine SPAR model updates annually.

The staff is also developing design-specific internal events SPAR models for new reactor designs. The AP1000 model was completed in February 2010. The model has been optimized for SAPHIRE Version 8 and has been transitioned to a routine maintenance status. A first draft of the Advanced Boiling-Water Reactor (ABWR) model has been provided to the Office of New

Reactors (NRO) for review. The staff also plans to initiate work on developing a design-specific internal events SPAR model for the US Advanced Pressurized Water Reactor (APWR). Because design standardization is a key aspect of the new plants, it should only be necessary to develop one SPAR model for each of the new designs.

A formal SPAR model quality assurance plan was implemented in September 2006. Limited scope validation and verification is accomplished by comparison to licensee PRA models (as available), and comparisons to NRC NUREGs and analyses. Limited scope peer reviews consist of internal quality assurance (QA) review by NRC contractors, NRC PRA staff, and Regional Senior Reactor Analysts (as available). The user feedback from staff, peer reviews from licensees, and insights gained from special studies such as identification of threshold values during Mitigating Systems Performance Index (MSPI) reviews and the Loss of Off Site Power and Station Blackout study result in improvements to the models on a continuing basis. In 2007, NRC entered into a cooperative effort with the Electric Power Research Institute (EPRI) to improve PRA quality and address several key technical issues common to both the SPAR models and industry models. This cooperative effort resulted in the joint publication of EPRI Report 1016741, "*Support System Initiating Events: Identification and Quantification Guideline,*" in 2008. This report documents current methods to identify and quantify support system initiating events used PRAs. In addition, the staff, with the cooperation of industry experts, performed a peer review of a representative boiling-water reactor SPAR model and pressurized-water reactor SPAR model in accordance with American National Standard, ASME RA-S-2002, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," and Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities." The staff has reviewed the peer review comments and has initiated projects to address these comments, where appropriate. The staff is also re-evaluating certain success criteria in the SPAR models using state-of-the-art thermal hydraulic modeling tools.

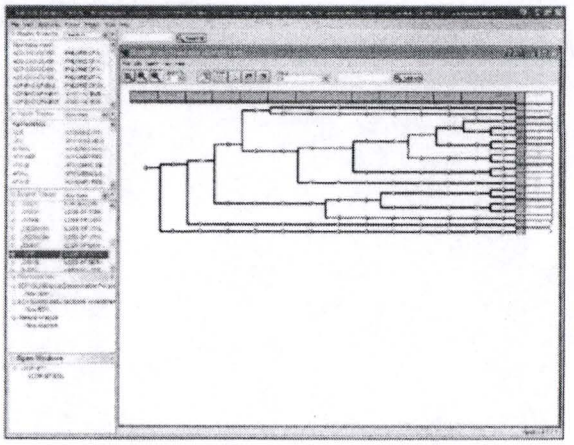

Figure 5.9 Example Loss of Offsite Power SPAR Model Event Tree Display with SAPHIRE Version 8

For More Information Contact:

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