

August 30, 2002

MEMORANDUM TO: NRR Executive Team
NRC Deputy Regional Administrators

FROM: Gary M. Holahan, Director/**RA**
Division of Systems Safety and Analysis

SUBJECT: RESULTS OF INTERNAL FOCUS GROUP DISCUSSIONS AND
INTERVIEWS REGARDING THE USE OF RISK-INFORMED
REGULATORY APPROACHES IN THE REACTOR PROGRAM

On April 2, 2002, at a joint meeting of the Executive Team (ET) and Leadership Team (LT), staff and their contractors presented results from the first phase of the Risk-Informed Environment (RIE) initiative. These results are documented in the attached report, prepared by our contractor, WPI, Inc. As discussed at the meeting, we are providing you with a copy of the report which has been updated to address suggestions made during the April 2, 2002, meeting. In addition, please find attached two additional summary reports that were requested at the meeting. These reports provide summaries and analysis of the results of focus groups and interviews that specifically relate to the reactor oversight process and the South Texas Project exemptions for special treatment of systems, structures, and components.

As discussed at the meeting, the RIE initiative is a 3-year program initiated by the LT in FY2001 with the objective of creating an environment in which risk-informed methods are integrated into staff activities, and staff plans and actions are naturally based on the principles of risk-informed regulation. Such an environment will help focus staff activities and resources of the NRC reactor program on those items most important to public health and safety. The term "environment" is used to reflect a collection of entities important to the functioning of the reactor program, including the policy direction set by the Commission and agency senior management, the work processes and procedures used to achieve the goals of the reactor program, the attitudes and perceptions of staff members regarding the use of risk information in the regulatory process, the means for communicating and learning about new regulatory approaches and the tools, and other resources needed to implement a regulatory approach.

The staff's plan for this program consists of four phases (see Attachment 4): (1) evaluate the current environment; (2) design an improved risk-informed environment; (3) implement changes to achieve the target environment; and (4) assess effectiveness of environmental changes. Based on the results from Phase 1 of the initiative, the staff's detailed action plan for the initiative is currently being revised and will be transmitted to you for information at a later date.

The attached report summarizes the results of Phase 1. The assessment team used focus groups and interviews to assess the current environment.

CONTACT: Mark Caruso, DSSA/SPSB
415-1310 (MAC)

These techniques allowed the team to gather information from a relatively large and diverse group of employees in the reactor program in a structured manner. The evaluation included individual interviews and focus group meetings conducted both at headquarters and with all four regions, and reached nearly 100 NRC employees nationwide. All participants were volunteers, and represented all levels within the reactor program - managers, supervisors, engineers, Probabilistic Risk Assessment (PRA) branch staff, inspectors, etc., and included PRA practitioners as well as non-PRA practitioners providing a broad array of perspectives and experience. The assessment team sought to identify barriers to implementing risk-informed approaches as well as catalysts for achieving successful risk-informed processes. This was done by exploring the views and perceptions of staff members regarding a number of past experiences in utilizing PRA techniques in regulatory matters and developing and implementing risk-informed regulatory processes, including the reactor oversight process, risk-informed technical specifications, maintenance rule implementation, and the South Texas exemptions for special treatment of systems, structures, and components.

As discussed at the April 2, 2002, meeting, the staff and its contractors have evaluated the information collected in the focus groups and interviews and identified the following key recommendations in creating an improved environment for risk-informed regulation:

- create a shared vision of “risk-informed” and “integrated decisionmaking”;
- integrate PRA roles and responsibilities more deeply into the organization;
- improve the knowledge and experience levels within the office;
- improve communication channels across the staff and between staff and management; and
- correct misconceptions about PRA technology.

Over the next several months the staff intends to identify and evaluate specific approaches to implementing these recommendations which in general relate to one or more of the broad areas of communication and information, staff training and process improvement within NRR and then bring appropriate recommendations to the ET.

Attachments:

1. Chart showing staff plan
2. Report on Interviews and Focus Group Discussions on Risk-Informed Activities in the NRC Reactor Program
3. Summary of Feedback from Regional Focus Groups on the ROP
4. Summary of Feedback from Focus Group on South Texas Exemption Review

cc:

NRR Division Directors
RES Division Directors
Regional Division Directors

These techniques allowed the team to gather information from a relatively large and diverse group of employees in the reactor program in a structured manner. The evaluation included individual interviews and focus group meetings conducted both at headquarters and with all four regions, and reached nearly 100 NRC employees nationwide. All participants were volunteers, and represented all levels within the reactor program - managers, supervisors, engineers, Probabilistic Risk Assessment (PRA) branch staff, inspectors, etc., and included PRA practitioners as well as non-PRA practitioners providing a broad array of perspectives and experience. The assessment team sought to identify barriers to implementing risk-informed approaches as well as catalysts for achieving successful risk-informed processes. This was done by exploring the views and perceptions of staff members regarding a number of past experiences in utilizing PRA techniques in regulatory matters and developing and implementing risk-informed regulatory processes, including the reactor oversight process, risk-informed technical specifications, maintenance rule implementation, and the South Texas exemptions for special treatment of systems, structures, and components.

As discussed at the April 2, 2002, meeting, the staff and its contractors have evaluated the information collected in the focus groups and interviews and identified the following key recommendations in creating an improved environment for risk-informed regulation:

- create a shared vision of “risk-informed” and “integrated decisionmaking”;
- integrate PRA roles and responsibilities more deeply into the organization;
- improve the knowledge and experience levels within the office;
- improve communication channels across the staff and between staff and management; and
- correct misconceptions about PRA technology.

Over the next several months the staff intends to identify and evaluate specific approaches to implementing these recommendations which in general relate to one or more of the broad areas of communication and information, staff training and process improvement within NRR and then bring appropriate recommendations to the ET.

Attachments:

1. Chart showing staff plan
2. Report on Interviews and Focus Group Discussions on Risk-Informed Activities in the NRC Reactor Program
3. Summary of Feedback from Regional Focus Groups on the ROP
4. Summary of Feedback from Focus Group on South Texas Exemption Review

cc: NRR Division Directors RES Division Directors Regional Division Directors

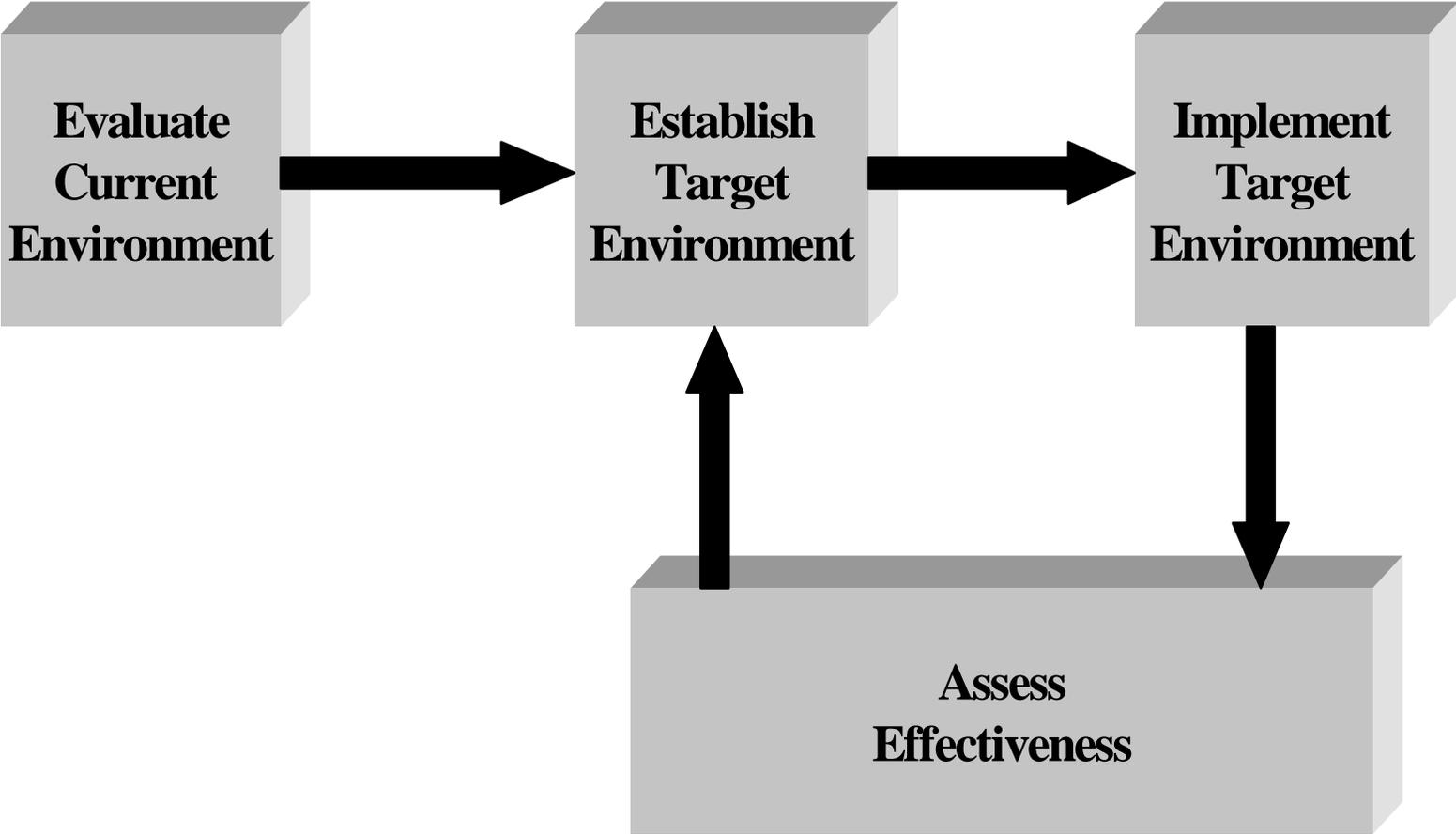
DISTRIBUTION: SPSB r/f MReinhart MJohnson MCaruso

G:\SPSB\Caruso\RIE action items2.wpd Accession#ML022460161 NRR-096

OFFICE	*SPSB	*SC:SPSB	*BC:SPSB	D:DSSA
NAME	MCaruso:nyc	Mreinhart/Signed by MJohnson for	MJohnson	GHolahan/SBlack
DATE	07/09/02	07/15/02	07/15/02	08/30/02

OFFICIAL RECORD COPY

**Risk-Informed Environment Project
Major Phases
Figure 1**



Report on Interviews and Focus Group Discussions on Risk-Informed Activities in the NRC Reactor Program

FINAL DRAFT

Prepared by WPI
Subcontractor to ISL, Inc.

WPI
12850 Middlebrook Road, Suite 250
Germantown, MD 20874
301.528.1960

Prepared for
Nuclear Regulatory Commission
Under Contract No. NRC-03-00-003

January 2002 - revised April 2002

Table of Contents

Executive Summary.....	3
Assessment Team Members.....	7
1 Introduction and Background.....	8
2 Methodology.....	9
3 Results and Analysis.....	12
4 Key Issues Identified by Participants.....	31
5 Challenges for Consideration in Implementing a Risk-Informed Environment.....	33

Appendices

Appendix A - Sample Questions from Interviews and Focus Groups

Appendix B - Sample Answers to Questions

Executive Summary

Background

The Office of Nuclear Reactor Regulation (NRR) has initiated a three-year program with the objective of creating an environment in which risk-informed methods are integrated into staff activities, and staff plans and actions are naturally based on the principles of risk-informed regulation. This project addresses one of NRR's Operating Plan goals and was conceived by the NRR Leadership Team. The term "environment" is used to reflect a collection of entities important to the functioning of the reactor program, including the policy direction set by the Commission and agency senior management, the work processes and procedures used to achieve the goals of the reactor program, the attitudes and perceptions of staff members regarding the use of risk information in the regulatory process, the means for communicating and learning about new regulatory approaches and the tools and other resources needed to implement a regulatory approach. The staff's plan for this program consists of four phases: (1) evaluate the current environment; (2) design an improved risk-informed environment; (3) implement changes to achieve the target environment; and (4) assess effectiveness of environmental changes. As this plan suggests, the basic strategy for the program is to first understand the current environment, and then, address the weaknesses and build on the strengths.

This report summarizes the results of Phase 1. The assessment team used focus groups and interviews to evaluate the current environment. These techniques allowed the team to gather information from a relatively large and diverse group of reactor program employees in a controlled manner. The assessment team sought to identify barriers to implementing risk-informed approaches as well as catalysts for achieving successful risk-informed processes. This was done by exploring the views and perceptions of staff members regarding their past experiences in utilizing PRA techniques in regulatory matters and developing and implementing risk-informed regulatory processes. As will be evident from the results of the focus groups and interviews, this approach has been effective. It identified important issues pertaining to specific risk-informed work activities and processes as well as a number of common themes agreed upon by diverse subgroups of employees.

A total of 98 NRR and regional staff and managers provided input through focus groups or individual interviews; participants' names and responses were kept confidential. In all cases, discussions were open and honest and responses reflected a strong commitment and high level of energy regarding risk-informed approaches within the reactor program. Participants expressed strong beliefs and raised a broad range of topics, from general concerns and frustrations to specific technical issues. In this report, we use the terms participants and respondents interchangeably to refer to staff who participated in interviews and focus groups. Throughout the report, direct quotes from respondents are included in italics.

Key Findings

In general, this evaluation found that staff are demonstrating increasing acceptance of a risk-informed approach. There are pockets of disagreement, but the majority of respondents felt that there are significant contributions PRA technology can make to regulatory practices in

the reactor program. Debate within NRR appears to have moved beyond whether risk insights should be integrated into NRR activities, to discussion of how and when to implement risk-informed approaches. Respondents expressed general consensus about the issues the reactor program faces in the use of PRA technology and risk insights, but there is not necessarily agreement about how to address them. During both the focus groups and the interviews, managers and staff, risk analysts and non-risk analysts, were remarkably consistent in the identification of barriers to a risk-informed environment. What is apparently lacking, however, is the knowledge that these same issues have been identified by different levels of management and across different areas of expertise. Respondents also identified various ideas, actions, and ongoing activities that could address these issues. However, these do not appear to be coordinated with one another nor are they well known throughout the organization. The following issues were identified repeatedly by participants:

- Overall, respondents, particularly those in the regions, indicated there is general acceptance that PRA and risk insights have a significant and potentially positive role to play in the reactor program. However, many staff believe that burden reduction is the driving force behind the use of PRA.
- While respondents believed that increasing the use of PRA within the reactor program is a priority, they indicated that there is not always a match of resources and incentives to help make a risk-informed environment a reality.
- Respondents felt that a clear, consistently agreed-upon definition of what is meant by "risk-informed" either doesn't yet exist or has not been adequately communicated across the reactor program. Concern about lack of standards for PRA applications was also frequently mentioned.
- Non-PRA staff have limited knowledge of existing guidance.
- A significant proportion of respondents from Headquarters noted that they don't see how risk directly relates to their job.
- There is general agreement among all the respondents that current PRA training classes are good for a basic explanation of risk analysis. However, they do not address the rationale for PRA, but instead focus on PRA processes (e.g., fault trees). This is seen as problematic in part because it does not help non-PRA experts understand the value of a risk-informed approach.
- An overriding issue that emerged during the focus groups and interviews relates to trust in the PRA technology itself. Respondents indicated that many staff and managers outside the PRA branch are not well-versed in the calculations, data or assumptions that feed PRA results. One barrier to acceptance of risk-informed approaches, therefore, is the lack of knowledge and experience with the technology.
- NRR staff asked repeatedly for PRA standards and for the opportunity to review industry created PRAs.

- Staff range from being experts at conducting PRAs to self-describing a lack of familiarity with risk technology and applications. In itself, that large experience gap is one cause of the communication and integration challenges discussed in this report.

Potential Improvement Actions

Analysis of the issues raised during the interviews and focus groups reveal a number of ideas NRR may consider in order to more fully implement a risk-informed environment. These ideas are listed below and fully discussed in section 5 of the report.

1. Provide clear, detailed direction for the creation of a risk-informed environment

Respondents reported they heard mixed messages and saw inconsistencies in risk policies and practices. There is not a uniform, detailed vision from all levels of management on what it means to be risk-informed, and there is not a consistent method or standard.

2. Address the lack of trust in PRA technology

Staff who have limited experience with risk have misgivings about the PRA data, analysis process, assumptions, development and use of the final numbers. While standards are part of this concern, understanding PRA analysis and application is central to the issue of trust, as is clear, respectful communication from senior management. Non risk analysis staff need opportunities to address their lack of familiarity with the technology.

4. Improve Training and Experience

The consistent and responsible use of risk requires an understanding of probabilistic risk assessment analysis, and equally importantly, its applications and implications. Respondents observed that while existing PRA training classes are adequate to teach technique, they do nothing to help an employee make the transition to applying that new concept to ongoing daily responsibilities.

3. Provide models for risk-informed approaches

Staff and management do not have a clear understanding of what is meant by risk-informed and integrated decision making. This creates a somewhat reactive climate of low trust and high concern.

4. Improve communication

Improve internal communications to address concerns and misconceptions about PRA technology and its place in regulatory activities, and to build consensus regarding the creation of a risk-informed environment. An effective communication initiative can allay concerns, promote consensus about risk-informing activities in the reactor program, and facilitate ongoing change management.

5. Focus on Safety

Most groups have questions about the extent to which current implementation of risk-informed activities has achieved the desired results. Common questions include: Is the current use of risk analysis and insights improving safety or hurting it? Is there more or less regulatory uncertainty? Is there more or less regulatory burden?

6. Provide for Feedback and Evaluation

By nature, the process of creating a risk-informed environment is an iterative process requiring evaluation and feedback to facilitate positive progress. As additional technical review areas, work planning activities and decision making processes are risk-informed, unanticipated concerns and consequences will surface. Evaluation methods are needed to enable these issues to be identified and addressed during implementation and to capture and share lessons learned.

Conclusion

This evaluation report provides broad insights into internal stakeholder perceptions of risk-informed regulatory practices. With nearly 100 participants in focus groups and interviews, NRR was able to gather information from a relatively large and diverse group of employees in the reactor program in a controlled manner. The results reveal a general consensus about many of the issues the reactor program faces in the use of PRA technology and risk insights. Staff were open and honest and their responses reflected a strong commitment and high level of energy regarding risk-informed approaches within the reactor program. There is general support for the use of risk in reactor program activities.

Participants expressed strong beliefs and raised numerous topics, ranging from general concerns to specific technical issues. There have been a number of risk-informed successes that simply need to be communicated, and there is broad commitment to making improvements. Responses were remarkably consistent in the identification of barriers to a risk-informed environment during both the focus groups and the interviews. Managers and staff, risk experts and non-risk experts alike have all identified the same issues, and though perhaps unaware of it, they are united in their effort to address them.

The data in this report is robust and should be useful to NRR as it continues to implement a risk-informed environment. It will be important to capitalize on the energy and interest expressed by all levels of staff to develop continued improvements to risk-informed approaches in the reactor program.

Assessment Team Members

Evelyn Wight, WPI (contractor)
Leila Peterson, WPI (contractor)

Mark Caruso, NRC/NRR
August Spector, NRC/NRR
Stuart Magruder, NRC/NRR

Robert Youngblood, ISL, Inc. (contractor)
Kim Green, ISL, Inc. (contractor)

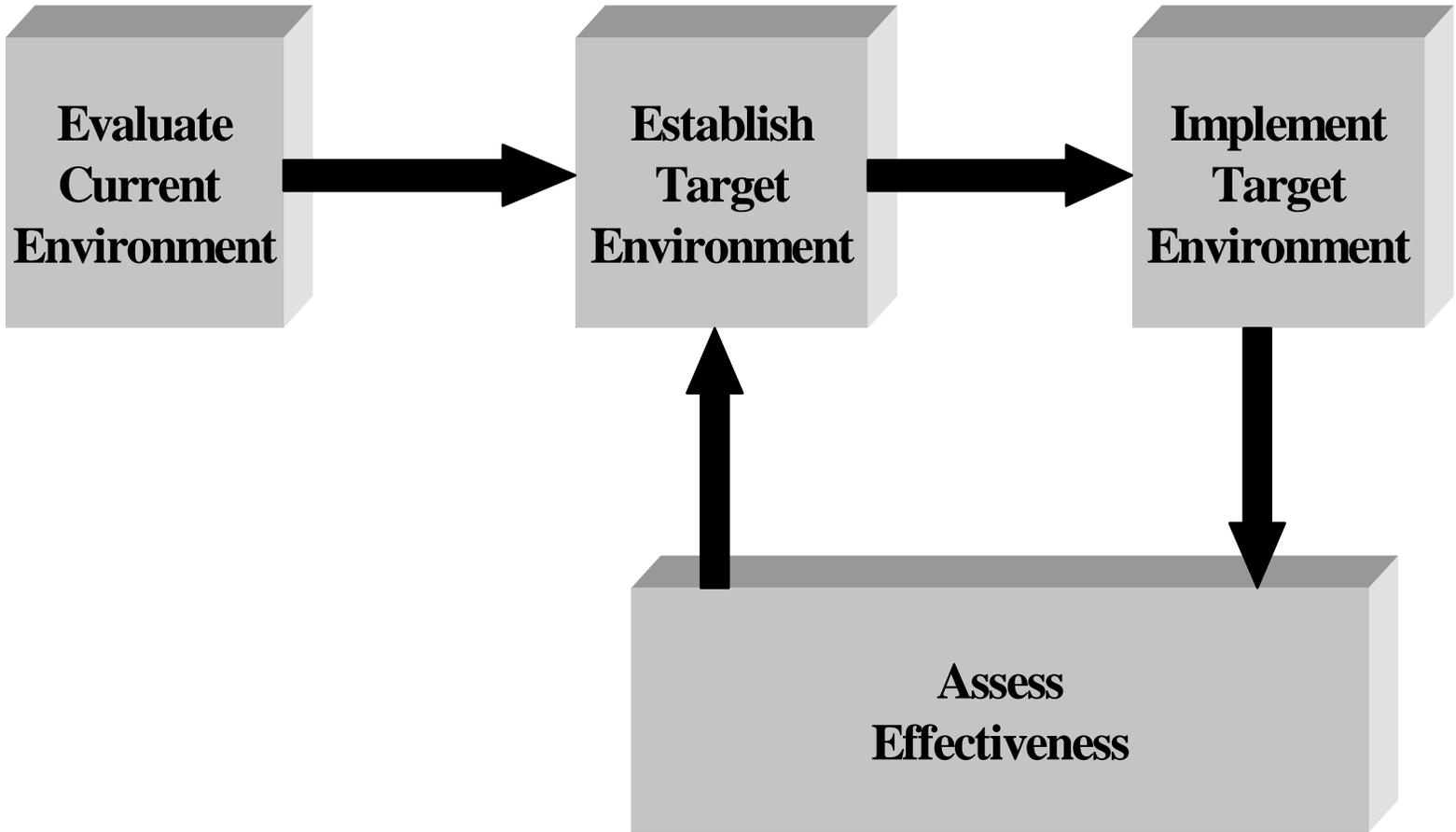
1 Introduction and Background

NRC continues to move towards a more risk-informed regulatory framework so that areas of highest risk receive the greatest focus. As described in the NRC Strategic Plan, the Risk-Informed Regulation Implementation Plan (RIRIP), and other Commission statements, NRC is working toward implementing a risk-informed regulatory process that increases focus on safety, conserves resources, reduces regulatory burden, and incorporates probabilistic risk assessment (PRA) insights into regulatory decisions. NRC has made progress over the past year to transition to a more risk-informed and performance-based framework. However, as the Chairman noted in a recent speech at the Nuclear Safety Research Conference, this transition is proving to be a slow and challenging process.

The Office of Nuclear Reactor Regulation (NRR) has initiated a three-year program with the objective of creating an environment in which risk-informed methods are integrated into staff activities, and staff plans and actions are naturally based on the principles of risk-informed regulation. This project addresses one of NRR's Operating Plan goals and was conceived by the NRR Leadership Team. The term "environment" is used to reflect a collection of entities important to the functioning of the reactor program, including the policy direction set by the Commission and agency senior management, the work processes and procedures used to achieve the goals of the reactor program, the attitudes and perceptions of staff members regarding the use of risk information in the regulatory process, the means for communicating and learning about new regulatory approaches and the tools and other resources needed to implement a regulatory approach. The staff's plan for this program includes four phases (see Figure 1): (1) evaluate the current environment; (2) design an improved risk-informed environment; (3) implement changes to achieve the target environment; and (4) assess effectiveness of environmental changes. As this plan suggests, the basic strategy for the program is to first understand the current environment, and then, address the weaknesses and build on the strengths.

This report summarizes the results of Phase 1. The assessment team used focus groups and interviews to evaluate the current environment. These techniques allowed the team to gather information from a relatively large and diverse group of reactor program employees in a controlled manner. The assessment team sought to identify barriers to implementing risk-informed approaches as well as catalysts for achieving successful risk-informed processes. This was done by exploring the views and perceptions of staff members regarding their past experiences in utilizing PRA techniques in regulatory matters and developing and implementing risk-informed regulatory processes. As will be evident from the results of the focus groups and interviews, this approach has been effective. It identified important issues pertaining to specific risk-informed work activities and processes as well as a number of common themes agreed upon by diverse subgroups of employees.

**Risk-Informed Environment Project
Major Phases
Figure 1**



2 Methodology

To evaluate the current environment within the reactor program regarding risk-informed approaches, the assessment team conducted individual interviews and focus groups both at headquarters and in the regions. Individual interviews and focus groups are qualitative research methodologies which can be used alone or with other qualitative or quantitative methods to bring an improved depth of understanding to the needs and requirements of a specific group about a specific topic. They are especially useful in exploring attitudes and feelings, providing insights into multifaceted behavior or motivation, and soliciting ideas for change and improvement. In both cases, confidentiality and non-attribution are key components in generating an open, creative atmosphere for frank information sharing and productive brainstorming in a controlled setting.

One-on-one interviews provide insights into attitudes, opinions and perceptions of individuals. Focus groups provide insights into attitudes, opinions and perceptions of a target group. In both cases, responses are solicited through the use of open-ended questions, followed by discussion and clarification. Individual interviews provide flexibility to explore in-depth subjective preferences, attitudes and experiences of one person. The focus group environment includes 6-12 participants and is an active and stimulating participatory process, eliciting a range of opinions. Another strength of this forum is that focus groups take place in a more natural environment than individual interviews because participants are being influenced by the suggestions and opinions of each other, just as in real life. The purpose of a focus group is not to attempt to bring the group to consensus, but rather to gather as much information as possible on multiple perspectives and the factors that influence their formation.

The purpose of this project was to gain insight into internal stakeholder perceptions of risk-informed regulatory practices. The assessment team focused on the following goals and designed interviews and questions that would generate input in these areas.

1. Assess the current environment
 - What is the current level of acceptance of risk-informed approaches throughout NRR?
 - What is the current level of integration?
 - Where has it been most successful?
 - Where are there difficulties?
2. Identify barriers to the integration of risk into regulatory activities
3. Gather input on how to move to a risk-informed environment

Another goal of this project was to solicit input from the broadest possible range of management and staff. The assessment team used both focus groups and individual interviews to accomplish this. Focus groups were conducted both at Headquarters and in each

of the regions in order to assess staff and management perspectives on using risk-informed approaches. Interviews with key managers and personnel were conducted as part of the planning process for the focus groups. Information gathered during the interviews was used to develop appropriate and relevant questions for the focus groups as well as to determine the make-up of the groups.

The assessment team interviewed 12 participants one-on-one. Interviews were conducted with branch chiefs, directors and engineers from all divisions of NRR.

The assessment team conducted a total of 13 focus groups - 2 in each of the regions¹ and 5 at Headquarters (sample questions for interviews and focus group are available in Appendix A). A total of 86 staff participated in all of the focus groups.

In designing the optimal make-up of a focus group, the assessment team aimed for diversity within a specified category of staff in order to uncover the subtleties, perspective, or level of experience of that group. A draft focus group plan identified eight different approaches for focus groups. The assessment team selected experience-based and attitudes-based techniques to structure the focus groups. Unique sets of questions were developed and tested for each focus group.

At Headquarters, focus groups were conducted on the following topics:

- Experience-based groups: South Texas exemption, ROP/SDP process, and Configuration Risk Management (i.e., maintenance rule and technical specification implementation).
- Attitudes-based group: in areas where integration has been minimal, gauge attitudes and concerns as well as familiarity with policies, concepts and methods of PRA.
- Attitudes-based group: within the PRA staff, gauge attitudes and concerns.

The regional focus groups were experience-based and focused on the ROP/SDP process. Two focus groups were held in each region, one with managers, including division directors and branch chiefs, and one with a range of staff members, including engineers, inspectors, health physicists, reactor analysts and inspectors-in-training. (A combined management and staff focus group was held in Region III).

- Region I - King of Prussia
- Region II - Atlanta
- Region III - Chicago (conducted by teleconference)
- Region IV - Arlington, Texas (conducted by teleconference)

¹Only one focus group was held in Region III, however, both management and staff were represented.

Data Collection

The assessment team used a modified notes-based analysis to prepare this report. All interviews and focus groups were recorded for use in the analysis. In some cases, a rough transcript was provided to the NRR staff members on the assessment team. However, all data was confidential and no interview or focus group comment was ever attributed to an individual speaker, either in draft or final versions of transcripts or reports.

For individual interviews, the interviewer asked questions and recorded comments. Each focus group used a primary and assistant moderator. The primary moderator served as group facilitator, walking the group through the questions, encouraging discussion, and asking clarification questions as needed. The assistant moderator backed up the primary moderator, and served as recorder or note taker.

Immediately following each focus group, the assessment team informally debriefed the session, discussing impressions and identifying key themes. During weekly conference calls, highlights and process adjustments were discussed as needed. Once all the focus groups were completed, the assessment team synthesized and analyzed the data. This report documents the results of the focus groups and interviews, illustrates areas of commonality and difference among management and staff, and provides direct, non-attributed, representative quotes to provide a flavor of the actual discussions to the reader.

3 Results and Analysis

A total of 98 NRR headquarters and regional staff and managers provided input through focus groups or individual interviews; participants' names and responses were kept confidential. In all cases, discussions were open and honest and responses reflected a strong commitment and high level of energy regarding risk-informed approaches within the reactor program. Participants expressed strong beliefs and raised a broad range of topics, from general concerns and frustrations to specific technical issues. In this report, we use the terms participants and respondents interchangeably to refer to staff who participated in interviews and focus groups. Throughout the report, direct quotes from respondents are included in italics.

In general, this evaluation found that staff are demonstrating increasing acceptance of a risk-informed approach. There are pockets of disagreement, but the majority of respondents felt that there are significant contributions PRA technology can make to regulatory practices in the reactor program. Debate within NRR appears to have moved beyond whether risk insights should be integrated into NRR activities, to discussion of how and when to implement risk-informed approaches. Respondents expressed general consensus about the issues faced by the reactor program in the use of PRA technology and risk insights, but there is not necessarily agreement about how to address them. During both the focus groups and the interviews, managers and staff, risk analysts and non-risk analysts, were remarkably consistent in the identification of barriers to a risk-informed environment. What is apparently lacking, however, is the knowledge that these same issues have been identified by different levels of management and across different areas of expertise. Respondents also identified various ideas, actions, and ongoing activities that could address these issues. However, these do not appear to be coordinated with one another nor are they well known throughout the organization.

NRR staff varied widely in understanding of and experience with risk-informed approaches. Staff ranged from being experts at conducting PRAs to self-describing a lack of familiarity with risk technology and applications. In itself, that large experience gap is one cause of the communication and integration challenges discussed in this report. The experience gap is also tied to trust and acceptance. Those with more experience with PRA tended to have a higher degree of trust and acceptance of the technology in concept, and also a higher degree of realistic understanding of what can be expected of that technology. Conversely, those with limited experience using PRA techniques tended to have less trust in and acceptance of the technology. For example, regional respondents who have extensive ROP experience expressed general support for the ROP and the use of PRA by the NRC, while some staff with limited experience with either the ROP or PRA techniques tended to express skepticism. The regional respondents who had ROP experience said the new process is more predictable and focuses all users on the same areas, including inspectors and management, as well as industry. Regional respondents also noted several areas for improvement based on their experience implementing the ROP. (Those suggestions are summarized in a separate, attached memo. A similar memo, also attached, summarizes feedback on the South Texas exemption experience.)

Overall, respondents reported general support for the use of PRA technology and risk insights in regulatory activities². In fact, frustration was expressed about staff feeling misjudged as anti-risk for raising concerns about implementation or not having the knowledge to integrate risk technology into their own work. In each focus group, respondents were asked to first address the positive impacts of PRA technology. (They were later given ample opportunity to address negative impacts; those results are provided throughout the report.) Focus groups consistently identified five positive impacts of risk insights:

- provides a common language;
- focuses resources on the most important things and focuses everyone on the same issues;
- identifies issues that might not have been observed under a strict design basis evaluation;
- provides a holistic view of system impacts and safety concerns; and,
- reduces unnecessary regulatory burden.

There are several indicators of increasing support for PRA technology. These include the implementation question discussed above (how and when, not if) and the frustration NRR staff members felt at being perceived as “anti-risk” when they raised questions. In addition, PRA staff reported increasing requests for help with PRA questions, less perceived defensiveness/hostility among peers with different experience levels with PRA, and an increase in NRR staff understanding of what information PRA staff need to do their jobs well.

These findings demonstrate another of the positive indicators of this evaluation: NRR staff share a very high degree of individual pride in a job well done, and share a high level of mutual respect regardless of area of expertise. This atmosphere encourages intelligent, engaged debate and problem solving. In addition, there was a high level of voluntary participation in the evaluation. While respondents from all levels are looking for increased communication and direction from management on risk-informed topics, they are also interested in participating in future planning for risk-informed regulatory approaches. One observation of the assessment team is that regardless of their opinion about risk-informed approaches, NRR staff feel they can make a significant contribution to, and would like to be involved in, any solutions or changes associated with improving the implementation of a risk-informed environment. The degree of energy NRR staff have is an asset; however, if this energy is not harnessed productively, negative impacts could result, such as low morale and resistance to change. Feelings of pride and commitment can be capitalized on, but can also contribute to a tense environment if individuals feel their technical expertise is not being acknowledged or invited.

The outcomes described above are assets the NRC can capitalize on as it moves forward in

²Although respondents did acknowledge that there were staff who refused to accept PRA, the majority of staff and managers the assessment team spoke to indicated that most staff, across all Divisions, support the use of PRA, but have lack of knowledge or concerns about the way it is being implemented.

implementing a risk-informed environment. NRR is well positioned with a large team of participants to move to the next level of implementing risk-informed regulatory approaches. This evaluation also revealed specific challenges regarding use and implementation of PRA technology. The remainder of this report is divided into general categories of comments that capture both challenges and assets NRR faces in implementing a risk-informed environment. These include:

- understanding “risk-informed” approaches;
- attitudes toward and trust in risk-informed approaches;
- technical concerns;
- organizational issues;
- communication;
- knowledge and training needs; and
- stakeholders perceptions and public confidence.

Understanding “risk-informed” approaches

A significant issue raised in every focus group and many of the interviews was the lack of a common understanding of what is meant by risk-informed. Respondents felt that a clear, consistently agreed-upon definition of what is meant by “risk-informed” either does not yet exist or has not been adequately communicated across the reactor program. Respondents indicated they believe the intention behind risk-informing approaches is to draw from the strengths of both deterministic and PRA techniques. However, it is not clear what this means in a practical sense for individual jobs and tasks, and respondents indicated they are looking for increased leadership in this area. Both staff and lower-level managers asked questions like: How do we do it? What are the objectives? What is the proper balance between risk and deterministic approaches? How do we retain the concept of defense-in-depth? These kinds of questions were raised by respondents who had both minimal and extensive experience with and acceptance of PRA technology.

Sample responses:

- *We don’t have a good model for risk-informed. No one has said how to integrate. It’s implied you’re supposed to use both, but we don’t know how much weight to give them. It’s like integrating apples and oranges.*
- *What really is meant by risk-informed and how do I really accomplish that in MY job?*
- *The agency doesn’t have a common understanding of what a risk-informed approach is. Policy is getting an understanding of the difference between risk-based and risk-informed.*
- *We’re in the transition phase of taking what we have (e.g., Reg Guide 1.174) and meeting the challenges we have in product lines for risk-informed. In the broader sense, people are hearing about risk-informed goals, but they haven’t yet experienced how they themselves would do it.*

- *We need to provide a process where people have information they can use to make decisions. You don't have to be a PRA expert. We need to provide processes so they don't all have to be experts. But they have to understand how risk insights can help them come to regulatory decisions differently.*
- *Some people use it all the time and have lots of experience. Other people rarely or inconsistently use it. The biggest problem is there seem to be two camps in the agency. Some people see their world as entirely risk-based and they don't want to take a risk-informed approach. Others don't want to take a risk-informed approach because they don't want it to be become totally risk-based. There is very little real risk-informed work going on at NRC.*

Respondents also expressed concern about whether or not the reactor program is implementing risk-based or risk-informed approaches. In some cases, respondents expressed confusion about the difference between the two. In other cases, respondents emphatically described the difference and expressed strong opinions about which approach is currently being following. This division is reinforced by certain organizational policies, such as separate review processes and separate guidance documents.

Sample responses:

- *I have my own understanding of risk-based/risk-informed. I think of risk-based as more hard numbers but risk-informed is taking that number and adding other factors to evaluate together with it. I hear people saying we are using risk-based in a risk-informed manner, but I don't know what that means.*
- *Risk-informed should be a tool and not a means to an end -- risk-based vs. risk-informed. If people could use the risk analysis as one input, as one tool, there would be more openness to it.*
- *Inspection findings were risk-based - it depends on the specific example. License amendments, that's risk-informed. It varies depending on the application. What concerns me more is we say we're doing risk-informed and we're not, it's risk-based.*
- *We're risk-informed at the front end, and there are improvements on selecting samples, not wasting time on things that aren't important but it's on the back end where we get risk-based - we're trying to risk inform our response, and we forget that in trying to get the numbers, we spend so much time agonizing over the numbers. The number comes up white and we don't think it is, but we can't convince management otherwise.*
- *Philosophy versus implementation. We're supposed to consider it (risk) one thing, not everything. Use defense-in-depth. However, when you look at implementation it is drifting back to risk-based.*
- *NRR has been very risk-based. I haven't seen a good, integrative approach. We have concerns in the PRA branch that NRR is too risk-based. Is not utilizing defense-in-depth. Not risk-informed.*

An element of this lack of clarity seems to result from the fact that although PRA is often referred to as a tool or a technology, some respondents perceive that its use requires a different set of underlying assumptions than the deterministic design-basis approach. Some respondents recognized that PRA is being applied more as a change in philosophy than simply as a new tool. In some instances, PRA complements deterministic analysis, however, respondents observed that a risk-informed regulatory approach requires a subtle shift in how the NRC defines its role and responsibilities in the maintenance of safety. Respondents raised a distinction between the deterministic and PRA approaches as follows. In the deterministic approach, resources were committed to ensuring worst case scenarios could not happen under any circumstances. However, this approach did not ensure that no events ever happened. In the PRA approach, resources are committed to preventing the most high risk events from happening, whether or not those events are worst case scenarios. While this distinction may seem subtle, respondents said it has had significant impact. This perceived change in philosophy raises potential difficulties in the creation of a risk-informed environment in areas such as what is allowed under current regulations, how staff understands their mission, how success is evaluated, and the language that is used to discuss analysis within the NRC and with the public. In the case of the South Texas request for exemptions, for example, underlying changes in assumptions were not clarified to staff in the presentation of the project. It was not clear what the current regulations allowed, or who bore the responsibility for ensuring functionality was being maintained. Many respondents believed this example made it clear that PRA is not simply another tool, but a change in philosophy that requires careful attention to the way new tasks are framed and how risk-informed approaches might conflict with current regulations. Thus, use of PRA introduces not only a new way of getting an answer, but a new type of answer³.

Sample responses:

- *Is my job to make sure that nothing ever happens or is my job to make sure the risk of something bad happening is as low as possible? These are two completely different perspectives. Some managers don't understand this. It is difficult to make this change. Risk is under the latter. That risk is no good because it doesn't do the first is a misunderstanding.*
- *The regulations are deterministically based and the staff has a high degree of confidence that the components will function well. With the risk method, you say "do I really need to do that test for all components, even the low risk ones?" For the low risk ones, the policy is we don't need to have as high a level of confidence that it needs to function. That is doublespeak.*
- *Staff has some resistance to it, largely because they are not terribly comfortable with PRAs and their results. That's because they don't understand how they are put together and are suspect of the reliability of the information that goes into PRAs. A large part of that is staff is not sure if reliability is based on real life data. They want a high degree of certainty. It's hard to move away from something you know that worked to something*

³In his seminal work, The Structure of Scientific Revolutions, Thomas Kuhn defined a paradigm as providing both model problems and model solutions and discusses how this can cause problems when a group is shifting to a new paradigm. As NRR makes the shift from using risk insights to adjust the amount of testing required for different components to a more rigorous application of the technology, the organization faces a set of challenges broader than simply encouraging the use of a new tool.

you're not 100% sure of - there is some natural tension.

- *Risk tells us that there is about 10% of things that we really need to worry about and 90% that isn't as important. However, the 90% is the stuff that people spent their career worrying about and they don't know how to stop.*
- *The biggest problem wasn't with PRA itself. It was a clash of philosophies in that engineering and risk-informed approaches are two different religions. We often talk about this as a religious conflict.*
- *In the broader sense, people are hearing about risk-informed approaches and goals, but they haven't yet experienced how they themselves would do it. They are hearing one thing (move to PRA) and doing another (deterministic). The approach to fix this is to be sure we're all aligned philosophically from the leadership team on down about how we approach our work in a risk-informed manner.*

A significant proportion of respondents from Headquarters noted that they don't see how risk directly relates to their job. There is a lack of direct application of risk insights into staff responsibilities and the NRR decision-making processes. Respondents noted they have had little contact with PRA and in some cases feel it does not relate to their work. In the regions, staff use PRA regularly but expressed a concern about how it impacts their oversight role. For example, some respondents said they felt PRA reduced the need for inspectors to apply their qualitative judgement to decisions, resulting in a negative morale impact. A related phenomenon that surfaced was respondents who support the utilization of risk insights in general, but are reluctant to apply it to their own areas. Some of the reasons for this include lack of knowledge of job-related applicability, lack of guidance, or a sense of security in the old way of doing things.

Not surprisingly, direct experience with PRA impacts staff attitudes towards it. There appears to be a positive correlation between level of experience and positive attitudes toward PRA and its potential usefulness. However, direct experience also makes staff more discerning about the broad application of PRA technology and the strengths and weaknesses of current implementation of risk-informed regulation. In some cases, staff felt that PRA's potential is not being realized. In other cases, staff viewed generic policy statements from the Commission or management about PRA as being overstated or politically driven. A key message from all respondents was that staff needs to see management address implementation issues in order to increase the credibility and usefulness of risk-informed approaches. Specific implementation issues that were repeatedly raised by respondents are discussed below in the technical concerns section, among others. But the key point here is that when making changes, there will be unforeseen problems and management needs to make a visible effort to allow these to emerge and to address them.

There is nearly universal agreement that the South Texas request for exemptions experience had a negative impact on staff perceptions about the use of PRA by NRR, despite any positive outcomes of the project. There is residual frustration and emotion about the project and the way it was handled. The manner in which new policies are implemented can reinforce concerns that respondents have and result in increased mistrust in PRA technology and its use in NRR activities.

Sample responses:

- *We put everyone through training. I thought it was good but I think that what people really need is practical experience. I don't think that a risk-informed environment will be created through training. Need to work through real experiences and situations to see the benefits.*
- *Outside of people in the PRA group, I don't think anybody really uses PRA per say. We look at the results, we understand some of the reasons why that conclusion makes sense, but we don't understand the process of how they got to that answer using PRA. If we knew better how they were developed, what assumptions were made, than staff could feel more comfortable.*
- *My concern is the job satisfaction for inspectors if we keep finding nothing of risk significance at sites. We want inspectors who are skeptical and motivated. The current process doesn't let people feel they are making a difference.*
- *We need more PRA experts integrated into the staff. We need more people who "speak" risk correctly.*
- *I do deterministic work. I have not used PRA, but it seems to be at odds with the deterministic approach. It could be useful but I don't know how it's supposed to interact with what I already do deterministically.*
- *A problematic example is South Texas' multi-part exemption. NRC granted this after 2 years of intense debate. When you get the results of PRA how do you address the interpretation of PRA into a change in regulations? Regs are deterministically based and the staff has a high degree of confidence that the components will function well. ...With South Texas, the policy was components have to remain functional, but they didn't have to be tested as rigorously. So how do you marry those two perspectives? It's a contradiction in terms to say it needs to function but you don't need to be 100% sure anymore.*
- *We can't assume that people are unwilling to do this. Management is responsible to provide access so the staff can be successful. We need to provide quality products for the licensees. We need to match up risk-informed with the work that people have to do every day. Only then can we hold people accountable for being willing to do the work. Historically, we focused on performance appraisals. We need to back off from that and leverage their roles to make them feel dedicated and allow them to succeed. We can manage the passion at NRC – it is a good thing. But passion will be a barrier without first providing the right tools so people can do their jobs and succeed in a risk-informed environment.*

Attitudes Toward and Trust in Risk-informed Approaches

Overall, respondents, particularly those in the regions, indicated there is general acceptance that PRA and risk insights have a significant and potentially positive role to play in the reactor program. Respondents see clear benefits in the use of risk and also recognize that NRC leadership has mandated its use. Even those who have significant reservations or limited experience with PRA identified positive impacts from the use of risk technology. When asked to talk about the most successful impacts of PRA, the most frequent responses included:

- Provides a common language.

- Focuses resources on the most important things and focuses everyone on the same issues.
- Identifies issues that might not have been observed under a strict design basis evaluation.
- Provides a holistic view of system impacts and safety concerns.
- Reduces regulatory burden.

There were also indications that widespread acceptance has increased over time, especially in the last year or so.

Sample responses:

- *The discipline of the use of PRA has been welcomed by the staff. They like the discipline and it gives good focus. It helps them know where management and industry is focused.*
- *People more and more are coming to us in PRA to ask questions. Five years ago the tone of the conversation would be very negative. In the last year, even the last few months, we are actually seeing people come to us. It has gone from confrontational to “help me.”*
- *In my opinion, the new process is more objective now. We are applying the focus - even the old school of thought acknowledged that we might be missing some of the spectrum that might indicate a problem. But given burden and resources, some of those things might just be documentation issues.*
- *I believe the new process is managing agency resources into areas that are risk significant.*
- *Now inspectors are allowed to think of things they might not have been able to look at, beyond the regulations. Now we’re talking about risk significant things - it’s more of a balanced approach.*
- *Some of the configuration risks have really surprised me, like DC power in outage configurations. I thought off site and diesel power was important, but it turns out a small room with some batteries in it is very important. We wouldn’t see these kinds of things without good PRA attacks on the problem.*
- *Use has definitely changed. In the past it was done largely in response. Now people are more willing to use it (PRA) to improve performance and to achieve relief from regs.*
- *Outside [of PRA branch] people have been force-fed policy. Like it or not, they have gotten to the point of accepting it – within certain bounds. These bounds are criteria that they establish and are imposed by each discipline...Maybe go from testing a certain piece of equipment from every three months to every 18 months, but will not believe that it would be ok every six years. Trust it, but trust it in small doses. “Show me” mentality.*

An overriding issue that emerged during the focus groups and interviews relates to trust in the PRA technology itself. Respondents asked questions such as: Where does the data come from? How good is this number? Respondents indicated that many NRR staff and managers outside the PRA branch are not well-versed in the calculations, data or assumptions that feed PRA results. One barrier to acceptance of risk-informed approaches, therefore, is the lack of

knowledge and experience with the technology.

From the risk analysts, we heard two related issues. First, many respondents from this group also raised issues related to the quality and availability of data needed for PRAs in certain areas. Second, they are looking for increased awareness about the impact of limited or outdated data on the PRA process and the applicability of PRA insights.

According to the focus group and interview respondents, to address mistrust in PRA technology NRR staff needs:

- 1) More experience with and understanding of the data and technical rigor that go into PRA calculations. Increased understanding of the appropriate and intended use, applications, and implications of PRA calculations.
- 2) An increased understanding that PRA numbers don't have to be perfect to be useful. If understood and used properly, this can be a strength of the technology because the uncertainties and assumptions are visible.
- 3) Candid, open discussion and acknowledgment of where PRA is not as useful; demonstration that concerns resulting from current implementation practices are being recognized and addressed.

Sample responses:

- *Difference is that risk is getting into more areas. It was an extra thing in the past. Acceptance is growing in some areas but many places still lack trust. Concern about not knowing how you got to a certain answer. Acceptance has improved but not done across the board.*
- *If people could see what actually goes into a PRA, it would allay some fears. Give examples of the real science and technical expertise behind the assumptions. Do this instead of just giving the results of PRA. People have a hard time trusting the outcomes without knowing what is behind it.*
- *In management, most people are on board with the use of risk. Staff has some resistance to it, largely because staff is not terribly comfortable with PRA and their results. A large part of the staff is not sure if PRA reliability is based on real life data.*
- *The most important thing is candor. People don't believe statements like "PRA improves safety unilaterally across the board." We're trading safety in one place to get it somewhere else.*
- *We need to provide processes where people have the info they need to make decisions and they don't all have to be experts. They have to understand how risk insights can help them come to regulatory decisions differently. They have to know how to ask the right questions, and recognize that risk should be applied to their decisions. But they need to trust the experts to feed them the info they need to make good decisions.*

Technical Concerns

NRR is in the middle of a change process so it is not surprising that respondents noted a variety of technical and implementation concerns that must be addressed to improve the effectiveness of a risk-informed environment. Words that came up repeatedly during focus group discussions about the extent of PRA integration in NRR activities were: spotty, inconsistent, evolving, and not there yet. (See Appendix B for a comprehensive list.) Specifically, five concerns were consistently raised:

- lack of integration,
- rush to judgement with incorrect technical information,
- lack of standards,
- improved guidance needed, and
- identification of problematic areas for PRA.

One factor that contributes to this situation is the separation/isolation of risk activities from deterministic activities. At this point, it is rare to find the two truly integrated. However, many of the concerns raised by technical, deterministic staff are echoed by risk analysts and PRA staff. Therefore, the solution is not just a matter of educating the non-PRA staff about PRA technology. Technical staff believe they have insights and experience that are helpful and possibly critical to PRA decision-making. PRA staff feel similarly. NRR needs to provide a context for all NRR staff that demonstrates the intended use and scope of PRA and addresses implementation concerns. In addition, integration of engineering and PRA staff and processes will demonstrate that concerns are being taken seriously and that NRR has a commitment to risk-informing the reactor program.

Certain characteristics emerged from the focus groups that indicated where risk insights were easier to integrate into the reactor program activities. Specifically, risk insights are more effectively integrated in cases where there were clear guidelines established, as was the case with the Maintenance Rule and the ROP. Generally, staff are also more comfortable using risk insights to enhance safety with new requirements rather than reduce burden, or to fill in areas where there was a demonstrated deficiency in identifying and addressing safety concerns under the design basis framework. Identifying characteristics that facilitate integration of risk insights, as well as the barriers to a risk-informed environment, provides staff and decision makers with important insights into the time and effort that is needed as NRR seeks to expand risk applications within the Reactor program.

Another issue that was raised repeatedly by engineers, PRA analysts, and in the regions is a shared frustration that the desired results of a review or analysis have been predetermined. That is, some respondents feel they are being encouraged to structure their calculations and findings to support a “correct” answer. Some spoke of feeling that their recommendations were actually modified, while others spoke of being under pressure not to pursue certain areas.

Sample responses:

- *When you go into risk-informed process, it has buy in at the top so they can sell it to staff. Managers say do this, but I don't really believe in it. This will be a big issue in Chicago – confirmatory use of the system, you know what the color is and work to*

match the color.

- *We're risk informed at the front end, and there are improvements on selecting samples, not wasting time on things that aren't important but it's on the back end where we get risk-based – we're trying to risk inform our response, and we forget that in trying to get the numbers, spend so much time agonizing over the numbers. The number comes up white and we don't think it is, we can't convince management otherwise.*
- *When an incident happens, the first HQ question is "what is the probability this would have led to serious damage?" The outcome is nearly always tied to perceived result based on PRA. It takes lots of time to find out what really happened – and the PRA calculation is done before this. Sometimes people don't like or believe the preliminary PRA result and they can change the finding.*
- *I would write my safety input [for S. Texas] and they would literally change it to make it say what management wanted, or conclude the opposite of what I wrote. They wouldn't even send it back to us. But we'd comment on it and tell them to put back what we said originally.*
- *Pressure to not pursue it. I had to have analysis that said that it was green but if it does effect the system outside, then what? I had finding with big warning label on top. Finding for what I was able to look at was green. But what didn't I get to look at. Who knows about what I wasn't able to look at. Resident shared my concern. Management in region c hanged positions, put pressure on.*
- *Structure is the SDP process that forces to say that there is an answer. Forces us to avoid pursuing some risk significant things.*
- *Lots of political pressure on agency. Example: inspection at plant. Can we wait an extra 19 days? Use very unreliable model. We have grouped a lot of plants under a bad model. Everyone agrees that it is a bad model, but t hen are going to use the bad model to make a decision about 19 days. We undermine our credibility when we do this. Damage trust within NRC and public.*
- *How well you do or don't do it. Decision is being made by pressure then use some technical analysis as an excuse. We don't have processes well defined. People don't know what to do, know what you want.*

Respondents were also concerned that some processes are evolving into a number being the "be all and end all" for risk-informed approaches. Respondents said they want to see more examination of the context of PRA numbers and inclusion of this context in decision making. Respondents repeatedly emphasized the need for integrating qualitative insights into NRR risk procedures and also that management needs more practical experience and knowledge related to uncertainty and decision making.

Sample responses:

- *There was an illusion of certainty in the old (deterministic) way. Some people say you can get any number you want in PRA space. But it depends on the assumptions you use, which you have to show.*
- *Senior management needs to put a lot of thought into what we are asking them to do. Management has a great deal of responsibility to not just say go do it.*

- *Commission has issued “guidance” on PRA but it has become a decision making tool. It’s used as a black and white tool, based on a numeric value. It doesn’t address the quality of the number, and we do not have a criteria for evaluating the quality of a PRA, it’s based on judgment.*
- *If something is classified as a safety-related component (therefore under the jurisdiction of the NRC) there is the attitude that says either change the designation so that I don’t have responsibility or don’t tell me not to worry about it. In other words, don’t want to have ownership without also having control.*
- *The next effort will be to stick their heads in the sand and say there is no such thing as a large break. But you still can’t properly quantify uncertainties. PRA says big breaks don’t happen, but that’s based only on frequency of testing. We still can’t quantify uncertainties to do anything but bound your calculations. ACRS doesn’t like to hear this. A big problem with PRA is it hasn’t been done, it’s untested/unproven and often done wrong.*
- *The numbers being put into PRA are not reflective of technological reality - it creates a false euphoria about the ability to do things. PRA “stick trees” are being used to make decisions but the numbers on the trees aren’t right... Then PRAs get quoted as saying risk is low, so we can bypass something. We don’t have a way to statistically determine uncertainty - we’re bounding it, not quantifying it.*
- *Integration for configuration control, this has been a success. Should serve as a model for those trying to bring risk into their decisions.*
- *Info on how to do a PRA is available. But what info to put into a PRA, and how satisfactory your numbers need to be, and how many sticks to put in your fault tree - that is not available. Management needs to take adequate assurances about PRA or admit its approving it even with bad numbers and tell us why. Staff is saying “we haven’t done a complete job, how can we say it’s good?” And NRC is phasing out old regs as fast as possible.*

As mentioned earlier, respondents were very concerned about the standards and quality issues for PRAs. The question of standards for, and quality of PRAs came up frequently. Staff across NRR asked repeatedly for PRA standards and for the opportunity to review industry-created PRAs. While lack of standards contributed to lack of trust in the technology, from a practical standpoint, there is a mix in the quality of PRAs coming to NRR from industry. Respondents referred to problems related to the quality of PRA data in some cases. In other cases the data just is not there and will take time to collect. Respondents are concerned that NRR risk-informed practices do not reflect this reality. This point is especially important because new risk policies are premised on a basic level of commitment and competence by licensees. Some respondents insist standards are essential while others feel a better understanding of PRA concepts would remedy the perceived need for standards.

Sample responses:

- *Problem is most people don’t have the knowledge to make sound judgments. The key is to know when PRA will be useful, but you can only know that based on experience, and not enough people have that experience. PRA can allow you to be realistic (instead of conservative.)*
- *People will use it [risk] beyond its capabilities. Management will trust the numbers too*

much. You need to know what the numbers mean. It is true that in the wrong hands it is just a bunch of numbers.

- *Risk assessments are not always there or are not always easy to get. This is not understood by senior management. Example – there is an issue that has come up recently about the cracking of a certain component. We asked the industry to do a PRA. They are not going to be able to get it to us until next spring because they don't have the data they need to plug into the model.*
- *If we answer "I don't know what the risk is" we create the impression that we are just being reticent. Some risk assessment takes a long time to do. There are higher expectations then can be achieved.*
- *We, the management, ought to bite the bullet and set some standards to give us confidence in the quality of PRA, or just stop asking the quality question. With all the time we've spent flailing around we could have already inspected every plant and figured out what the standard was. What we have is good but very proceduralized. We don't have a standard on what a PRA should be.*
- *If you have no standards, it puts a burden on the staff to review the entire PRA. We can't cut the licensees loose. Do we have enough staff to do this? I don't think we do. We need better quality tools and more staff to use a PRA approach over a deterministic one. PRA puts a tremendous burden on the staff. The quality of PRA comes up with every review. If we could have a standard to rely on, it would give the staff more time; realistically, we don't have the necessary resources to do that review.*

The need for better guidance was also raised as an important issue. There is a shared concern about the lack of detail and specificity of existing guidance and policy statements with regard to PRA/risk informed approaches. Respondents noted the current format of the guidance reinforces the dichotomy between risk and deterministic approaches. With two separate documents, even the guidance is not integrated. Non-PRA staff have limited knowledge of existing guidance either due to lack of time or due to a sense that it is not relevant for them. Respondents noted the current guidance is complex.

Sample responses:

- *There is the attitude that only people in PRA need to read the Reg Guides related to PRA. People get very busy and feel they don't have the time to pay attention, learn about and keep up with PRA policies and guidance.*
- *I think there is a lot of guidance written and policy papers. Maybe there is too much. But it's the implementation and the way the guidance is interpreted throughout the organization that is the problem. Interpretation needs to be improved and made consistent.*
- *I've heard of the reg guides, policy statements, etc., but I really haven't gone to the trouble to read all that. It's overwhelming, there is so much of it. A better job is needed to communicate this information to the staff in more concise ways so that we can understand it. That job is not being done.*
- *We're in the transition phase of taking what we have (e.g., Reg Guide 1.174) and meeting the challenge we have in product lines for risk-informed. We are working these through for the staff with examples and focus to move us into the routine application of*

risk-informed regulations and acceptance or risk-informed applications.

Some topics are more difficult to treat with a PRA analysis than others. Respondents listed areas they felt risk insights are harder to apply; examples included fire, human performance, crosscutting issues, security, and seismic events. NRR staff share a concern that evolving practices do not reflect the point that some areas are less suited to the direct application of risk insights under the current state of the technology, and in some cases PRA is being misapplied.

Sample responses:

- *In Maintenance Rule space you can do qualitative, quantitative or blended analysis. I think they should all be blended. But the pendulum is focused on getting the number in, don't pay attention to how it was done. Decisions are made based on the numbers, even though they shouldn't be done that way...We are supposed to look at assumptions and understand where the numbers come from.*
- *I think we need more interaction for the more complex problems, it depends on the nature of the problem how much PRA analysis or interaction you need between PRA and deterministic. Two analyses get sent to a project manager, but no one ever gets together and talks in a room.*
- *Cross cutting issues have big divisions. I would use an analogy of a house on stilts with a beaver taking bites out the legs. When does it become a problem and the whole house falls down? We don't have the capacity to assess this.*
- *How do you quantify operator-licensing issues? Someone goes to the control room and messes up. How do you quantify poor training in the simulator with risk? You have green findings but still have concerns. How do you quantify those things? Risk technology is not there yet.*
- *[Risk-informed environment will exist] when we have tools and people are able to use them. Need group of people to do detailed analysis beyond models. SPAR models miss a lot of issues. Does amateurish job sometimes. Often information and time limited. People will go to simplified model and use it in the wrong application and therefore come up with a wrong answer. We want to be risk-informed. I am hearing risk-based.*

Organizational Structure & Processes

Across the spectrum of management and staff, respondents noted that there are several organizational issues that are reinforcing the challenges of moving to a risk-informed environment. The consolidation of PRA expertise in one branch, in particular, has impacted NRR's ability to create a risk informed environment that promotes integrated decision making. There is general support for and interest in an integrated approach, but there are also many concerns about how to achieve it. Specific areas of concern include: resources, treatment and involvement of PRA experts, performance measures, and organizational flexibility.

While respondents believed that increasing the use of PRA within NRR is a priority, they complained that there is not always a match of resources and incentives to help make a risk-

informed environment a reality. Examples they noted included: 1) Industry is not required to use PRA. 2) Risk experts are not sufficiently represented in management. 3) NRR does not have enough risk analysts on its staff.

Respondents also noted that NRR needs to become more flexible and nimble so that it can make adjustments to new processes as unanticipated issues emerge. In the South Texas exemption project, for example, staff spent many months struggling with trying to integrate new expectations about functionality with existing ones. Once management provided needed guidance, the team was able to make rapid progress. NRR needs to move faster to respond to projects that are applying PRA technology for the first time and allow for open discussion of issues raised during implementation. Regional focus groups emphasized that good communication and feedback mechanisms that work both ways are critical to an effective implementation of a risk-informed environment. Respondents were looking for the creation of an atmosphere where issues can be raised and addressed regularly and quickly.

Another area respondents expressed concern about was in the general area of personnel issues and accountability. Respondents brought up concerns related to personal job satisfaction, job security and promotion potential for PRA experts versus other staff members. One concern is there are very few PRA experts within NRR management. Another concern raised was that the rigidity of the SDP process removes some elements of individual judgement from the job for inspectors and could impact job satisfaction. Finally, respondents mentioned a fear of being held responsible by Congress or the courts if something goes wrong under the new approach.

Sample responses:

- *We still have a lot of work to do in accountability in performance and in rewarding people in order for management to be able to provide for the success of the staff. We need to provide access to the resources and training necessary to do their job correctly and in alignment with a risk-informed environment. We need to make sure people have the skills they need to do the work, and create an environment where people are willing to do the work. In the past, a critical performance appraisal was the key (to behavior change).*
- *When we promote people we do not look at whether they have been using a risk-informed approach. It isn't part of the evaluation, award structure. There are not a lot of incentives to use it.*
- *It starts with senior management and permeates down. If the agency really wants to be risk-informed then it needs to bite the bullet and put the resources and education into it, start talking to each other. Mentioning. Biggest problem is that NRC is not coherent. We don't have a complete process.*
- *This technology goes back 25 years, and even in the last 10 years there hasn't been much use of it. One problem is that only people in the PRA branch are sent and involved with things related to PRA. We (engineers) are not notified or actively included early enough in the process. We will get called in half-way through. Once involved with actual licensing amendments it works well. All the benefits of having up-front involvement are lost.*

- *At TMI, the plant operator kept doing what the procedure said even though he felt something was wrong, in part because it was the procedure writer who would get in trouble, not him. Now we have better procedures. But if you had done a PRA, and the PRA said the operator would do things right 99% of the time, but the procedure was wrong, you would have had a core failure.*
- *We need to provide sufficient information and data so staff feels they can make the right decision and so they have management backup if they make a risk informed decision and something goes wrong.....How do you define success? The public wants no rupture, but risk-informed allows one. Which one does the commission and staff support? Will we defend the staff in risk decision making? We need to answer these questions for the staff.*

Communication

Improved communication between upper management and staff is critical to NRR moving into a risk-informed environment. The results of the focus groups and interviews reveal that an information vacuum has created uncertainty about motivations in both directions. Specifically, staff tend to feel that politics are taking precedence over their technical and safety expertise and are impacting management decision making in a negative way. There is a perception that technical staff concerns about the implementation of risk-informed regulation are viewed by management as resistance to change/opposition to using a risk-informed approach. Many respondents want increased opportunities for communication across NRR.

Staff members may be surprised to learn that the gap is not as wide as they perceive it to be. The interviews we conducted with managers at all levels revealed that management is aware of and working to solve many of the issues the staff raised about implementing risk-informed approaches. However, it's clear from the focus groups that management understanding and efforts have not been communicated well enough to the staff. Similarly, the successes that NRR has experienced in implementing risk-informed approaches are not widely known; in fact, the opposite is true - the examples that were the most challenging are famous.

Perhaps because NRR staff members are not aware of management's knowledge and support for addressing risk issues, they reported a certain amount of difficulty in expressing professional opinions in the current environment. There is a perception that negative consequences can be associated with raising issues that need to be addressed. Staff at headquarters and in the regions all emphasized their need to see movement within NRR that addresses concerns and implementation questions.

According to the focus group data, the level of acceptance and use of risk-informed approaches is much higher in the regions than at headquarters. The lack of a consensus at headquarters about the role of PRA and how PRA technology should be integrated into policies impacts not only communication between headquarters and the regions, but the overall success of moving to a risk-informed environment. Respondents in the regions noted that they get mixed, and some times conflicting, messages from different parts of NRR headquarters. The regions also reported that it was sometimes difficult to get any response from headquarters staff regarding

ROP/SDP feedback forms which were submitted.

Sample responses:

- *The perception of senior management was that the staff was not willing to accept PRA. I think this is a big problem. I think that the staff is more opening and willing then they are given credit for.*
- *I don't want to have heartburn every time I go and talk to a deterministic person. And managers. I want a common understanding of philosophy and processes. Want a sense of working together. Realize that we are working toward a common goal.*
- *People in the PRA branch, we tend to be too shy about our work because it is a new science. Also feel pressure and get edgy. We don't push technology to what it could be. There is the fear of litigation. How will this stand up in front of a judge? Fear of unknown. This attitude doesn't give other branches confidence because we won't be definitive. Never use the word "never." Never say it won't fail. Just say low probability.*
- *The challenge is to move people productively without making them feel like the past was a failure. We need to break down barriers to involve people in these changes. We're applying lessons learned into new definitions for programs. It's much more resource intensive to do it correctly, but for our long term goals it's worth it..... We (management) could do better in providing a coherent picture of what we're trying to accomplish.*
- *Uncertainty – if you say that something is uncertain then people think that means that the technology is limited or flawed. Don't understand that this is addressing uncertainty straight on.*
- *There needs to be candor about the reality of PRA and WHY we're doing it (instead of claiming it's right). Management can't keep telling me PRA is a chocolate bar when I can see it's caramel. I have to conclude maybe they don't know the difference. Instead, they should say, I think you might like this caramel bar better, will you give it a try -- use open communication. Don't say the chocolate (PRA) makes things more safe when it doesn't. Say: "our techniques incorporate a greater quantification of uncertainties so we're not so unsure..."*

Knowledge and Training Needs

There is general agreement among all the respondents that current PRA training classes are good for a basic explanation of risk analysis. However, they do not address the rationale for PRA, but instead focus on PRA processes (e.g., fault trees). This is seen as problematic in part because it does not help non-PRA experts understand the value of a risk-informed approach. Those who are new to the technology face two major challenges:

- 1) The training does not provide guidance in how to apply risk insights and technology into respondents' jobs. Respondents all said they need information from the training that creates a connection to the everyday work staff performs. Without this explicit examples of how to apply PRA techniques, it is likely that staff attend the training classes and then go back to their desks and continue to do their jobs exactly the same way as they have in the past.

- 2) Currently there are not enough opportunities for staff to gain practical experience in using risk-informed approaches. Thus, the expertise and understanding gained during training is lost through lack of use.

Another key area respondents mentioned was that not all managers have had adequate training in PRA to facilitate the process of moving to a risk-informed environment. The lack of middle or senior level management with PRA expertise was noted as a roadblock to success, especially in the South Texas exemption project.

Sample responses:

- *We need task-specific training. The training only gives you the basic concepts of PRA. What's lacking is how can I use this to do my job.*
- *Always going to be hampered until we have managers who know how to make decisions under uncertainty, under risk. In 26 years we have not gotten major insights to change much. Invest in the management structure.*
- *At HQ we have trained risk analysts who serve as consultants to everyone else. In the regions, we took certain inspectors and trained them in risk, gave them new tools. (Note that we didn't take risk experts and train them as inspectors.) We picked the best. The problem is that their risk knowledge only goes so far. But we do have a subgroup in the PRA branch that is dedicated to their support.*
- *Decision making was what I was going to say. Uncertainty decision making is a big part of this. Good enough versus perfect answer.*
- *We need to think about an interest-based approach. Get PRA people to see the benefits of codes and standards and get engineers to see the benefits of risk. Find common ground. See that we want to accomplish the same thing but in a different way.*
- *PRA training is pretty good. But building fault trees doesn't teach you how to calculate or understand the numbers behind the tree. Training should include what ifs - if you add this, you would end up with this - instead of letting people come to faulty conclusions.*
- *We put everyone through training. I thought it was good but I think what people really need is practical experience. I don't think that a risk-informed environment will be created through training. People need to work through real experiences and situations to see the benefits.*
- *The staff needs a better understanding of the basis for PRA data and that's not covered in any class.*
- *The staff has lots of training but middle managers assigned to oversee it (South Texas) had no competence or expertise. That didn't stop them from playing 'bring me a rock.' They would vote for things based on what senior management wanted, not based on technical knowledge or understanding.*

Stakeholder perceptions and public confidence

The primary focus of this project was an internal NRC assessment. However, respondents brought up relevant issues related to the influence of industry stakeholders, and the impact of

public confidence on NRC activities. Respondents noted that there are strong political motivations in support of the use of risk-informed approaches from industry and from Congress. Some respondents view this as a simple reality, while others view political influences with suspicion and question the motivations behind using risk-informed approaches. In addition, respondents noted that the perception of risk by stakeholders may have an impact on NRR's implementation of risk-informed approaches, particularly in light of the events of September 11, 2001.

Respondents were asked to assess how industry is helping and/or hindering the development of a risk-informed environment. Overall, the majority believe that industry has been an important driver of this change. Some view this as positive, some as negative. In some cases, staff members feel PRA has been emphasized to the detriment of safety concerns, in other cases they feel safety is enhanced because both the NRC and licensees can focus on high risk issues. In general, NRR staff believe that burden reduction is the driving force behind the use of PRA. While there are specific examples of real successes in burden reduction, some implementation issues have served to increase burden on both NRC and licensees. For example, areas of the ROP have proven to be cumbersome and the South Texas Project request for exemptions took two years.

Specific issues raised during the focus groups and interviews included:

1. NRC staff will always need to recognize that licensees are businesses and are motivated by enlightened self interest. They are concerned about safety but also their bottom line. It would be a mistake for NRR to rely exclusively on industry to identify all areas for action and change.
2. Industry is not a homogeneous group. Within this category there is a range of types of plants, variations in the type and quality of PRA, and broad disparities in the use of PRA by licensees.
3. NRR staff believes that industry has more access to top NRR/NRC decision makers than they do.

Sample responses:

- *Upper management has an "open-door" policy for external stakeholders. NRC staff gets upset when they have spent a great deal of time and effort negotiating with lower level counterparts in the industry over an issue to then have upper level industry management go and complain to NRC managers that they are being uncooperative or are not moving fast enough. The open door policy has helped push the process along but it has not helped staff morale.*
- *Licensees are coming up with a lot of good ideas for how to use risk. They push a lot of the risk-informed efforts. It is because of them and their efforts in PRA that we have gotten as far as we have. They come up with suggestions for the use of PRA, help with PRA standards documents. Very willing to go into pilot programs with NRC. Without*

these efforts the NRC staff would not have been able to do as much.

- *Industry is driven by cost and we have to be clear and realistic about that. They want to reduce costs and increase revenue. This means that they tend to focus on the application of risk in support of this objective as long as it doesn't go too far to jeopardize safety. NRC, on the other hand, wants to use risk to make things safer. And these are the areas we focus on. To a certain extent this means we are at cross purposes. We don't tend to have an integrated plan. Efforts tend to be scattered.*

In the area of public confidence, respondents discussed the concern that in general, the term risk has negative connotations with stakeholders, and that these perceptions may be even more problematic due to the 9-11 tragedy. NRR's move to a greater reliance on risk insights and technology may impact public confidence, which in turn could impact a risk-informed environment.

Sample responses:

- *"Nuclear risk" does not play well to the public. Our communication needs to start internally. Communicate comfortably and honestly about how and why. It all hinges on communication.*
- *They are trying to show that because the potential occurrence of an event is so low, you can make the change because there is a low chance of consequences. What they don't realize is –they is industry and management proponents within NRR -- if the situations we face were not low risk to begin with, probably we wouldn't be here and nuclear power wouldn't be here. .. If you were having nuclear accidents every week, you wouldn't have nuclear power. TMI had no health effects, but we had monetary effects that almost killed the industry. What they have not realized is that there are two different measuring sticks – one is scientific and technical – says that every now and t hen there is an accident and that's OK. But the reality is the other one – we're in a political environment so no accidents are OK.*
- *9-11 throws PRA up in the air. It totally shifted our perceptions. What are the chances of that happening from a PRA standpoint?*
- *PRA might allow a small amount of leak or a break if risk is shown to not be high, that is, if we can have no deaths and no harm to the environment. But the agency could experience criticism in spite of no deaths and no harm to the environment. An example of this is the case of that steam generator tube rupture at Indian Point. We suffered greatly on this issue due to stakeholders even though there was no measurable release of radiation, no harm to people or the environment, and we were able to meet all our goals. Are we willing to take the stakeholder consequences of using a risk-informed approach? We must remain in control of safety, either way.*

4 Key Issues Identified by Participants

In this section we provide a summary list of the issues discussed in the previous section that seemed to come up again and again in the interviews and focus group discussions. These issues have led to a number of the recommendations for further consideration given in the next section.

- Overall, respondents, particularly those in the regions, indicated there is general acceptance that PRA and risk insights have a significant and potentially positive role to play in the reactor program. However, many staff believe that burden reduction is the driving force behind the use of PRA.
- While respondents believed that increasing the use of PRA within the reactor program is a priority, they complained that there is not always a match of resources and incentives to help make a risk-informed environment a reality.
- Respondents felt that a clear, consistently agreed-upon definition of what is meant by "risk-informed" either doesn't yet exist or has not been adequately communicated across the reactor program. Concern about lack of standards for PRA applications was also frequently mentioned.
- Non-PRA staff have limited knowledge of existing guidance.
- A significant proportion of respondents from Headquarters noted that they don't see how risk directly relates to their job.
- There is general agreement among all the respondents that current PRA training classes are good for a basic explanation of risk analysis. However, they do not address the rationale for PRA, but instead focus on PRA processes (e.g., fault trees). This is seen as problematic in part because it does not help non-PRA experts understand the value of a risk-informed approach.
- An overriding issue that emerged during the focus groups and interviews relates to trust in the PRA technology itself. Respondents indicated that many staff and managers outside the PRA branch are not well-versed in the calculations, data or assumptions that feed PRA results. One barrier to acceptance of risk-informed approaches, therefore, is the lack of knowledge and experience with the technology.
- Staff across NRR asked repeatedly for PRA standards and for the opportunity to review industry created PRAs.

- The results of the focus groups and interviews reveal that an information vacuum has created uncertainty in the minds of staff and management about each other's motivations in regards to implementing risk-informed approaches and using PRA regulatory matters.
- Staff range from being experts at conducting PRAs to self-describing a lack of familiarity with risk technology and applications. In itself, that large experience gap is one cause of the communication and integration challenges discussed in this report.

5 Challenges for Consideration in Implementing a Risk-Informed Environment

As part of the focus groups and interviews, respondents were asked to answer the question: “What would indicate to you that a risk-informed environment had been created within NRR?” A broad sampling of the answers to this question is included in Appendix B. Common responses were:

- improved trust/confidence in PRA results
- real integration of risk and deterministic approaches across NRR
- increased communication and agreement among all layers of staff and management
- a thorough understanding of PRA, demonstrated by focus on the high risk issues, asking the right questions, and consistency in usage and definitions
- trust in the process, demonstrated by lack of questioning of motives/outcomes
- balanced education in PRA, balanced application of resources to PRA

NRR is working to create an environment in which risk-informed methods are integrated into staff activities, and staff plans and actions are naturally based on the principles of risk-informed regulation. Analysis of the issues raised during the interviews and focus groups reveal a number of challenges NRR may consider as it more fully implements a risk-informed environment.

Understand the systems approach

In the process of implementing change, each action and system will draw on and impact the others. Many of the challenges in moving to a risk-informed environment are interrelated and thus addressing one area can together have a positive impact on the overall process. For example, improvements in communication will likely increase trust, and integrating risk staff with deterministic staff may increase understanding of PRA data. Coordination and integration of staff can break down barriers, align groups in a common goal, and manage resources more effectively. A key message from the analysis is that NRR needs to identify and address all its systems in order to effectively move to a risk-informed environment. Issues to consider include:

- bringing together PRA and deterministic staff in hands on risk-informed experiences
- integrating PRA and deterministic guidance
- providing clear, candid, open communication channels with management and staff, headquarters and regions
- linking PRA approaches consistently
- include workforce planning, performance appraisals, and promotion opportunities as part of the new risk-informed environment

Provide clear, detailed direction for the creation of a risk-informed environment

Respondents reported they heard mixed messages and saw inconsistencies in NRR’s risk policies and practices. There is not a uniform, detailed vision from all levels of management on

what it means to be risk-informed, and there is not a consistent method or standard. Management direction sometimes is not aligned with allocation of resources. However, there is a strong commitment - NRR staff understand the what, and that the how will be difficult - they are looking for direction on the how. Issues to consider include:

- refining the high-level definition of risk-informed into clear, specific, detailed guidelines, job descriptions, tasks, etc.
- educating all management about PRA and risk-informed approaches and decision making
- resolving differences among managers about perceptions of PRA and risk-informed approaches
- creating forums for PRA and deterministic staff and managers to identify and resolve issues
- addressing the question of standards for PRA
- matching resources with PRA needs
- balancing priorities between PRA and deterministic approaches

Answer questions to address lack of trust

NRR staff who have limited experience with risk have misgivings about the PRA data, analysis process, assumptions, development and use of the final numbers. While lack of standards are part of this concern, understanding PRA analysis and application is central to the issue of trust, as is clear, respectful communication from senior management. Non risk analysis staff need opportunities to address their lack of familiarity with the technology. Risk analysts also have concerns about PRA quality as well as the misuse of PRA results to support “predetermined” answers. Issues to consider include:

- providing opportunities for PRA education and experience about both the data and the application of risk-informed approaches
- opening communication channels to encourage information sharing
- adopting frank language in internal communications
- encouraging cross functional problem solving
- identifying ways to get PRA analysts and engineers to share the benefits of deterministic and risk expertise and approaches with one another

Improve Training and Experience

The consistent and responsible use of risk requires an understanding of probabilistic risk assessment analysis, and equally importantly, its applications and implications. Respondents observed that while existing PRA training classes are adequate to teach technique, they do nothing to help an employee make the transition to applying that new concept to ongoing daily responsibilities. Both improved training experiences that focus on application, and more experiences with PRA tools are need. Issues to consider include:

- identifying ways to increase opportunities to work with PRA tasks, with industry and within NRR
- adding to or creating new training courses that provide instruction on qualitative

methods, decision making with uncertainty, applications, and the work relevancy of PRA techniques.

- setting up mentioning programs among PRA and deterministic staff
- publicizing successes in the PRA arena and providing detailed descriptions of what contributed to that success

Provide models for risk-informed approaches

NRR staff and management do not have a clear understanding of what is meant by risk-informed and integrated decision making. This creates a somewhat reactive climate of low trust and high concern. Issues to consider include:

- clearly articulating what is meant by risk-informed
- identifying and sharing successful risk-informed initiatives, integrated decision making, increased management attention, etc.
- listening to internal and external stakeholder concerns in real time (in addition to this evaluation process)

Improve communication

Improve internal communications to address concerns and misconceptions about PRA technology and its place in NRR activities, and to build consensus regarding the creation of a risk-informed environment. An effective communication initiative can allay concerns, promote consensus about risk-informing NRR activities, and facilitate ongoing change management. Inform and involve staff about past, current and future actions taken to implement a risk-informed environment and the rationale for those actions. Issues to consider include:

- promoting the use of strategic tools (including information systems, guidance, documents and meetings)
- opening communication channels across management
- forming cross functional teams to gather input and solve problems
- defining and sharing what is meant by risk-informed and why NRR is moving to it

Focus on Safety

Most groups have questions about the extent to which current implementation of risk-informed activities has achieved the desired results. Common questions include: Is the current use of risk analysis and insights improving safety or hurting it? Is there more or less regulatory uncertainty? Is there more or less regulatory burden? Issues to consider include:

- improving staff understanding of high risk/low risk areas
- understanding and monitoring internal and external stakeholder perceptions of PRA
- managing industry role and influence
- ensuring risk-informed approaches improve safety

Feedback and Evaluation

By nature, the process of creating a risk-informed environment is an iterative process requiring evaluation and feedback to facilitate positive progress. As additional technical review areas, work planning activities and decision making processes are risk-informed, unanticipated concerns and consequences will surface. NRR needs evaluation methods to enable these issues to be identified and addressed during implementation and to capture and share lessons learned. Easy, ongoing feedback between the staff responsible for risk implementation and various levels of decision makers is needed. Communication activities need to be evaluated periodically to ensure they remain effective. Issues to consider include:

- developing evaluation methods and documenting results
- establishing effective feedback mechanisms
- documenting successes and failures, sharing and addressing both
- continually focusing on the purpose of risk informing the reactor program

Conclusion

This evaluation report provides broad insights into internal NRR stakeholder perceptions of risk-informed regulatory practices. With nearly 100 participants in focus groups and interviews, NRR was able to gather information from a relatively large and diverse group of employees in the reactor program in a controlled manner. The results reveal a general consensus about many of the issues NRR faces in the use of PRA technology and risk insights. NRR staff were open and honest and their responses reflected a strong commitment and high level of energy regarding risk-informed approaches within the reactor program. There is general support for the use of risk in NRR activities.

Participants expressed strong beliefs and raised numerous topics, ranging from general concerns to specific technical issues. There have been a number of risk-informed successes that simply need to be communicated, and there is broad commitment to making improvements. Responses were remarkably consistent in the identification of barriers to a risk-informed environment during both the focus groups and the interviews. Managers and staff, risk experts and non-risk experts alike have all identified the same issues, and though perhaps unaware of it, they are united in their effort to address them.

The data in this report is robust and should be useful to NRR as it continues to implement a risk-informed environment. It will be important to capitalize on the energy and interest expressed by all levels of NRR staff to develop continued improvements to risk-informed approaches in the reactor program.

APPENDICES

Appendix A

Sample Questions from Interviews and Focus Groups

Sample Questions from Interviews and Focus Groups

Sample Individual Interview Questions

In general, what is your assessment of the attitude of management and staff toward NRC policies related to the use of PRA in regulatory activities?

What is your assessment of information and guidance about the use of PRA? Are people aware of Regulatory Guides (RGs) and Standard Review Plans (SRPs)? Are RGs and SRPs used?

How would you evaluate training in PRA? How relevant is the subject matter to work activities? Have the right people received it?

How would you describe staff and management experience with PRA? (e.g. knowledge of policies, practical knowledge about using PRA, direct experience with utilizing risk-informed approaches). In general, how would you categorize these experiences? (positive, negative, mixed)

Do you believe that PRA and deterministic approaches can be integrated? What areas have been most successful at integrating a risk-informed approach? Why? What areas will be the most problematic for integrating a risk-informed approach? Why?

What has been done to encourage the use of PRA in NRR activities? How successful were these efforts?

In general, how understandable are PRA data, reports, and results to staff?

To what extent are licensees and the nuclear industry, in general, helping or hindering the NRC's use of risk-informed approaches? Do you think the industry supports risk-informed regulation?

The objective of this project is *to create an environment in which risk-informed methods are integrated into staff activities and staff plans and actions are naturally based on the principles of risk-informed regulation*. Is this a realistic goal? Why or why not?

What would indicate to you that a risk-informed environment had been created?

Do you have any other comments or advice that would help us in this project?

Sample Focus Group Questions

The following questions (or slightly modified versions of them) were asked in every focus group.

Using only one or two words, how would you describe the use of PRA technology by NRR in its regulatory activities?

What recommendations do you have for management in developing and supporting other risk-informed activities?

To what extent are licensees and the nuclear industry, in general, helping and/or hindering the NRC's use of risk-informed approaches? Do you think the industry supports risk-informed regulation?

The goal of this project is to create a risk-informed environment. To what extent has risk been productively integrated into Regional activities? What would indicate to you that a risk-informed environment had been created? What are key elements of a risk-informed, integrated decision-making process?

If you had to pick one thing to emphasize from today's discussion, what would it be?

Sample Focus Group Questions: South Texas Exemption Experience

Describe what worked well and why in terms of using an integrated decision-making in response to the South Texas amendment requests.

What problems/issues did you encounter in trying to use a risk-informed approach? (Note: We are not trying to elicit specific technical issues, but rather attempting to identify overarching problems and concerns as related to the application of PRA in this situation.)

How has the South Texas experience affected staff and management views about the use of PRA?

If you had to explain the significance of the South Texas project to someone outside of the NRC what would you say?

Based on this experience (and any other relevant ones), what are key elements of a risk-informed, integrated decision-making process?

Sample Focus Group Questions: Staff Attitudes/Input

How would you describe staff and management experience with PRA? (e.g. knowledge of policies, practical knowledge about using PRA, direct experience with utilizing risk-informed approaches)? In general, how would you categorize these experiences? (positive, negative, mixed)

What benefits are there to using risk assessments in NRR activities? (Include both current and potential.) Are there applications in your area of expertise?

What concerns do you have about the implementation of risk-informed regulation? Do you feel these concerns are being addressed?

What has been done to encourage the use of PRA in NRR activities? How successful were these efforts? What can management do to support the responsible use of PRA in NRR activities?

Sample Focus Group Questions: PRA Staff Attitudes/Input

To what extent have the benefits of using PRA/risk assessments in NRR activities been realized? What are the areas of most success? Where are problem areas?

Do you think the use and acceptance of PRA within NRR has changed within the last few years? Why or why not?

What are some of the commonly held perceptions/misconceptions about PRA? Is there any truth to these perceptions? Have they affected how you do your job?

What is being done, or can be done, to improve confidence and trust in PRA results among non-PRA experts at NRC/NRR?

What concerns do you have about the implementation of risk-informed regulation? Do you feel these concerns are being addressed?

What is your assessment of information and guidance about the use of PRA (Reg guides, SRPs)?

Sample Focus Group Questions: Configuration Management Experience

What have been the impacts of the maintenance rule and technical specification implementation?

- on safety
- on regulatory burden

- on industry/NRC relationship

What issues or problems have come up regarding the use of risk analysis in configuration management? How have these issues been addressed?

What do you think about the arguments for on-line maintenance? Do you think that risk and deterministic insights can be integrated to address this issue?

What precedents regarding the use of risk analysis have been set during the development and implementation of the maintenance rule? What have been the ramifications?

Is this [maintenance rule and technical specification implementation] an example of successful integration of deterministic and risk-informed approaches? Explain

Sample Focus Group Questions: ROP Experience

Is the ROP more effective than the old oversight methods (conservative/inspections/fines)? Explain why or why not.

What concerns do you have about the implementation of risk-informed regulation, in particular the ROP? Do you feel these concerns are being addressed?

How do you assess the objectivity and predictability of the new ROP? To what extent has its potential in this regard been achieved? Does the ROP result in consistency?

What have been the most successful elements of the ROP implementation? Is the ROP an example of successful integration of deterministic and risk-informed approaches? Why or why not?

How has the new ROP affected NRR staff perceptions about the use of PRA?

What can HQ learn from the experience of implementing the new ROP? What issues are faced at HQ that are different from the Regions?

Sample Focus Group Questions: Regional Focus Groups

What have been the most successful elements of the ROP implementation? The SDP?

How do you assess the objectivity and predictability of the new ROP? To what extent has its

potential in this regard been achieved? Does the ROP result in consistency?

What concerns do you have about the implementation of risk-informed regulation?

- In particular the ROP?
- In particular the SDP?
- Do you feel these concerns are being addressed?

What improvements would you suggest? What changes/suggestions would you recommend to management at HQ? At the Regions?

What issues are faced in the Regions that are different from HQ? What can HQ learn from the experience of the Regions in implementing the new ROP?

How has the new ROP and the SDP affected NRR staff perceptions about the use of PRA?

- In the Regions?
- At HQ?

What benefits are there to using risk assessments/PRA? (Include both current and potential.) Be specific.

- Maintain Safety
- Increase Public Confidence
- Make NRC more Effective and Efficient
- Reduce Regulatory Burden

Appendix B

Sample Answers to Questions

Sample Answers to Questions

This appendix lists responses from the interviews and focus groups to questions that were asked of every respondent.

Ice Breaker Question

The opening, or ice breaker question used in every focus group as well as some of the interviews was the following:

Using only one or two words, how would you describe the use of PRA technology by NRR in its regulatory activities?

In the focus groups, the question was answered in a round robin fashion - each person said their answer one at a time without interacting with or responding to the others. The answers are listed below in no particular order.

Limited and different throughout the division

PRA is OK as long as it is performance-based

Supports relaxation in requirements

Never used PRA, it's not favorably looked upon

Good tool to help me evaluate whether or not exemptions should be allowed

Not much experience using PRA (though have been trained in it). It's a promising application or tool to use in future, at this time we have the cart before the horse.

Useful but not the only tool (impression is that PRA is "it" the new thing, but I think it's only a tool).

I do deterministic work, have not used PRA. It seems to be at odds with the deterministic approach - could be useful and I don't know how it's supposed to interact with what I already do deterministically.

Inconsistently used throughout organization, polarized into 2 camps (either you don't like it so you don't use it/or you think it's the only thing there is).

It (risk-informed regulation) sucks

Extremely frustrating

Mismanagement, haphazard

Politically driven and unsafe, lack of communication

Unsatisfactory professionally

Confusing, outcome predetermined

Challenging and frustrating

Frustrating

Thin ice

Failed opportunity

Difficult and worrisome
Not good
Pervasive but weak
Evolving, Slow
Using it but they don't realize they are using it.
Better and Incoherent
Growing but uneven
Inconsistent and amateurish
Good within ROP
Appropriate, especially with resources
Needs more flexibility
Caused us to have a level playing field, cumbersome in areas where risk is not well defined
Difficult to deal with and still needs some work
Good. I think it does need some definitions like what does credible mean, how do you determine if something is credible, needed.
Still learning
Evolving
Cumbersome, overall good, but some areas are cumbersome for implementation
Spotty
Source of rationalization of decisions
Too much
Makes sense (in theory)
Current SDP phase 2 process is cumbersome and inaccurate
Cumbersome and accuracy is questionable
Cautious improvement, we have to use it carefully, can be improved
I've never known anything else
Helpful in samples, but difficult to work through
Good and extensive
Cumbersome
Problem with whole program - not predictive
Can distinguish from inside the ballpark to outside the ballpark
Poor
Not good
Spotty
Spotty
Moderately

Risk-based (as opposed to risk-informed)

Fair/ok

Limited

Reasonably well applied

Limited

Limited, but better

Cumbersome, but best we have

Tremendous potential

More meaningful regulation

Ideally suited

Very effective

Part-way there

Very high potential

Outta control

OK if done right

Very useful but getting there

Difficult and informative

Misguided

Under development

In some ways it has been really effective. In other ways it has wasted a lot of resources. Both things.

Evolving, under development

Changing, evolving. Can't evaluate it yet

Useful

Unseen in health physics

Potentially useful, unreviewed

Help focus

Useful

Difficult, confusing

Challenging, new

Difficult, focusing

Interesting, insightful

The goal of this project is to create a risk-informed environment. What would indicate to you that a risk-informed environment had been created?

When you are making some assessment, you are asking if the activity is worthwhile from the point of risk or safety.

Your questions presupposes - the problem is to do what, risk-informed to do what? We have not gone out to understand the size of the problem we want to address. What are our problems with the use of risk? We need to do this so that we can go back to understand how to fix them.

We do have our 4 pillars to guide us. They are high level, but they all come down to safety. Risk is being used get safer. But we don't agree on what is safety.

I don't want to have heartburn every time I go and talk to a deterministic person or manager. I want a common understanding of philosophy and process. Want sense of working together. Realize that we are working toward a common goal.

It starts with senior management and permeates down. If the agency really wants to be risk-informed then it needs to bite the bullet and put the resources and education into it, start talking to each other. Mentioning. Biggest problem is that NRC is not coherent. We don't have a complete process.

It shouldn't be dependent on the outcome of a PRA analysis. There should be allowance for other factors than the risk piece.

We would have better communication between the risk people and the technical reviewers.

To integrate this we would want to do a better job of looking at the SRP, and integrate risk criteria into each section of the SRP rather than a separate SRP just for the risk. I understand we have a draft SRP for PRA, but that would still be separate. We need to look at the way we do our work and revise the SRP so PRA is part of the process.

There has been no discussion on how you would integrate risk-informed into deterministic. We always start with an assumption that 100% of the core has melted. There is NO discussion on how/if you should change that if you go into a risk-informed environment. Do you risk inform the accident scenarios? Do you make them more realistic somehow? That goes with comments on integrating SRP's so you know what you're doing day to day. Right now, you do the 2 analysis completely differently. I guess then the PM reviews and says, "OK." I don't know what they would do if the PRA said something different from the deterministic answer. In my area (dose analysis) there is no integration. We need to integrate everyone; we can't have deterministic outliers. It's not clear what risk-informed exactly means in a practical sense.

We need to incorporate PRA guidance into guidance we're already using.

We need a standard procedure for how to break out info from a review. For the dose area, these are the kinds of things you could apply risk insights to. I don't know if we can write that, as a practical matter, but that's what we need. I thought we were thinking about risk informing all our regulations. But what I'm talking about is internal processes, reviews of a licensing action. If it comes in with both PRA and deterministic numbers, how do they/can they be integrated? Risk will tell you not to look at it; deterministic will look at the worst possible case to identify some margin of error designed just in case, even if it's very low probability. As a practical matter, I as a technical reviewer, need guidance - what guidance is provided to determine this integration (none)?

If nothing significant happens, then what would be the goals of the program for the next 5 years? The risk-based performance indicators are going to be a big part of the program. Everyone would have full IPE on their laptop instead of having to use those crazy work sheets.

We'd do SDPs on the PC (instead of on the forms).

We'd have an online risk monitor like we use right now, only question we'd have is 'are assumptions valid?'

Branch chiefs would have a say on SDP all the way up through the decision, no SERPs, no HQ involvement in decisions. We would just audit them for consistency. Put a directive out from Sam Collins that says it's OK to do it that way.

Need to be looking hard at effectiveness of our inspections, not many findings associated with them. What happens when you're in your 5th rendition of the SSDI and PMDR and you don't have any different findings, but there is a change? Some inspection procedures should go away and move assets to areas where there are findings.

More licensee self-assessment, more performance indicators.

There are going to be fewer people/resources, need to move back to licensee self assessment.

Lots of historic pet peeves that are still in the program, these need to be eliminated.

Some inspectable areas that would no longer be in there that are today, and some new ones would be added. It's a living process.

NRC will be focusing on the most significant things.

People won't say give me a number before 4pm

We would be recognizing the risk uniformly.

We would look at significance first. Wouldn't have to look at it at the resident inspector level.

Instead of having people coming to PRA branch, they will do their own analysis.

When regions let go of crosscutting issues.

When people use SPAR models individually and challenge industry, that would be a good indicator.

People would be proficient with the SPAR model. And it would be consistent with thinking.

When we have tools and people are able to use them. Need group of people to do detailed analysis beyond models. We can't just rely on models and experts. We need tools that can be used by the individuals that don't have to be done by experts. We don't have them all, haven't even thought of developing them. When we have them and they are available for use by everyone than we will be risked-informed.

We have no processes for merging defense-in-depth with risk.

We need to come up to speed. Engineers have to take statistics.

The way people ask questions, what they worry about. When some people talk about components instead of facilities and safety functions, I know they are not risk-informed.

Risk puts components in a safety context. Think about probabilities and consequences as opposed to codes and standards.

The ultimate test would be if people in the staff who had certain responsibilities came up and said that based on risk, we need to do less in that area of responsibility.

It is better to look at what hasn't been done. When we promote people we do not look at whether they have been using a risk-informed approach. It isn't part of the evaluation, award structure. There are not a lot of incentives to use it. But we have specified when it has to be used and provided the tools to do it. But we are not using it as much as we could. If we had the right RIE they would be coming up with ideas about how it might be used. Now everyone uses it to the extent that management says to, there is no creativity or initiation from staff.

Having people ask us the right questions. People not being worried about treating all plant incidents in the same light. Shrug off things that don't matter.

Hear less complaining about risk taking over their lives.

Basic enough understanding, trust in technology. Not always questioning motives of outcomes.

When I could say and understand and know why they're doing this and can't point out something that would compromise the health and safety of the public. When prioritization would reflect the reality of why you're doing PRA, not a statement about how much safer it is.

Is everyone using it in a consistent way?

The environment really exists now. Senior management asks the risk questions. The guidance is there. The issue is that the industry needs to be risk-informed. It has to come from them. They need to start to take advantage of it.

Good question. We haven't defined complete success because it's still developing. It'll be when we get to the point when we can say we have high quality information available to us and stakeholders, and we have processes available to apply that risk-informed info to our decision making, and people are doing that routinely, and the process is done in a way that is integrated with the 4 performance goals, (maintain safety, reduce burden, be efficient/effective, stakeholders are aligned). We can come to the right decisions and be perceived as a strong credible regulator. The philosophy of when we make risk decisions, the consequences are understood and stakeholders still support us and industry. That reflects back into industry and the sciences. It involves a lot of people. We're challenged to take this on, and control it not let it happen to us. We're working toward that, there are still challenges remaining and we're working on that. We're doing change management, working on processes, writing standards for PRA, and working with stakeholders about how we do our work.

We'd know it if people really embraced PRA and the results, and could feel comfortable with that, have confidence that what PRA was telling them was reasonably accurate. If the skepticism went away, we'd know we had gotten there. Now, every time PRA is mentioned, people shudder. Once we get to the point that results of PRA have a high level of confidence, then we can use it to formulate policies. We need better understanding of the basis and assumptions for PRAs. How could we do this? With better communication between PRA practitioners and tech staff and by getting the staff involved in PRA processes to a level that there is some trust (not personal trust, technical trust). PRA people are "believers" -- the rest of us are skeptical. Our staff is very technically competent and can be convinced if you provide a reasonable technical argument and basis. Now, we face fear of the unknown -- PRA is like black magic. They are so committed, and the staff feels that PRA'ers have too much confidence in the results. Just because something is low risk doesn't mean you can walk away from it. You

need to think about the consequences, either in 1 million or 10 million years. You have to weigh this in the PRA results. PRA folks would say it's 10 to the minus 7, so don't worry about it. But you don't know when that chance of 10 to the minus 7 will happen - next year, in 20 years, a million years?

Within the management chain: need common definition of a risk-informed environment and need process that includes qualitative and quantitative data (qual. more in risk aspects).

People will not still be saying "I know what the PRA says (that's it's not important), but I know in my gut that it is important."

When questions are already risk-informed before the question is asked (by management). I shouldn't be asking my staff to look at questions I know are not risk significant.

I think you would know because it would have the buy in of public politicians, NRC and interest groups - this is the way we measure safety and we recognize that failure will occur and we're willing to accept the infrequent failures because the consequences are fairly minimal. It would be successful if when you tried to apply your risk arguments you have an answer that says you can't do this because it's risk significant. There never seems to be a failure. We have a pass/fail for risk-informed, and it never fails. Hopefully, we would have more data. Data isn't just about letting time go by, we need more data to have a good risk-informed program.

If you had to pick one thing to emphasize from today's discussion, what would it be?

A lot of work still needs to be done.

The same thing I said before - before I can have confidence in the process, we need standards.

I think we do have standards and reg guides. We need a better SRP that integrates both.

We don't have standards and they need to be developed for them (PRA). How did you do the PRA? Where did they get the numbers, where did they apply it? Need those standards.

There needs to be more practical guidance to the technical staff on how you do a risk-informed review.

What really is meant by risk-informed and how do I really accomplish that IN MY JOB.

There is a lot more inconsistency among the staff than I realized, shows we have a lot of work to be done.

Risk informed regulation is a good tool. Non-believers don't have a full appreciation of it. We can't truly understand what the PRA'ers are trying to do. Maybe we need more training. That's why there is so much passion about this argument. We need a high degree of awareness. We are not aligned with risk-informed regulation right now.

I've been here 23 years, and this was the most mismanaged program [South Texas] I've ever seen. It was only due to the hard work of a lot of staff who suffered threats from management that we were able to hold our line so the agency was not a laughing stock in terms of credibility.

I would like us to somehow work with the PRA guys and management to find a way to use the tool in a technically responsible way. Like if we don't know certain things we admit that in the analysis or put controls in place so we know our assumptions are OK. We need some kind of joint venture so we can make the PRA a good engineering tool and have it reflect what we are trying to do as regulators. If we're going to assume a 10% change in reliability, we need to have a way to manage and monitor that.

I'm taking away a challenge to management - if this was as poorly managed [South Texas] as this group suggests, I think we still have a huge challenge of managing change in the future.

I don't think the staff understands the difference between risk-based and risk-informed. We'll always have this problem until we can get everyone to understand that. We need more training to attack that.

It [South Texas] was too much too soon. Had we taken gradual steps it would have been better.

I get the feeling that most of technical staff can't keep up with what's going on with Risk Informing initiatives. All these SECY papers, meetings, etc. - it's hard to keep up with that and get your regulator job done. I'm not sure what the solution is.

With PRA you can prove anything and can't prove anything at the same time. It's too flexible. Management says you have to prove the licensee is wrong or you can't disallow something. But with PRA you can't do that. It's not a good way to do business.

South Texas is a bad example of risk-informed regulations and a bad example. The biggest casualty is not just risk-informed regulation, but it's the deep-rooted seeds of mistrust among staff and management. I thought RILP had learned a lesson, but maybe not. I don't agree with everyone, but I respect them. It's a big problem if we can't communicate because of distrust.

The agency as a whole needs to be more flexible about learning lessons in mid project. South Texas was a train and we couldn't stop it (heads nodding, management and staff). We should have been able to make some changes mid course. We should have stopped and said we have a problem we need to resolve before we proceed, even if that meant South Texas had to be deferred and do what 7411 said - do risk-informed in little pieces instead of one big one. It

shouldn't be that there is nothing we can do to change things mid project.

That's because the last several years we've been pushed to meet schedules.

We need more PRA experts into staff. If you start at bottom then it will make impression. More people speaking risk correctly.

Management that allocates resources to recognize where there are needs and deficiencies.

Senior managers to realize that these changes are not going to happen in a year or two. Have vision or where we are going. Not just a budget for the year. Long-term investment.

Sick and tired of the two dichotomies. Learn and understand how two blend. Real integrated decision making. Big step forward if we can have discussions to express doubts and then get answers.

More PRA experts, necessary but not sufficient. Always going to be hampered until we have managers who knows how to make decisions under uncertainty, under risk. In 26 years we have not gotten major insights to change much. Invest in management structure. That will causes them to recognize that they need more experts and all these other things we are talking about. I think it needs to come from top down. Like with ROP process.

Decision making was what I was going to say. Uncertainty decision making is a big part of this. Good enough answer versus perfect answer.

I was basically going to say education of upper management. But also commissioners and ACRS and their staffs.

We need to stay the course, we need to stay on the risk-informed path. Tweaks are causing us to vacillate; we need to move forward.

For the non reactor SDPs, until we refine those and get them where we want them to be we ought to go back to traditional enforcement till we're comfortable they work.

We ought to drive decisiveness with time frames where we have yellow or white issues, don't let a licensee draw us into a long research project. Set a time frame and process, be decisive and move forward.

I agree with that. I've been burned with non-reactor SDPs. We've really hurt ourselves in that area.

Keep the process risk-informed vs. risk-based. We keep struggling with that.

I'd like to see the SDP process be the same as what we call our findings - a step change, not just a graded approach, we need a change on how we deal with the colors or we should change the definitions. We need consistency in the process of SDP and the implementation (e.g. if we say whites are a big deal, correspond level of effort/resources with the definitions).

Responsiveness/timeliness of bringing closure to identified issues. Too much emphasis on trying to find right answer. You need to make a decision and move on. Don't let the perfect be the enemy of the good.

We are willing to use the tools that were given us but want some consistency and some feedback mechanisms. We would like to see some progress in getting the problems fixed.

Set the criteria and let us apply it, keep it the same for more than a quarter. A lot of energy is being expended in better areas. Sure the documentation is important. For the public. How to phrase things does not deserve the consternation that we are going through. Other than that the process is good. Give us more plant status time. A lot of things that we could be doing. We are smart people give us a chance to utilize that.

We need some definitive leadership. We have not even talked about the Phase II worksheets. They have not been benchmarked. No resources committed to getting things that work.

Give answers with the uncertainties. Know how to use the tools that we are using.

Let go of the past, start the future

Program flexibility

Emphasize to follow the process (as far as it works and is accurate and efficient) and come up with a way to get some efficiency back by dealing with thresholds issues - be able to go beyond the process when it doesn't work

We do not really appreciate the uncertainties in calculating and estimating risk. Sometimes those uncertainties are incredibly important. Example - estimating risk from fire - its based on lots of assumptions, this is lost when we look only at nominal risk. The uncertainty is so broad the risk could be much beyond the risk that is being advertised for a specific scenario. It's easy to over estimate risk. Takes a lot of work to quantify risk correctly.

Replace SDP phase 2 with days to light/yellow/red chart

The ROP has been step in right direction but it might tend to marginalize some of our activities in the future. Have good framework to reduce reg. burden. All right now but a concern going forward.

Leaving it stable for a while. Give us period of time without revising.

How we can move ahead, factor in more of the input? Checks and balances. We have been doing this and need to continue to do this. There are reasons for why things are in place should be careful before doing them.

ROP has helped utilities to focus on most important.

What HQ can learn - prioritizing what activities you work on has more safety benefit overall. There are constraints in making changes. We have more flexibility than HQ.

Let go of the old. After two years we have a sound basis to say that is an improvement can do it. The elements of the old that we have hung on to we don't need to any more. Matrix gives us an adequate tool to determine what additional inspection resources we should apply. The performance labels we used apply we don't need any more.

I want a needs statement from Sam that my organization is going to be risk-informed. Stated with force.

I need a common understanding of what it is.

Commitment from management. We have had a policy statement since 1995 need implementation and commitment.

Agree with needing commitment from management

Working staff should be able to know how to use it

PRA branch needs people and money and time to do assessments.

Staff is deterministic. PRA branch is risk-based. We haven't integrated.

Need to be goal-oriented not process-oriented. Check off box that it is risk-informed. Need to focus on goal of getting people the knowledge to use this and be risk-based.

To go with caution about using risk and regulations especially in this area (tech specs, MR).

Make sure that we understand what we're doing, what tools we're using, especially the PRA, proceed step by step.

PRA is a complement to decision making, doesn't do away with defense-in-depth. Industry seems to want that.

We need regulation about quality, use and practitioners of PRA.

I agree. What is central is we are missing the regulation that requires licensees and industry of a certain quality.

Integration for configuration control, this has been a success. Should serve as a model for those trying to bring risk into their decisions.

Need more and better communication with licenses, particularly through the owners groups. (He said the owner's group interactions had been helpful to him.)

No change comes without risk, and it's the senior managers' responsibility to communicate to staff they are responsible to shoulder that risk and share it with the staff. Leadership.

Continue making progress.

Go back to Rules-based - we need a Rule that sets stage for industry and us on quality and scope, qualifications for people involved, and what does NRC have to do to follow it. I think this would get senior management to step forward and take responsibility. Don't ask industry, tell them we're going to make the Rule and then just get their input on it.

Final issues are deep and fundamental and will relate to how people think about themselves and reactor safety.

I have two things - 1) in using the argument of low probability we need to understand that they wouldn't be operating to begin with if it wasn't already low probability. There would be no industry without already low probability. 2) Both are important - you have to have a metric that demonstrates that some of these arguments will fail. If using a PRA and there is never a failure then we're not using the right tool metrics - something is wrong with our process.

NRR needs to work towards a truly blended approach of risk-informed and deterministic methods for the Oversight program. Right now I see a very heavy dependence on risk, almost risk-based, on the reactor side. And almost purely deterministic-based on the security and EP side. We have two extremes with HP falling in the middle. Need to get to a truly blended as

opposed to two extremes that we currently have.

Expedite completion and resolution with all of the issues associated with the SDP, so that we have a program that isn't in draft form, so that it is focused and you can count on it. For this you also need to resolve an administrative program, 610 Star that supports and focuses on important issues.

Transition from risk-driven to risk-informed.

It seems to me that NRR is not aware of specific problems that each of the regions faces. I may be wrong, but I haven't seen the things that we have to contend with incorporated into the program. I don't know what has changed significantly in the past year, for instance, based on issues that the regions face. There needs to be better communication.

Three times someone turned in the same comments and it feels like he has been ignored.

Allow for regional control of inspection program, control over your own destiny.

It's needs work. Fix or junk.

Need to continue developing the SDP program. Don't stop now. It is currently going too slow.

Need planning tool for ROP

Don't forget deterministic principles. Should focus on PI&R to ensure robust self-improvement program.

Need to continue to improve already good communication with HQ.

Learning changes can be burdensome.



April 22, 2002

To: Bill Borchardt

From: Leila Peterson, WPI
Evelyn Wight, WPI

Re: Regional Focus Groups ROP Evaluation Feedback

As part of the Office of Nuclear Reactor Regulation (NRR) Risk-Informed Environment (RIE) project, WPI conducted an evaluation of NRR staff perceptions and views of risk-informed regulatory approaches. The evaluation process comprised multiple focus groups and individual interviews at headquarters and in the regions. We conducted both experience-based and topical focus groups using customized questions designed to elicit personal, real-world responses and opinions from participants. On April 2, 2002, we presented our evaluation results to the NRR Leadership and Executive teams. One outcome of that presentation is this memo which summarizes key points raised within the regional focus groups that specifically pertains to the ROP/SDP process.

We conducted focus groups in each of NRC's four regions:

- Region I - King of Prussia
- Region II - Atlanta
- Region III - Chicago (conducted by teleconference)
- Region IV - Arlington, Texas (conducted by teleconference)

The regional focus groups were experience-based and designed to gather input on the ROP/SDP process. Two focus groups were held in each region -- one with managers, including division directors and branch chiefs, and one with a range of staff members, including engineers, inspectors, health physicists, reactor analysts and inspectors-in-training. (A combined management and staff focus group was held in Region III. Regions III and IV focus groups were conducted by teleconference.) Direct quotes from respondents are included in italics.

Key Points Raised by Regional Focus Groups

- Overall, respondents expressed general support for the ROP and the use of PRA by the NRC. This support appeared to be less ambiguous and more consistent than with headquarters respondents. In particular, they said the new process is more predictable and focuses all users on the same areas, including inspectors, management and industry. The new process also minimizes individual inspector idiosyncracies. Specific things respondents agreed were beneficial included: increased consistency of findings, a 'common language' and structure, focus of resources on the right issues, and a foundation of objectivity for planning and discussion. When asked how the ROP and SDP have

affected staff perceptions about the use of PRA, respondents reported a positive impact. In general, respondents said the new process was an improvement over the old.

- The SDP appeared to be more problematic than the ROP. A frequent word used to describe it was 'cumbersome.' Several regions noted that in practice, too much time is spent on white findings. *"If it is greater than green, like white, low risk significance -- we advertise those as not a big deal to engage upon, but if you look at the processes we go through, we have conferences on the white issues, process takes forever, process is cumbersome."* In addition, a large number of respondents noted that the SDP Phase 2 is problematic with regard to assessing risk in systems support. And a common complaint was the difficulty in using the current worksheets.
- In the discussion of the pros and cons of new limits on the level of documentation included in inspection reports, some respondents acknowledged that the new process has improved effectiveness and limited the ability of individual inspectors to nitpick. Others noted that the lack of documentation will prevent warning signs that a problem is developing from being noticed. For instance, a 'no findings' result means there is no documentation to review if a problem surfaces years later; predictability is reduced.
- Despite any concerns about the process, respondents in all four regions suggested that the ROP be left alone for a specific period of time to allow users to become familiar with it. The frequent adjustments made to date have made it difficult for regional users to determine exactly where problems lie that may require significant changes to improve the process.
- There were two exceptions to this point. (1) Respondents generally felt that revising the SDP has been too slow, and (2) specific problem areas that have been raised repeatedly need to be addressed. *"We dump things to HQ and our perception is no one is tracking it, its on no one's to do list, they only work on it when they get around to it."*
- Regional respondents raised concerns about areas in which PRA is not as strong, such as crosscutting issues such as plant security and fire safety. This concern was shared by respondents at NRR headquarters.
- While recognizing that the ROP is more objective than the old system, respondents expressed concern that there was no room for qualitative judgments to be captured. One result of this is that resources and time are wasted trying to come up with a number in a borderline issue that everyone recognizes is not important. Regional respondents also felt the system would benefit from more flexibility in the areas of scheduling and use of some discretionary resources. *"There is a hole in the program - if we calculate risk and find that its white and the licensee says I've done enough, I'm not doing more, I'll accept white, there is nothing in the program that says OK. Our program says you must reduce that risk."* The process at times indicates actions that require more resources than are budgeted for. *"We should spend money on keeping plants safe not in analysis to show that plant is green."*

- Respondents said they felt more flexibility is needed to accommodate results that don't match expectations. *"We spend so much time agonizing over the numbers. The number comes up white and we don't think it is, but we can't convince management otherwise."*
- Respondents reported experiencing a lack of consistent approach from headquarters staff. For example, responses from RES and NRR headquarters staff conflicted at times, and some comments have been raised repeatedly over several years without resolution. *"There is a lack of clear progress and milestones in closing out these issues that have been around for years. That's where the focus should really be, not asking again what are they."* Respondents also noted they send the problems they can't solve to headquarters, so it is not surprising that the answer may be slow in coming.
- Timeliness of responses to licensee questions was noted as a professional concern. *"We have to face the licensee and say 'you know that issue we've been working on for 3 years, here is the answer (finally). Frankly it's embarrassing.'" Related to this concern, some respondents debated the issue of program control and noted the difference in motivations between headquarters and regional staff. "HQ wants the perfect answer and will spend months developing it. Region wants an 80% answer that is good enough because we want to push it through the system. HQ developed the process, they want it to be perfect, but we don't need it to be perfect to make decisions."*
- Regional respondents encouraged headquarters to provide more opportunities for staff and decision makers to gain experience and understanding of the new and changed reality in the field. One concern was also surfaced about the lack of field inspection and oversight experience among senior managers both at headquarters and in the regions. In a related note, respondents encouraged headquarters to integrate its PRA and non-PRA staff to increase effectiveness. *"The regions have worked hard to integrate, and not have a cadre of specialists - HQ should do the same thing."*



April 22, 2002

To: Bill Borchardt

From: Leila Peterson, WPI
Evelyn Wight, WPI

Re: South Texas Project Request for Exemptions Evaluation Feedback

As part of the Office of Nuclear Reactor Regulation (NRR) Risk-informed Environment (RIE) project, WPI conducted an evaluation of NRR staff perceptions and views of risk-informed regulatory approaches. The evaluation process comprised multiple focus groups and individual interviews at headquarters and in the regions. We conducted both experienced-based and topical focus groups using customized questions designed to elicit personal, real-world responses and opinions from participants. On April 2, 2002, we presented our evaluation results to the NRR Leadership and Executive Teams. This memo responds to a request made during that presentation for an overview of key points related to the South Texas Project request for exemptions pilot project (South Texas) that might be useful in addressing Option 2.

The following points are derived from focus groups that included staff who were involved with the South Texas effort, and from several interviews with NRR senior managers. Direct quotes from respondents are included in italics.

Key Needs Identified Based on the South Texas Experience

1. Clear direction is needed. Before starting a major new RI project, NRR staff need to hear a clear message from management describing objectives and rationale. *"We started to build a bridge (and we know how to build it) before there was agreement on where it should go." "As a manager, I pushed back up the chain, but I think the real issue was the fundamental ground rules."*
2. Open communication is essential. For example, both staff and management would benefit from explicit acknowledgment that the new RI process will be challenging and at times, difficult. Also, a rapid-response decision channel for dealing with unanticipated issues that arise must be incorporated into the process. Finally, no-retribution, open conversations based on staff concerns about external influence and management motivations must be a part of a major culture change project such as South Texas.
3. Strong and consistent leadership is required from all levels of management. This includes:
 - access to all levels of management
 - consistency of message and goals among managers and levels of management

- clarification of roles and responsibilities and expectations during project
- clarification of who owns responsibility (and consequences) if something goes wrong at a plant based on a RI decision
- all levels of management need to have technical and RI competency

"We didn't communicate well. Management did a great job of playing both sides against each other. If you are going to take treatment to nothing, you have to deal with cross systems, but the issue is the different assumptions of various levels of management and staff. "

4. There are questions about the viability of Option 2 that need to be addressed.

Discussion Points Raised by Respondents

- **Need to Improve Communication.** Communication between staff and management appeared to be a significant issue both during the two year South Texas process and following it. Staff reported that communication got bogged down and that information and concerns were filtered out rather than being sent up the management chain. In addition, although communication issues were eventually addressed, respondents indicate they feel that their concerns were never heard by senior management, and that NRR did not learn from the South Texas experience. Interestingly, the interviews with managers demonstrated that they are in fact aware of the questions, issues and problems raised by and during the South Texas process. This discrepancy highlights the need for improved, increased and more consistent communication among all levels of NRR staff and management.
- **Need to Clarify Expectations and Responsibilities.** All respondents agreed that a significant drawback for the project was that management had not adequately clarified expectations and responsibilities. Respondents reported that South Texas was resolved quickly after staff responsibilities related to ensuring functionality were clarified and senior NRR management became involved directly with staff.

Excerpt from South Texas Focus Group:

Respondent 1: One of the big issues was when we started we assumed the SER was going to look like the others, have the level of defensibility and detail you'd accept in other SERs. I expected to see what I'd always seen. That detail and what you asked questions about was severely cut back.

Respondent 2: I agree with that, it's similar to the issue about assumptions. We made a decision we'd move from the staff justifying it and move that burden to the licensee. We all nodded, but that was not taken to heart. That is the fundamental cause of the disagreements of all these issues - whether the burden is on the staff or licensee.

Respondent 3: I tend to agree. It was a reversal of roles and responsibilities. There was a lack of leadership in changing the way we'd conducted business for years. We did the work for the licensees that staff had never done before. We worked for them, helped them develop a project and we weren't sure how it would work out. The licensee didn't do what they were supposed to do. We had to guess what was on their mind. Normally, we react when someone tells us what they want (we don't try to figure out what they want).

Respondent 1: We said it was OK for the licensee to determine how to do things. Our normal process is we verify what the licensee says. [Respondent 3] was saying this time we had to put in all the details we wanted. This time we couldn't get the information we needed, given the assumptions. So to make the review be thorough enough you had to make the detail visible. Normally, they (utilities) would have already provided those details to the NRC staff.

- **Negative impact on RIE.** Respondents agreed the South Texas experience has had a negative impact on creating a RIE. *"We have to admit this was a bad example of risk-informed regulation. If we do that, we will stop hearing the angry voices. There are many positive examples of risk-informed regulation decisions, but at a much smaller scale, and now South Texas is the biggest one, the only one on people's minds."* A related concern is that industry will look at the South Texas experience and not want to get involved in an unpredictable and lengthy process.
- **Incorrect Perceptions of Staff Views on PRA.** Both staff and management believe that there is more support for the use of PRA than NRR staff is given credit for. *"I think that the staff is more open and willing than they are given credit for. We [management] put the staff into a box on the South Texas project. We asked the staff to find that the industry plan was good but also said they had to find that functionality was proven across the board. For some components the licensee didn't believe it needed to be based on risk and it wasn't in the plan."* *"We were not these wide-eyed radicals that are just against risk informed regulation. We'd been doing this for years and we had specific technical things we needed our division director to understand; within engineering that worked well."*
- **South Texas was surprisingly difficult.** Everyone reported that the South Texas experience was much more difficult than had been anticipated. Frustration levels were high both among management and staff when the expectations did not match reality, though for different reasons. Although there is some agreement that the outcome was good, there have been some positive lessons learned, and some movement toward implementing risk informed approaches, significant frustration and emotion is still prevalent throughout NRR. There appear to be no neutral views on the South Texas experience.
- **Lack of a transparent, rapid process for addressing unanticipated issues.** There were very mixed feelings about the ability of RILP to guide the process. Issues included level of expertise/knowledge about specific South Texas issues and PRA in general, RILP's ability to respond quickly, and a perception that management agendas were being pushed regardless of technical questions. *"The agency as a whole needs to be more flexible about learning lessons in mid-project. South Texas was a train and we couldn't stop it. We should have been able to make some changes mid-course."*

- **Low-safety significant challenges are hardest.** Borderline issues tend to be the most difficult and time consuming to resolve. For example, in the case of South Texas, questions about the low safety significant items (Risc-3) slowed down the process. *“When the licensee talked about Risc-3 stuff they would focus on the lowest risk stuff. The staff were looking at the ones that were still Risc-3 but were higher up the list. We were talking at cross purposes, and this left staff with the impression that industry wasn’t trying. It was helpful when we asked them (industry) to bring in a list of higher level risk-3.”*
- **External Influence.** Overall, the staff who participated in this evaluation project were concerned that outside pressure is in the driver’s seat of risk-informed regulation and many felt that the South Texas experience confirmed this fear. In particular, staff felt that the outcome was predetermined and that this compromised safety. *“We had the technical guidance, but alignment between branch chiefs, senior managers, and the commission was not there, so the pressure was coming from outside and the guidance was distorted and we had to play ‘bring me a rock.’ Influence from outside was tremendous, and we missed the point of aligning with the stakeholders. That’s what made a fiasco of the whole thing.”* A related point was the recognition that NEI and individual utilities do not have identical agendas. *“NEI wanted to ensure that South Texas wasn’t going to set precedents that every other plant would not want to live with. Some things were OK with South Texas but then NEI would disagree and reopen issues. South Texas didn’t provide closure on issues. Their agendas were parallel but different.”*
- **Is Option 2 workable?** Many of the staff and managers who participated in the evaluation believe that the South Texas experience calls into question whether or not Option 2 is practical. Others respondents expressed support for Option 2. Indications are that despite the South Texas experience, staff are still finding it hard to resolve outstanding questions about new RI initiatives, such as Option 2 and Option 3.

Additional Quotes

I see the big issue as management’s responsibility in this. On South Texas, the staff worked for nine months. Then when we clarified the task it took three weeks. If we [management] do our job right then we will get there.

This division got a lot of criticism. But they were asked to make the traditional finding and when the plan didn’t do this they were stuck negotiating for nine months. Finally, we came around with the help of senior management, including Sam Collins. We said that staff didn’t have to make a finding of functionality for everything and also we are not going to make you testify in a hearing. But we will ask you to say that the outcomes are right and that the industry has the responsibility to maintain functionality because it is low risk. The staff could do this. It wasn’t staff who were the problem here. Once this was changed, the report was written in three weeks.

The desired outcome was to try to look at the balance between effectiveness, efficiency, and burden reduction - BALANCED with safety. When I say risk management technical specification I hope to see a better balance like this. We're not there yet but hopefully we've got people thinking that way. It's a one edged sword.

I would like us to somehow work with the PRA guys and management to find a way to use the tool in a technically responsible way. Like if we don't know certain things we admit that in the analysis or put controls in place so we know our assumptions are OK. We need some kind of joint venture so we can make the PRA a good engineering tool and have it reflect what we are trying to do as regulators. If we're going to assume a 10% change in reliability, we need to have a way to manage and monitor that.

Staff and the agency are looking toward what equipment we truly don't care if it functions or not. We should have done that step first — that is the primary lesson learned from South Texas. The perception of senior management was that the staff was not willing to accept PRA. I think this is a big problem.

For South Texas, the leadership was disconnected from the operations level regarding expectations. The staff could only go so far without understanding from management what the expectations for success were. The staff needed to be empowered to do their work differently. Stepping outside the deterministic approach was already uncomfortable. We had to tell them we were willing to take the PRA/RI business risk. We need to provide sufficient info and data so staff feels they can make the right decision AND so they have management backup if they make a RI decision and something goes wrong. We have to let go of control. They are technically knowledgeable, and willing. We have to provide the process. With increased vulnerability, they need to know they won't come under criticism - like what happened at Indian Point. There, NRC, went looking for the fall guy. There were independent reviews, the Office of Inspector General was very critical, the staff was not aligned with their conclusions. That all works against our ability to convince ourselves and the staff that RI is the right way to go. We need to know how we define success.