Issued 03/16/01
CERTIFIED 04/06/01

April 6, 2001

MEMORANDUM TO: Maggalean W. Weston, Senior Staff Engineer
ACRS/ACNW

FROM: John D. Sieber, Chairman
Plant Operations Subcommittee

George E. Apostolakis, Chairman
Reliability and Probabilistic Risk Assessment Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES OF THE PLANT OPERATIONS AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT SUBCOMMITTEES MEETING HELD ON FEBRUARY 21, 2001, ROCKVILLE, MARYLAND

I hereby certify that, to the best of my knowledge and belief, the Minutes of the meeting on the South Texas Exemption Request issued April 6, 2001, are an accurate record of the proceedings for that meeting.

John D. Sieber 4/6/01
John D. Sieber, Chairman Date

From: Maggalean Weston
To: D.A. Powers; F. P. Ford; G.B. Wallis; G.E. Apostolakis; G.M. Leitch; J.D. Sieber; M.V. Bonaca; R. E. Uhrig; T.A. Kress; W.J. Shack
Date: 4/9/01 5:00PM
Subject: CERTIFIED COPY - Minutes of 2/21/01 Plant Operations Subcommittee Meeting on STP Exemption Request

The attached minutes have been certified.

CC: James Lyons; John Larkins

Issued 03/16/01
CERTIFIED 04/06/01

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
PLANT OPERATIONS AND PRA SUBCOMMITTEES
SOUTH TEXAS PROJECT EXEMPTION REQUEST
FEBRUARY 21, 2001
ROCKVILLE, MARYLAND

On February 21, 2001, the ACRS Plant Operations and PRA Subcommittees met to discuss the South Texas Project (STP) exemption request with representatives of the NRC staff and the industry. The purpose of this meeting was to discuss categorization and associated open items related to the STP request to exclude certain components from the scope of special treatment requirements in 10 CFR Parts 21, 50, and 100. The meeting was open to the public. Mrs. Maggalean W. Weston was the cognizant ACRS staff engineer and Designated Federal Official (DFO) for this meeting. There were no written comments from the public. The meeting was convened by the Subcommittee Chairman at 8:30 a.m. and adjourned at 12:11 p.m. that day.

ATTENDEES

ACRS Members/Staff

G. Apostolakis, Chairman, PRA Subcommittee
J. Sieber, Chairman, Plant Operations Subcommittee
M. Bonaca, Member
T. Kress, Member
D. Powers, Member
W. Shack, Member
R. Uhrig, Member
M. W. Weston, DFO

NRC Staff

Goutam Bacchi, NRR
Mike Cheok, NRR
Stephen Dinsmore, NRR
Gary Hukam, NRR
John Hannon, NRR
Ken Heck, NRR
John Nakoski, NRR
Stu Richards, NRR
Rich Barrett, NRR
Bill Dam, NRR
John Fair, NRR
Bob Gramm, NRR
Donald Harrison, NRR
Samuel Lee, NRR
Gareth Perry, NRR
Mark Rubin, NRR

Industry Representatives

Rick Grantom, STPNOC
Ralph Chackal, STPNOC
Russ Lovell, STPNOC
Dave Blanchard, Tenera
William Burehill, Exelon
Steve Frantz, Morgan Lewis & Bockius, LLP
Mike Knapik, McGraw-Hill
J. Russell Lovell, STPNOC
Jim Petro, Winston & Strawn
Glen Schinzel, STPNOC
Takashi Yamagushi, Kyusho EPCO
Glen Schinzel, STPNOC
Allen Moldenhauer, STPNOC
Tony Brooks, NEI
Biff Bradley, NEI
Nancy Chapman, SERCH/Bechtel
Bob Jaquith, Westinghouse
Stanley Levinson, Framatome, ANP
Allen C. Moldenhauer, STPNOC
Craig Seivers, ITSC
Doug True, ERIN

The slides and handouts used during the meeting are attached to the Office copy of the minutes. The two presentations to the subcommittees conducted by the South Texas Project (STP) attendees and by the NRC staff are summarized below.

OPENING COMMENTS

G. Apostolakis, Chairman, PRA Subcommittee and J. Sieber, Chairman, Plant Operations Subcomrnittee, convened the meeting. STP started the presentation. Prior to the presentation, Dr. Shack asked about the number of items still unresolved relating to the categorization process. At the time of the Subcommittee meeting there were three open items specific to categorization. They are 3.4, 3.5, and 3.6.

STP PRESENTATION ON CATEGORIZATION OF SSCs

Introduction

Mr. Grantom made some opening remarks and Mr. Schinzel introduced the STP participants: Rick Grantom, Expert Panel member; Allen Moldenhauer, Working Group PRA member; Russ Lovell, past Working Group chairman and member of the Expert Panel; Ralph Chackal, Working Group facilitator; and Glen Schinzel, Working Group sponsor for graded quality assurance. Mr. Schinzel explained the difference between a sponsor, a facilitator, and the chairman of a Working Group. A sponsor is the primary interface between the Working Group and the Expert Panel, the facilitator prepares the meeting information for the Working Group members, and the chairman is responsible for maintaining the meeting and other Working Group meeting activities. A sponsor is not a member of the Expert Panel or the Working Group.

Overview

Mr. Schinzel said that the STP categorization process includes both the PRA input and deterministic input. For each individual system, STP begins by reviewing the bases for the PRA model for that particular system. The model inputs and results are considered. In addition, for the model components, the categorization results from the PRA for those individual components are identified. Deterministically, the functions that are performed by the system are identified through the design basis document and also with input from STP system engineers. A risk significance for each of those functions is established and then vetted through the categorization process using the five critical questions that were developed and weighted for the purposes of categorization. After the significance of each function is identified, the function is mapped to the individual components and the significance of each individual component is determined.

After the PRA and the deterministic aspects are completed, a final categorization for the individual components is done by comparing the PRA categorization and the deterministic categorization and selecting the higher of the two. The final categorization is never less than the PRA categorization.

Critical attributes that make that specific function or component important are identified. The Working Group documents the bases for all of the information and decisions and presents a draft categorization to an Expert Panel. The Expert Panel reviews and critically assesses the product and then approves the process before its use. There is ongoing feedback into both the PRA and the deterministic aspects of the process for potential changes to the categorizations.

In summary, categorization controls consist of an integrated decision-making process made up of a Working group and an Expert Panel. The process is procedurally controlled. The procedure for the Working Group is separate from the procedure for the Expert Panel. The SSCs are categorized into one of four categories: high safety/risk significant (HSS); medium safety/risk significant (MSS); low safety/risk significant (LSS); and not risk significant (NRS).

PRA Categorization Approach

The PRA risk ranking is procedurally controlled. The full scope model quantification includes an at-power Level 1 and 2 model with external events and internal floods/fires. The PRA models about 1200 SSCs for Unit 1. The PRA categorization is based on Fussell-Veseley (FV) importance measures and risk achievement worth (RAW) as follows:

PRA Ranking	Criteria
High	RAW $\geq$ 100.0 or FV $\geq$ 0.01 or FV $\geq$ 0.005 and RAW$\geq$2.0
Medium - R*	FV $\geq$ 0.005 and 100.0 >RAW$\geq$10.0
Medium	FV $\geq$ 0.005 and RAW $\geq$ 2.0 or FV $\geq$ 0.005 and 10.0 > RAW $\geq$ 2.0
Low	FV $\geq$ 0.005 and RAW $\geq$ 2.0

*Additional review required. The full QA program should be applied to the critical attributes associated with this PRA ranking.

The STP uses the conservative common cause approach approved in the graded quality assurance (GQA) SER. This approach sums the importance measures based on FV/RAW for all causes of basic event failures. The final FV/RAW importance measures for the component include the total common cause contribution and the different failure modes. STP will continue to work with the industry and the staff to improve risk-ranking methods, and to develop a more realistic approach for including common cause failures in the risk ranking analysis.

PRA Sensitivity Studies

There are twenty-one sensitivity studies currently in use at STP. The final PRA risk is based on examples from the following sensitivity cases:

- Average Core Damage Frequency
- Effects of Scheduled Maintenance
- Removal of Operator Recovery
- Removal of Common Cause Failures
- 10 times Increased Failures for Low-Ranked Components
- Average Large Early Release Frequency
- Decreased Steam Generator Tube Rupture Contribution

Robustness of PRA Ranking

The PRA is procedurally updated on a periodic basis. It is a comprehensive model that has been extensively reviewed by the NRC and others in the industry. It follows the GQA SER, a conservative approach for summing importance measures.

Deterministic Function Categorization Approach

The Working Groups consistently use the following five critical questions at the system function level to guide the deterministic evaluation:

Critical Questions	Weighting Factors
1. Directly causes an initiating event?	5
2. Loss of function fails another risk significant system?	5
3. Mitigates accidents or transients?	4
4. Specifically called out in emergency operating procedures and/or emergency response procedures?	3
5. Significant for shutdown/mode change activities?	3

Positive responses to questions are weighted according to the impact and the frequency of occurrence. The results are summed and categorized in accordance with the following guidelines:

SCORE RANGE	CATEGORY
0-20	NRS
21-40	LSS
41-70	MSS
71-100	HSS

A high response to a question is factored into the categorization to prevent masking.

Deterministic Component Categorization Considerations

Redundancy and diversity are factored into the final component categorization. General notes are used to optimize documentation for ancillary and passive components. The final component categorization cannot be lower than the PRA ranking, but can be deterministically ranked higher. If the panel fails to reach consensus on final categorization, the categorization is referred to a more senior panel for resolution. Categorization recommendations are forwarded to the Expert Panel for approval.

Categorization Summary

In summary, Mr. Schinzel said that the categorization process balances PRA input and deterministic insights, resulting in a technically sound, well-documented product. The common cause approach is conservative and appropriate for use in this exemption request. The process clearly distinguishes SSCs that are important and SSCs that are not safety/risk important.

Selected Subcommittee Member Comments

- Dr. Bonaca: The deterministic process focuses only on the core damage issues or containment challenges, not the intermediate goals that are in the FSAR. You do not look at DNB.

  Mr. Schinzel: That's correct

- Dr. Apostolakis: What is the core damage frequency now for STP?

  Mr. Moldenhauer: It is approximately 1E-5, a little above that.

- Dr. Kress: If your core damage frequency were considerably higher than that, would you still use the same RAW values and FV values.

  Rick Grantom: That's kind of an issue, the RAWs and FVs are going to be relative. If you have ten to the minus 2 CDF, you still end up with numbers like this.

- Dr. Kress: If you have a component that has a low risk significance coming out of the PRA, based on these RAW and FV values, but you actually have 100 of those components in separate systems that fail, and if the failure of the components is by chance, which is sort of the way we deal with them in PRA, then shouldn't the FV and RAW values be multiplied by 100.

  Mr. Schinzel: The sensitivity studies take those ones that fall into the low category and have increased their failure rates by an order of magnitude in total, to see what the impact on CDF does, and of course, the impact increases CDF, but it is still within the guidelines of RG 1.174.

- Dr. Apostolakis: The methodology could be improved in several areas. This is not a routine application. The end result works for STP but the methodology would not produce the

same result for others. This is a precedent-setting application. There will be rulemaking in the near future that this could impact.

Mr. Grantom: I would agree with you that the risk-ranking methodologies can improve.

- Dr. Kress: The fact that STP came out with a consistency with the PRA in this deterministic process says that for this particular system, the right weighting values and the right ranges for the thresholds might have been chosen. I am willing to accept that it has been validated for your system by the consistency. However, the concern is that the next plant that comes in will probably (because a precedence has been set) want to use the same values, same thresholds, and same process. There is no firm basis for choosing these based in some way on the actual risk numbers.

  Mr. Grantom: There are criteria that go into determining how frequent a component's demand is and what the impact of the failure of that component is, and that is included in the number that would be assigned to that component or that function.

NRR PRESENTATION ON THE STPNOC RISK-INFORMED EXEMPTION REQUESTS AND COMPONENT RISK CATEGORIZATION PROCESS

Introduction

Mr. John Nakoski, Project Manager, NRR, introduced the NRC participants: Sam Lee, Lead Reviewer for the South Texas exemption categorization process; Steven Dinsmore, Lead Reviewer for the GQA submittal; and Mike Cheok, Lead Reviewer for the Option 2 categorization process.

Overview

The staff's presentation paralleled that given by STP. In the interest of time, the presentation was adjusted to focus on points of interest and issues which remain unresolved.

Points of Interest

Mr. Lee said a powerful argument for supporting the categorization is that if you categorize these LSS components and multiply them by a factor of 10, the results of the postulated increase in unreliability are very comforting. Another point regarding the expert judgment process is that the scoring scheme has evolved through several versions and each numerical score is now meaningful. By and large, what the staff sees across this entire process is a logically sound process that produces results the staff is comfortable with. South Texas is a unique plant, unique in the quality of its PRA, in the redundancy of its systems, and the size of its containment. The sensitivity study worked in this case.

STP Unresolved Issues

- 3.4 - STPNOC must clarify how it addresses the significance of SSCs that function to protect the integrity of the containment for consequence mitigation in its categorization

process. This item is open pending the licensee's demonstration that the role of containment as a barrier (defense-in-depth) is not significantly degraded when components that support the prevention of the late containment failure are moved to the LSS category.

- 3.5 - STPNOC must provide sufficient risk-informed justification for application of the categorization process to passive functions (i.e., structural integrity, pressure boundary) of safety-related SSCs.

- 3.6 - (nearly resolved) STPNOC must finalize its process for the development and implementation of general notes in the categorization of SSCs and submit the process to the NRC for review. This item involves placement of the documentation of the general notes and is open pending the licensee's submittal of appropriate descriptions of general notes in the FSAR.

Selected Subcommittee Member Comments

- Dr. Powers: The weighting factors are remarkable. We have functions used to mitigate an accident transient and we give it a five, but if it initiates an accident we only give it a three. Similarly, if a function causes an impact on a safety-significant system, it gets a four, but if it initiates an accident it still only gets a three.

  Mr. Barrett: I think it fair to say we didn't focus on the weighting factors. I think this is a sufficiently qualitative process that they could have come in with weighting factors that were different. I think probably if we had seen weighting factors that were off by orders of magnitude, we might have focused on it a little more, but since this is essentially a qualitative process, I think we kind of glossed over the differences between a five and a three.

- Dr. Bonaca: STP has a list of questions which have to do with defense in depth. It seems like containment slipped through.

  Mr. Lee: We have an open item that addresses this very question about containment.

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
PLANT OPERATIONS AND PRA SUBCOMMITTEES
SOUTH TEXAS PROJECT EXEMPTION REQUEST
FEBRUARY 21, 2001
ROCKVILLE, MARYLAND

-PROPOSED AGENDA-

	SUBJECT	PRESENTER	TIME
I.	Introductory Remarks Subcommittee Chair	G. Apostolakis	8:30-8:35 a.m.
II.	Industry Presentation	Rick Grantom, STPNOC Ralph Chackal, STPNOC Russ Lovell, STPNOC Allen Moldenhauer, STPNOC Glen Schinzel, STPNOC	8:35-10:00 a.m.
		******BREAK******	10:00-10:15 a.m.
III.	NRC Staff Presentation	Rich Barrett, NRR Stu Richards, NRR John Nakoski, NRR Samuel Lee, NRR	10:15-11:15 a.m.
IV.	General Discussion and Adjournment		11:15-12:30 p.m.

In Attendance:
Steve Frantz, STP Counsel

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NOTE: Number of copies of the presentation materials to be provided to the ACRS is 35.

ACRS CONTACT: Mrs. Maggalean W. Weston, mww@nrc.gov or (301) 415-3151.

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

PLANT OPERATIONS AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT

FEBRUARY 21, 2001
Today's Date

ATTENDEES - PLEASE SIGN BELOW

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NAME	AFFILIATION
CRAIG SELLERS	ITSC
Rick Grantom	STPNOC
Nancy Chapman	SERCH/Bechtel
Steve Frantz	Morgan Lewis & Bockius LLP
RALPH CHACKAL	STPNOC
Jim PETRO	WINSTON & STRAWN
Allen C Moldenhauer	STPNOC
J. Russell Lovell	STPNOC
STANLEY LEWINSON	FRAMATOME ANP
MIKE KNAPIK	McGRAW-HILL
Takashi YAMAGUCHI	Kyushu EPCO
Osamu Shisaya	Kyushu EPCO
Biff Bradley	NEI
Doug True	ERIN
Tony Brooks	NEI
William Burchill	Exelon
BOB JAQUITH	WESTINGHOUSE / CEOG
Dave Blanchard	Tenera
Glen Schinzel	STPNOC

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

PLANT OPERATIONS AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT SUBCOMMITTEES MEETING

SOUTH TEXAS PROJECT EXEMPTION REQUEST

February 21, 2001
Today's Date

NRC STAFF SIGN IN FOR ACRS MEETING

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NAME	BADGE #	NRC ORGANIZATION
John Fair	A-7270	NRR
Bill DAM	8288	NRC
John A. Nakoski	B-8091	NRR/DLPM/PDIV-1
Donald G Harrison	B-8744	NRR/DSSA/SPSB
Bob Gramm	B 8582	NRR/DLPM /PDIV-1
Hukam Garg	B6143	NRR/DE/EEIB
Mark Rubin	B7052	NRR / CPSB
RICH BARRETT	A730	NRR / SPSB
GARETH PARRY	B 8060	NRR / DSSA
Ken Heck	B8128	NRC
STU RICHARDS	B8535	NRR/PD4
GOUTAM BAGCHI	B 8626	NRR/DE
Stephen Dinsmore	B7898	NRC/SPSB
Samuel Lee	B7501	NRC/ SPSB
John Hannon	A6149	NRR/SPLB
Mike Cheok	B7917	NRR/SPSB

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

PLANT OPERATIONS AND RELIABILITY AND PROBABILISTIC RISK ASSESSMENT SUBCOMMITTEES MEETING

SOUTH TEXAS PROJECT EXEMPTION REQUEST

February 21, 2001
Today's Date

NRC STAFF SIGN IN FOR ACRS MEETING

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NAME	BADGE #	NRC ORGANIZATION

STAFF PRESENTATION

TO

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

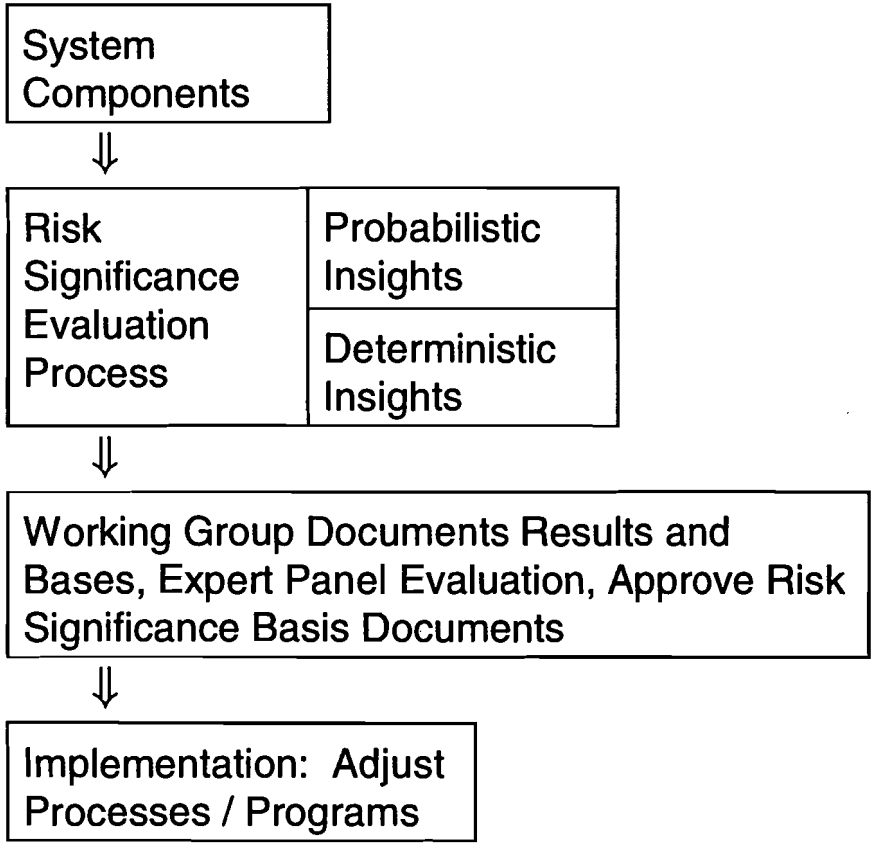
ON

STPNOC RISK-INFORMED EXEMPTION REQUESTS COMPONENT RISK CATEGORIZATION PROCESS

FEBRUARY 21, 2001

Presenters: Samuel Lee
Stephen Dinsmore
Michael Cheok

South Texas Project Multiple Exemption Request Component Risk Significance Determination Process - Simplified Process Flowchart



Risk Categorization Process Based on Probabilistic Insights (PRA)

Step 1: Use of PRA **Importance Measures**

❶ "Importance" of each component is determined using two PRA importance measures: (1) Risk Achievement Worth (RAW) and (2) Fussel-Vesely (FV) importance measure.

❷ **RAW**: provides a measure of how much the sequence frequency would increase if it were assumed that a component would fail. The measure is a **ratio of core damage frequency (CDF) with a component assumed as failed to the nominal plant CDF.**

$$\text{RAW} = \frac{\text{New CDF (with an assumed failure of the component in question)}}{\text{Nominal Plant CDF}}$$

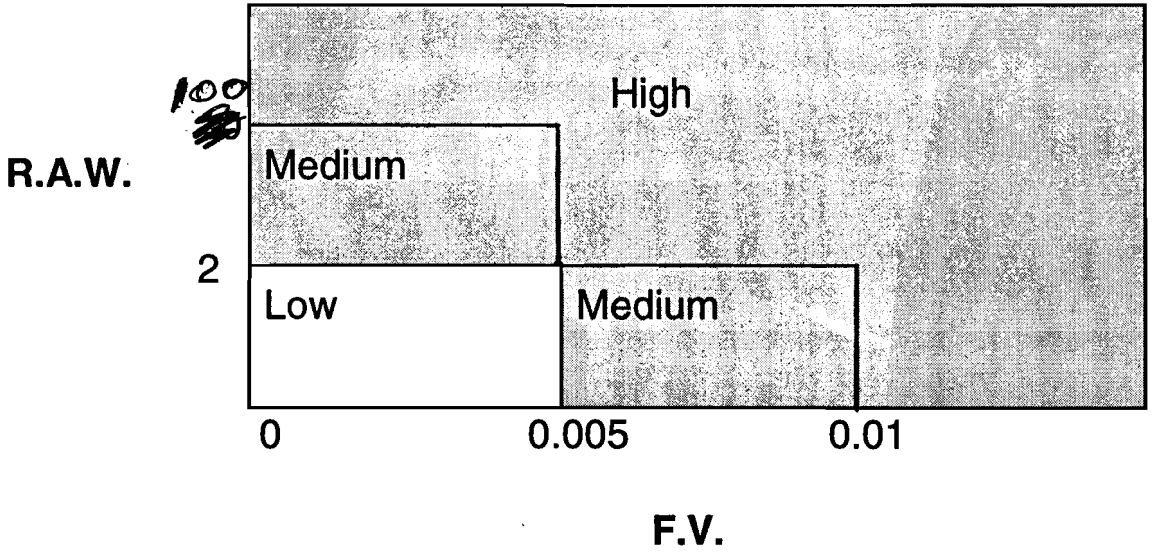
❸ **FV**: provides a measure of how much of the total sequence frequency is due to minimal cutsets that contain the specific component for which the FV importance measure is to be calculated. The measure is a **ratio of sum of all frequencies (for cutsets) that contain the component in question to the nominal plant CDF.**

$$\text{FV} = \frac{\text{Sum of sequence (cutset) frequencies which contain the component in question)}}{\text{Nominal Plant CDF}}$$

❹ Final component importance measure consists of the sum of the independent component importance measure and the common cause failure importance measures. For example,

RAW (for a pump that has 2 trains) = RAW (pump A) + RAW (common cause failure of A and B)

Table 1. Risk Ranking of Components Modeled in PRA



Step 2: Evaluation of **Impact on Overall Plant Risk**

Since the impact of the proposed reduction in special treatment requirements on components' failure rates is expected to be small but uncertain at this time, the licensee performed a sensitivity study to determine the **impact on the overall plant CDF and LERF from postulating a factor of 10 increase in the failure rates of all LSS components** modeled in the STP PRA.

Results: About 2.5 X 10-7/Year increase, or **2.7% increase, in CDF**.
About 2 X 10-9/Year increase, or **1.2% increase, in LERF**.

Conclusion: The postulated increase in failure rates of all LSS components resulted in a **small increase in the overall plant risk.**

Risk Categorization Process Based on Deterministic Insights

Table 2. Determining the Significance of a Function of a Component

Critical Question	**Weighting Factor**
1. Is the function used to mitigate accidents or transients?	5
2. Is the function specifically called out in the emergency operating procedures (EOPs) or Emergency Response Procedures (ERPs) (which provides beyond design basis configuration)?	5
3. Does the loss of the function directly fail another risk-significant system?	4
4. Is the loss of the function safety significant for shutdown or mode changes?	3
5. Does the loss of the function, in and of itself, directly cause an initiating event?	3

Disposable
Are Generic
Premature problem

Table 3. Scoring for Each Critical Question

Score for Each Critical Question	Score Explanation / Definition
0	Negative response - "No".
1	Positive response having an insignificant impact and/or occurring very rarely. Occurring Very Rarely – demanded once per lifetime. Insignificant Impact – a system function has been challenged, but there is no core damage or negative impact on the health and safety of the public.
2	Positive response having a minor impact and/or occurring infrequently. Occurring Infrequently – demanded < once per cycle. Minor Impact – a system function has been moderately degraded, but there is no core damage or negative impact on the health and safety of the public.
3	Positive response having a low impact and/or occurring occasionally. Occurring Occasionally – demanded 1-2 times per cycle. Low Impact – a system function is significantly degraded, with very low likelihood of core damage, and no negative impact on the health and safety of the public is expected.
4	Positive response having a medium impact and/or occurring regularly. Occurring Regularly – demanded > 5 times per year. Medium Impact – a system function is lost which may, but is not likely to, result in core damage and/or is unlikely to have a negative impact on the health and safety of the public.
5	Positive response having a high impact and/or occurring frequently. Occurring Frequently – continuously or routinely demanded. High Impact – a system function is lost which likely could result in core damage and/or may have a negative impact on the health and safety of the public.

The scores for all critical questions, after being multiplied by weighting factors for each question, are then summed. The **maximum possible score is 100.** Based on this final score, the functions are categorized as follows:

Table 4. Categorization Based on Final Scoring Range

Final Score Range	**Risk Category**
0 – 20	Non-Risk Significant (NRS)
21 – 40	Low Safety Significant (LSS)
41 – 70	Medium Safety Significant (MSS)
71 – 100	High Safety Significant (HSS)

Exceptions: (1) A weighted score of 25 on any one question would result in HSS category.

(2) A weighted score of 15-20 on any one question would result in MSS category.

Example 1: Chemical Volume Control System (CVCS) Regeneration Heat Exchanger - **PRA Ranked Medium.**

System Functions	Results of Deterministic Questions	Deterministic Ranking
Transfer reactor coolant from volume control tank to reactor coolant system	0/0/2/3/2	Low safety significant (LSS) (final score = 23)
Increase temperature of charging coolant	0/0/0/1/0	Non-risk significant (NRS) (final score = 3)
Provide pressure boundary retention	2/0/2/0/3	Low safety significant (LSS) (final score = 27)
Part of flow path for emergency boration.	**2/0/2/3/2** 2(5)+0(5)+2(4)+3(3)+2(3) = 33	**Low safety significant (LSS) (final score = 33)**

Final component ranking is Medium -- Although the score of 33 (highest of all functions) belongs in the LSS category, the component ranking is medium because PRA ranking determined the ranking to be medium.

Example 2: CVCS Reactor Coolant Filter 1A - **PRA Rank: NOT Modeled**

System Functions	Results of Deterministic Questions	Deterministic Ranking
Transfer reactor coolant from volume control tank to reactor coolant system	0/0/1/2/2	Non-Risk Significant (NRS) (final score = 16)
Increase temperature of charging coolant	0/0/0/0/2	NRS (final score = 6)
Provide pressure boundary retention	2/0/2/0/2	Low Safety Significant (LSS) (final score = 24)
Filter collects demin resin fines and particulates greater than 25 microns. Redundant filter available	2/0/2/2/2	LSS (final score = **30**)

Final component ranking: LSS, 2/0/2/2/2 (**final score: 30**)

Component Risk Significance Breakdown

Table A. Total Component Risk Significance Breakdown According to Safety Class

Total Evaluated Component Population: 25 systems, 37,535 components							
Safety Related: 16,303 (43% of total)				Non-Safety Related: 21,232 (57% of total)			
NRS **7,725** **(48%)**	**LSS** **4,776** **(29%)**	MSS 2,350 (14%)	HSS 1,452 (9%)	NRS 19,376 (91%)	LSS 1,484 (7%)	MSS 352 (2%)	HSS 20 (<1%)

About 77% of the safety-related components are candidates for requested exemptions.

Table B. Total Component Risk Significance Breakdown

Total Evaluated Component Population: 25 systems, 37,535 components			
NRS 27,101 (73% of total)	LSS 6,260 (16%)	MSS 2,702 (7%)	HSS 1,472 (4%)

OPEN/RESOLVED ITEMS

Open/Resolved item 3.1: The appropriate equation for combining the random and common cause failure modes into a single importance value needs to be addressed by STPNOC. The licensee decided to use a methodology previously accepted by the staff.

Open/Resolved item 3.2: STPNOC is required to provide the NRC with clarification on the FV criteria used in the categorization process for determining HSS SSCs. Typographical errors were corrected.

Open/Resolved item 3.3: STPNOC needs to incorporate the qualification criteria for members of the IDP provided in the July 19, 2000, draft review guidelines into its categorization process and a description of the qualification criteria into the proposed FSAR section. The licensee agreed to the proposed actions.

Open item 3.4: STPNOC needs to clarify how it addresses the significance of SSCs that function to protect the integrity of the containment for consequence mitigation in its categorization process. The resolution of this item is pending licensee's demonstration that the role of containment as a barrier (defense-in-depth) is not significantly degraded when components that support the prevention of late containment failure are moved to LSS category.

Open item 3.5: STPNOC needs to provide sufficient risk-informed justification for application of the categorization process to passive functions (i.e., structural integrity, pressure boundary) of safety-related SSCs. For example, the staff has determined that the categorization process may not be sufficiently robust to support the requested exemption from ASME Section XI Inservice Inspection requirements. ASME Class 1 and 2 piping categorization is resolved; however, the Class 3 categorization is under further review.

Open/Nearly Resolved item 3.6: STPNOC needs to finalize its process for the development and implementation of general notes in the categorization of SSCs and provide it to the NRC for review. The licensee provided a complete list of general notes and identified those that the staff agreed with. The resolution of this item pertains to the documentation placement of the general notes and is pending licensee's submittal of appropriate description of general notes in the FSAR.

Categorization of SSCs as Performed by South Texas Project

Presentation to the Advisory Committee on Reactor Safeguards

February 2, 2001

STP Attendees

- Russ Lovell - Past Working Group Chairman
- Rick Granton - Expert Panel Member
- Allen Moldenhauer - Working Group PRA Member
- Glen Schinzel - Working Group Sponsor
- Ralph Chackal - Working Group Facilitator
- Steve Frantz - STP Counsel

Categorization Approach at STP

- Categorization Process consists of the following:
  - PRA
    - Review bases for model inputs and results
    - For modeled components, state PRA risk
  - Deterministic
    - Identify functions performed by system
    - Establish deterministic risk significance of each function
    - Identify functions supported by each component
    - Establish deterministic risk significance of each component

Categorization Approach at STP (cont.)

- Designate overall categorization, based on higher of PRA and deterministic risk
- Identify critical attributes for appropriate risk significant SSCs
- Results are presented to an Expert Panel for review and approval prior to implementation of results

Categorization Flowchart

PSA RISK RANKING

STATION & INDUSTRY PERFORMANCE

EXPERT PANEL

DOCUMENTED EXPERT PANEL DECISIONS

GQA WORKING GROUP

Documented recommendations & rationale to Expert Panel

Categorization Controls

- Integrated Decision-Making process made up of a Working Group and Expert Panel
  - experienced, qualified personnel
  - diverse membership with consensus decision-making
- Process is procedurally controlled
- SSCs categorized into one of four categories:
  - HSS - high safety/risk significant
  - MSS - medium safety/risk significant
  - [illegible]
  - [illegible]

PRA Categorization Approach

- PRA risk ranking is procedurally controlled
- Full scope model quantification includes an at-power Level 1 and 2 model with external events and internal floods/fires
- PRA models about 1200 SSCs for Unit 1
- PRA model is periodically updated to reflect changes in SSC performance and/or Station design/operation
- PRA categorization based on FV and RAW value criteria as shown:

PRA Categorization

Risk Ranking	Criteria
High	RAW ≥ 100.0 or FV ≥ 0.01 or FV ≥ 0.005 and RAW ≥ 2.0
Medium -R*	FV < 0.005 and 100.0 > RAW ≥ 10.0
Medium	FV ≥ 0.005 and RAW < 2.0 or FV < 0.005 and 10.0 > RAW ≥ 2.0
Low	FV < 0.005 and RAW < 2.0

*Medium-Additional Review Required Risk Significance Determination and Assessment Process (RISAP) ranking.

PRA Categorization

- Approach to Common Cause
  - STP will use the conservative common cause approach approved in the GQA SER
  - This approach sums the FV/RAW importance measures for all causes of basic event failures
  - The final component FV/RAW importance includes the total common cause contribution and the different failure modes
  - We will continue to work with the industry and the staff to improve risk ranking methods, and to develop a more realistic approach for evaluating common cause [illegible] the [illegible]

PRA Sensitivity Studies

- 21 sensitivity studies are currently in use
- Final PRA risk is based on the following example sensitivity cases:
  - Average Core Damage Frequency
  - Effects of Scheduled Maintenance
  - Removal of Operator Recovery
  - Removal of Common Cause Failures
  - 10x Increased Failures for Low Ranked Components
  - Average Large Early Release Frequency
  - [illegible]

Robustness of PRA Ranking

- PRA is procedurally updated on a periodic basis
- PRA is a comprehensive model that has been extensively reviewed by the NRC and others in the industry
- It is recognized that the GQA SER approach of summing importance measures is conservative

Deterministic Function Categorization Approach

- Working Group consistently uses five critical questions at the system function level to guide the deterministic evaluation:
  - Directly Causes an Initiating Event?
  - Loss of Function Fails Another Risk Significant System?
  - Mitigates Accidents or Transients?
  - Specifically Called Out in Emergency Operating Procedures and/or Emergency Response Procedures?
  - Specifically Credited in Design Analyses?

Deterministic Function Categorization Approach

- Questions are individually weighted based on the importance to risk insights
- Positive responses to questions have a grading scale applied based on impact and frequency of occurrence
- Results are summed and categorized per the following guideline table:

Score Range	Category
0-20	NRS
21-40	LSS
41-70	MSS
71-[illegible]	HSS

- [illegible]

Deterministic Component Categorization Considerations

- Redundancy and diversity are factored into the final component categorization
- General Notes are used to optimize documentation for ancillary and passive components
- Final component categorization cannot be lower than the PRA rank, but can be deterministically ranked higher
- Failure to reach consensus on final categorization is forwarded to more senior panel for resolution
- Categorization recommendations are forwarded to the [illegible]

Categorization Feedback

- Periodic feedback is provided to ensure categorization still proper. Consideration includes:
  - system engineer feedback
  - design changes
  - operating/industry experience
  - corrective action program (internal operating experience)
  - updated PRA model insights (revised failure rates, unavailabilities, procedures, etc)
- Categorization changes must be approved by Expert Panel [illegible]

Categorization Open Items

- Containment Integrity
  - STP has a robust large, dry containment
  - LERF is a surrogate for latent fatality risk
  - Level 3 risk studies show that dominant contributor is the large early release
- Pressure Boundary Categorization
  - STP will use GQA Risk Ranking supplemented by Risk-Informed ISI Ranking for Class 1,2 piping
  - STP proposes to use GQA only for Class 3 piping
  - [illegible] NRC [illegible]

Categorization Summary

- Categorization process properly balances PRA input and deterministic insights resulting in a technically sound, well-documented product
- Common cause approach is conservative and appropriate for use in the intended Exemption Request
- Categorization process clearly delineates both those SSCs that are truly important and those that are not important

Categorization Summary

- PRA and deterministic categorization processes produce comparable results
- Categorization process is a robust approach and supportive of requested risk-informed application
- Feedback loop ensures that categorizations are periodically reviewed and updated
- STP will continue to work with NRC and industry to enhance categorization methods and will [illegible] under the proposed FSAR Section [illegible] process