

July 30, 2010

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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| In the Matter of |) | |
| |) | |
| NORTHERN STATES POWER COMPANY |) | Docket Nos. 50-282-LR/ 50-306-LR |
| |) | |
| (Prairie Island Nuclear Generating Plant, |) | |
| Units 1 and 2) |) | |

NRC STAFF TESTIMONY OF DR. VALERIE E. BARNES, JUNE CAI,
MOLLY JEAN KEEFE, AND AUDREY L. KLETT CONCERNING SAFETY CULTURE AND
NRC SAFETY CULTURE POLICY DEVELOPMENT AND IMPLEMENTATION

Q1. Please state your name, occupation, and by whom you are employed.

A1(a). My name is Dr. Valerie Barnes (“Barnes”).¹ I am employed by the U.S. Nuclear Regulatory Commission (“NRC”) as Senior Technical Advisor in Human Factors, Office of Nuclear Regulatory Research. A statement of my professional qualifications is attached.

A1(b). My name is June Cai (“Cai”). I am employed by the NRC as the Senior Safety Culture Program Manager in the Office of Enforcement. A statement of my professional qualifications is attached.

A1(c). My name is Molly Jean Keefe (“Keefe”). I am employed by the NRC as a Human Factors Specialist in the Health Physics and Human Performance Branch of the Division of Inspection and Regional Support in the Office of Nuclear Reactor Regulation (“NRR”). A statement of my professional qualifications is attached.

A1(d). My name is Audrey L. Klett (“Klett”). I am employed by the NRC as a Reactor Operations Engineer in the Performance Assessment Branch of the Division of Inspection and

¹ In this testimony, the sponsors of each numbered response are identified by their last name; no such designation is provided for paragraphs which are sponsored by all witnesses.

Regional Support in NRR. A statement of my professional qualifications is attached.

Q2. Please describe your current responsibilities as relevant to safety culture.

A2(a). (Barnes) I am currently involved in the following activities related to the agency's safety culture initiatives:

- Advising the cross-agency Safety Culture Policy Statement Working Group,
- Providing technical oversight of a research project to evaluate the construct validity of safety culture concepts and potential quantitative measures, and
- Advising NRR on the scientific and technical validity of an industry-proposed approach to assessing and monitoring safety culture at commercial reactor sites.

A2(b). (Cai) Currently I have the staff lead in advising, developing, and implementing activities related to supporting and improving the NRC's internal safety culture. In addition, I advise and participate in the NRC's external safety culture activities in the oversight of licensees. I am also leading a variety of continuous learning and improvement efforts on safety culture, including benchmarking other agencies and organizations, learning from operating experience from other industries, and training and development of new staff.

A2(c). (Keefe) I am the contact for safety culture in NRR. My current responsibilities involve developing a new definition and traits of safety culture for the NRC's draft safety culture policy statement and working through issues associated with implementation of the policy statement that is under development. I am also involved in stakeholder outreach and present on the policy statement at various conferences and workshops. Prior to my NRR work, I worked in the NRC's Office of Nuclear Reactor Research and was involved in the Reactor Oversight Process ("ROP") Safety Culture Working Group and the development of the safety culture enhancements to the ROP and the inspector training program in 2006. Additionally, I have participated in safety culture and safety conscious work environment assessments at plants throughout the country including Davis-Besse, Salem and Hope Creek, Duane Arnold, and Palo Verde.

A2(d). (Klett) I have the staff lead for the ROP's operating reactor assessment program

and am responsible for the oversight of the program's implementation. The ROP operating reactor assessment program describes the NRC's oversight of an operating reactor licensee's safety culture and the process for identifying substantive cross-cutting issues.

Q3. What is the purpose of your testimony?

A3(a). (Barnes) The purpose of my testimony is to describe theory, research and practice related to safety culture analysis.

A3(b). (Cai) The purpose of my testimony is to describe safety culture and the Commission's safety culture policy, including the development of that policy.

A3(c). (Keefe) The purpose of my testimony is to describe the Commission's implementation of its safety culture policy through the ROP, and opine on the current status of safety culture at Prairie Island and the ability of the ROP to verify safety culture at Prairie Island.

A3(d). (Klett) The purpose of my testimony is to describe the oversight of safety culture in the Reactor Oversight Process and the ability of the ROP to verify adequate safety culture at Prairie Island.

Safety Culture Generally

Q4. What is safety culture?

A4. (Barnes) The term, "safety culture," refers to those dimensions of an organization, including its underlying assumptions, values and norms, which influence the behavior of the organization's members with respect to safety. There have been many definitions of safety culture published in the research literature (e.g., E.H. SHEIN, ORGANIZATIONAL CULTURE AND LEADERSHIP (2d ed. 1992); Guldenmund, 2000 (NRC Staff Exhibit [26NRC000027](#)), cites 16 definitions; Mearns, et al, 2003 (NRC Staff Exhibit [27NRC000028](#)); Von Thaden and Gibbons, 2008 (NRC Staff Exhibit [34NRC000029](#)), but no consensus exists on a "best" definition. Within the nuclear domain, numerous regulatory bodies, including the U.S. Nuclear Regulatory Commission, and other entities have developed working definitions of safety culture to communicate the necessity of maintaining an over-

arching commitment to the protection of people and the environment in nuclear operations (“Policy Statement on the Conduct of Nuclear Power Plant Operations,” 54 FR 3424, January 24, 1989 (NRC Staff Exhibit [35NRC000030](#)); “Freedom of Employees in the Nuclear Industry to Raise Safety Concerns Without Fear of Retaliation,” 61 FR 24336, May 14, 1996 (NRC Staff Exhibit [36NRC000031](#)); “Draft Safety Culture Policy Statement: Request for Public Comments” 74 Fed. Reg. 57525, November 6, 2009 (NRC Staff Exhibit [40NRC000032](#)); INSAG, 1991 (Staff Exhibit [32NRC000033](#)); INPO, 2004 (NRC Staff Exhibit [29NRC000034](#)). For the purposes of the ROP, the Office of Nuclear Reactor Regulation has adopted the INSAG (1996) definition of safety culture, which is “that assembly of characteristics and attitudes in organizations and individuals that establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance.” NRC Staff Exhibit [33NRC000035](#). As Ms. Cai will discuss in greater detail, the NRC staff is working with stakeholders to develop a revised definition that will apply across the range of activities and organizations that the NRC regulates.

“Safety climate” is a related concept that has been used interchangeably with “safety culture.” As currently defined by most researchers and theoreticians, however, safety climate is considered to be an organization’s members’ shared perceptions of and attitudes towards the state of safety within the organization at a given time. Climate is more easily affected by recent events and conditions both within and external to the organization than culture, and is therefore considered to be more transitory than culture. In his book, The Corporate Culture Survival Guide (1999), Dr. Edgar Schein suggests that climate is a “surface feature” or “artifact” of the underlying organizational safety culture. Some authors have distinguished culture from climate by characterizing culture as analogous to the “personality traits” of an organization whereas climate is analogous to the current “mood or state” of the organization (*cf.* Weigmann, et al, 2002 (NRC Staff Exhibit [30NRC000036](#))).

For simplicity of communication, the NRC uses the term, “safety culture,” to refer to the concepts included within the definitions of both safety culture and safety climate.

Q5. How can safety culture be assessed or evaluated?

A5. (Barnes) There is general agreement that safety culture can be assessed and evaluated, but some disagreement as to the most appropriate methods. Experts from the disciplines of anthropology and sociology suggest that ethnographic methods, particularly extended participant observation and interviews, are most useful for understanding an organization's safety culture. Organizational psychologists see additional value in workforce surveys, although it is recognized that survey results are more likely to provide information about the organization's current safety climate than its culture.

When evaluating a licensee's self- or third-party safety culture assessment (or when performing an independent safety culture assessment), the NRC staff prefers that a combination of methods be used (*cf.* NRC Inspection Procedure ("IP") 95003 (NRC Staff Exhibit [24NRC000026](#))). For example, a survey may be useful for identifying shared perceptions, beliefs and attitudes among members of the organization with respect to the importance the organization places on nuclear safety, as well as differences in perceptions, beliefs and attitudes between departments or work groups. However, survey results do not provide sufficient information to understand the sources or causes of the perceptions, beliefs and attitudes, or whether those opinions are transitory or represent deeply held and enduring beliefs. Therefore, the staff prefers that an assessment also include historical investigation, typically through document reviews and interviews; case studies, for example, of any work groups that may have expressed more negative views than others in survey results or of events that were meaningful to the workforce; observations of meetings and the performance of work at the site; and interviews with site personnel from all levels of the organization. Use of multiple methods in a safety culture assessment strengthens the likelihood that the conclusions drawn from the assessment are valid and that they will be useful to inform the regulatory review of any licensee corrective action plans to address identified safety culture weaknesses.

Q6. How can safety culture be improved?

A6. (Barnes) There are many ways to improve an organization's safety culture, which may range in scope from an organization-wide change effort to very small changes, such as improving the usability and accuracy of a procedure to ensure it can be implemented in the circumstances for which it was written. There is an extensive research and practice literature available to aid in the design and conduct of organization-wide change efforts, which also applies to safety culture improvement efforts (*cf.* W.W. BURKE, ORGANIZATION CHANGE: THEORY AND PRACTICE (FOUNDATIONS FOR ORGANIZATIONAL SCIENCE) (2002)).

In response to the results of a safety culture assessment, interventions to improve safety culture should be tailored to the specific nature and scope of the weaknesses identified. For example, assessment results might show that the majority of the members of a particular work group are reluctant to raise safety concerns to their supervisor. Interventions could include evaluation of the supervisor's leadership style and behaviors and then coaching, additional training, or possible replacement of the supervisor; facilitated problem-solving meetings involving the supervisor and group members; management meetings with the group members to reassure them that raising concerns is valued behavior; prompt action to resolve safety concerns; and on-going monitoring and follow-up by management or their representatives to verify that the interventions have been effective. As another example, safety culture assessment results might indicate that the organization's work practices have fallen below industry standards. In this case, interventions could include initiating benchmarking trips to other sites and implementing the lessons learned from those trips; funding staff attendance at conferences and participation in industry working groups; creating incentives for personnel to seek continuing education; and bringing in representatives of industry groups or from other sites for training sessions or workshops.

Q7. How can a positive safety culture be maintained?

A7. (Barnes) There is a consensus among experts as well as empirical support for the key role that an organization's leaders play in sustaining a positive safety culture (*cf.* Yule

and Flin; 2007 (NRC Staff Exhibit [58NRC000037](#)). Research and practical experience indicate that management commitment to safety is fundamental to maintaining a positive safety culture. A commitment to safety is demonstrated both directly in the oral and written messages that managers communicate to the organization's members, as well as indirectly through the decisions they make and the behavior they model. As an example, a senior management decision to lengthen a refueling outage to make discretionary repairs (i.e., those not required by regulation) to safety-related equipment would demonstrate management commitment to safety over the competing goal of maximizing production. Of course, a single management communication or action is insufficient to ensure that a positive safety culture is maintained. A pattern of consistent management emphasis on safety over time is necessary to shape the culture.

Like managers, supervisors also have a central role in maintaining a positive safety culture through their patterns of communication and behavior. Supervisors have the additional responsibility of translating management's commitment to safety into specific expectations for how work is to be performed in their work groups. Supervisors are also responsible for reinforcing those expectations daily.

Informal leaders and individual contributors in an organization similarly contribute to maintaining a positive safety culture. These individuals demonstrate a commitment to safety by, for example, ensuring that their day-to-day work activities and products meet high standards, commensurate with the potential impacts of their work on safety; stopping work to resolve unexpected conditions, uncertainties, or unsafe circumstances; peer-checking one another's work; and holding one another accountable for safety behaviors on the job, such as following procedures.

As stated by the Institute of Nuclear Power Operations in its *Principles for a Strong Nuclear Safety Culture* (2004) (NRC Staff Exhibit [29NRC000034](#)), "everyone is personally responsible for nuclear safety." The exercise of this responsibility by the organization's

members maintains a positive safety culture.

Q8. How quickly can safety culture change (improve or decline)?

A8. (Barnes) Theory and practice suggest that managing culture change may be difficult. Organizational change practitioners suggest that a wide-scope, significant culture change effort may require up to 5 years or more to complete (*cf.* Schneider, et al, 1996 (NRC Staff Exhibit [28NRC000038](#))).

As previously discussed, safety climate is more transitory than safety culture. Experience in the nuclear industry has shown that single, highly visible events within an organization or work group have the potential to rapidly and adversely affect the safety climate. An example might be an incident in which a senior manager is perceived by the workforce to have retaliated against an individual for raising a safety concern. Overcoming those perceptions and re-establishing trust may require continued active interventions over 18 months or more.

In general, addressing localized safety climate issues or specific weaknesses in an area related to safety culture can be achieved in shorter time periods than attempts to implement a wholesale safety culture change.

Q9. Is it possible to predict future safety culture based on current performance?

A9. (Barnes) Predicting an organization's future safety culture is difficult because there are many unpredictable external and internal factors that will change the safety culture. The extent to which an organization's safety culture will remain stable depends on the external and internal influences to which the organization will be subject over time. External factors that can impact an organization's culture may include changes in the wider economy, corporate-level mergers and acquisition, or regulatory pressures. Internal influences may include leadership changes as well as changes in the workforce itself. For example, the nuclear power plant workforce has aged and is retiring. As a result, there is currently an influx of new personnel entering the industry. Although new personnel become acculturated to the organization they

join, they also change it. Because the probability and nature of these types of pressures to change are difficult to foresee, it is unlikely that an organization's current safety culture predicts its future performance, particularly over the long term (e.g., beyond 5 years into the future).

NRC Safety Culture Policy Development

Q10. Why did the NRC first become concerned about safety culture?

A10. (Cai) The NRC has been concerned with elements related to safety culture since the 1979 Three Mile Island accident, although the term "safety culture" was not in use then. In 1989, in response to an incident at the Peach Bottom Nuclear Power Plant involving operators sleeping in the control room, the NRC issued a policy statement on the conduct of operations which describes the NRC's expectation that licensees place appropriate emphasis on safety in the operations of nuclear power plants ("Policy Statement on the Conduct of Nuclear Power Plant Operations," 54 FR 3424, January 24, 1989 (NRC Staff Exhibit [35NRC000030](#))). In 1996, following an incident at the Millstone Nuclear Power Station in which workers were retaliated against for whistle-blowing, the Commission issued another policy statement ("Freedom of Employees in the Nuclear Industry to Raise Safety Concerns Without Fear of Retaliation," 61 FR 24336, May 14, 1996 (NRC Staff Exhibit [36NRC000031](#))). That policy statement describes the agency's expectations that licensees establish and maintain a safety conscious work environment ("SCWE"), which is an environment in which employees are encouraged to raise safety concerns both to their own management and to the NRC without fear of retaliation. SCWE is an important element of a positive safety culture.

Q11. Do the Commission's regulations require licensees to maintain a positive safety culture?

A11. (Cai) The NRC does not have a specific regulation for safety culture. However, many of the proposed characteristics/traits being developed for the draft safety culture policy statement (see additional details regarding the characteristics/traits in A17) are embedded in NRC's regulations. For example, provisions protecting employees from discrimination for

engaging in protected activities (related to supporting a SCWE) are in 10 CFR 50.7, and requirements for quality assurance programs are in Appendix B of Part 50 (related to identification and resolution of problems). In addition, elements of safety culture are addressed in the NRC's oversight of reactor licensees (see A19 about the ROP's treatment of safety culture).

Q12. What is the NRC's current policy on safety culture?

A12. (Cai) As stated in A10, the NRC has issued two policy statements in the past that are related to safety culture. The 1989 policy statement, "Policy Statement on the Conduct of Nuclear Power Plant Operations," places an emphasis on the personal dedication and accountability of all individuals engaged in any activity which has a bearing on the safety of nuclear power plants. The policy statement reads:

The Commission has decided to issue this policy statement to help foster the development and maintenance of a safety culture at every facility licensed by the NRC, and to make clear its expectations of utility management and licensed operators in fulfilling NRC regulations and prior guidance regarding the conduct of control room operations.

...

Management has a duty and obligation to foster the development of a "safety culture" at each facility and to provide a professional working environment, in the control room and throughout the facility, that assures safe operations. Management must provide the leadership that nurtures and perpetuates the safety culture.

| NRC Staff Exhibit [35-NRC000030](#) at 2.

The 1996 policy statement, "Freedom of Employees in the Nuclear Industry to Raise Safety Concerns Without Fear of Retaliation," describes the NRC's expectation that that licensees establish and maintain a SCWE. The policy statement states:

The purpose of this Statement of Policy is to set forth the Nuclear Regulatory Commission's expectation that licensees and other employers subject to NRC authority will establish and maintain a safety-conscious work environment in which employees feel free to raise concerns both to their own management and the NRC without fear of retaliation. A safety-conscious work environment is critical to a licensee's ability to safely carry out licensed activities.

NRC Staff Exhibit [36-NRC000031](#) at 24337.

In response to Commission direction in SRM COMGBJ-08-0001, "A Commission Policy Statement on Safety Culture," (February 25, 2008) (NRC Staff Exhibit [37-NRC000039](#)), the staff is currently in the process of updating the Commission's policy on safety culture (see A14 and A15).

Q13. How was the NRC's current policy developed?

A13. The 1989 policy statement, "Policy Statement on the Conduct of Nuclear Power Plant Operations," reads that it "is being issued to make clear the Commission's expectations of utility management and licensed operations with respect to the conduct of nuclear power plant operations." NRC Staff Exhibit [35-NRC000030](#) at 1. It describes how the NRC had received reports of operator inattentiveness and unprofessional behavior in the control room. It references several regulations and regulatory guidance where the Commission previously addressed expectations for operator conduct. It also provides "endorsement of industry initiatives to enhance professionalism by both management and plant operators." *Id.* The policy statement states, "The Commission has decided to issue this policy statement to help foster the development and maintenance of a safety culture at every facility licensed by the NRC, and to make clear its expectations of utility management and licensed operators in fulfilling NRC regulations and prior guidance regarding the conduct of control room operations" *Id.* at 2.

The 1996 policy statement, "Freedom of Employees in the Nuclear Industry to Raise Safety Concerns Without Fear of Retaliation," contains the following details about the development process:

As a result of questions raised about NRC's efforts to address retaliation against individuals who raise health and safety concerns, the Commission established a review team in 1993 to reassess the NRC's program for protecting allegeders against retaliation. In its report (NUREG-1499, 'Reassessment of the NRC's Program for Protecting Allegers Against Retaliation,' January 7, 1994) the review team made numerous recommendations, including several recommendations involving issuing a policy statement to address the need to encourage responsible licensee action with regard to fostering a quality conscious environment in which employees are free to raise safety concerns without fear of

retribution (recommendations II.A–1, II.A–2, and II.A–4). On February 8, 1995, the Commission after considering those recommendations and the bases for them published for comment a proposed policy statement, 'Freedom of Employees in the Nuclear Industry to Raise Safety Concerns Without Fear of Retaliation,' in the *Federal Register* (60 FR 7592, February 8, 1995).

The proposed policy statement generated comments from private citizens and representatives of the industry concerning both the policy statement and NRC and Department of Labor (DOL) performance.

...

In addition, two public meetings were held with representatives of the Nuclear Energy Institute (NEI) to discuss the proposed policy statement. Summaries of these meetings along with a revised policy statement proposed by NEI were included with the comments to the policy statement filed in the Public Document Room (PDR).

This policy statement is being issued after considering the public comments and coordination with the Department of Labor.

NRC Staff Exhibit [36-NRC000031](#) at 24336-24337.

In developing the current draft policy statement (SECY 09-0075 (NRC Staff Exhibit [38NRC000040](#))), the NRC staff considered a wide variety of information sources, including NRC lessons learned, domestic and international documents, organizational science literature, and other high reliability industry approaches. The staff also sought input and feedback from a wide range of stakeholders through presentations at stakeholder organization meetings, a *Federal Register* notice, a public workshop, and teleconferences with the Organization of Agreement State representatives and the Conference for Radiation Control Program Directors. The draft policy statement contains a proposed definition of safety culture and a set of characteristics of a positive safety culture (see additional details in A16 and A17).

After the Commission provided additional guidance in response to the draft policy statement the staff submitted in May 2009 (SRM-SECY 09-0075 (NRC Staff Exhibit [39NRC000041](#))), the staff continued to engage in outreach activities. The NRC published the draft Safety Culture Policy Statement formally for public comment from November 6, 2009, through March 1, 2010, in the *Federal Register* (74 FR 5752, November 6, 2009; and 75 FR

1656, January 12, 2010). In February 2010, the staff held a public workshop to: (1) to develop a common definition of safety culture and a common set of descriptions/traits of what constitutes a strong safety culture and (2) to solicit input on the draft policy statement that had been published in the *Federal Register*. The workshop was a collaborative effort – the panelists and other participants represented a wide range of Agreement and non-Agreement State materials users, including reactor licensees, fuel cycle licensees, certificate holders, both medical and industrial materials users, a member of an Indian Tribe, and members of the public. The NRC and the Organization of Agreement States, as co-regulators, took a less active role during the workshop and allowed the workshop panelists to reach alignment with input from other meeting attendees on a high level definition of safety culture and a set of descriptions/traits. This process allowed staff to gain a fuller understanding of what is important to the various stakeholders as they endeavored to develop the terminology. Additionally, on the last day of the workshop, participants were able to provide their comments on the published draft policy statement.

Based on the public comments received on the draft policy statement, the products from the February 2010 workshop, and the additional input from other stakeholder outreach efforts, as well as consideration of the Commission guidance in the October 2009 SRM to SECY 09-0075 (NRC Staff Exhibit [38NRC000040](#)), the staff will develop a final draft policy statement and provide it to the Commission in early 2011. Included in the final draft policy statement will be a final definition of safety culture and set of characteristics/traits, which the staff is currently developing by taking into consideration the terminology in the draft policy statement and from the February 2010 workshop.

Q14. Has the NRC's policy on safety culture changed over time?

A14. (Cai) The previous two policy statements related to safety culture are described in A13. In February 2008, the Commissioners issued direction SRM COMGBJ-08-0001, "A Commission Policy Statement on Safety Culture," (NRC Staff Exhibit [37NRC000039](#)) regarding

expanding the Commission's policy of safety culture. This followed the Davis Besse reactor vessel head degradation event in 2002, which led to the subsequent 2006 revisions to the ROP to better address safety culture (see additional details in A20 and A21). Specifically, the Commission's primary direction to the staff was (1) to expand the Commission safety culture policy to address the unique aspects of security; and (2) to ensure that the resulting policy would be applicable to all licensees and certificate holders. The focus on security followed the events of September 11, 2001, which had a significant impact on the way the NRC approaches regulation in the area of security. The addition of nuclear security to the safety culture policy statement emphasizes the importance the NRC places on security in the current climate. The focus on expanding the scope of the policy statement to apply to all NRC regulated activities provides clear recognition that safety culture applies to more than power reactors. In May 2009, the staff submitted its proposed draft Safety Culture Policy Statement, SECY 09-0075 (NRC Staff Exhibit [38NRC000040](#)), to the Commission. In response, the Commission provided additional guidance in October 2009 (SRM-SECY 09-0075) (NRC Staff Exhibit [39NRC000041](#)) (see more discussion in A15).

Q15. Is the NRC's policy on safety culture likely to change in the future?

A15. (Cai) As described A14, the Commission provided direction in February 2008 to expand the Commission's policy on safety culture. In response to this direction, in May 2009, the staff provided a draft policy statement to the Commission (SECY 09-0075 (NRC Staff Exhibit [38NRC000040](#))), which contained the following key messages:

- Licensees and certificate holders bear the primary responsibility for the safe handling and securing of radioactive materials; therefore, it is each licensee's and certificate holder's responsibility to develop and maintain a positive safety culture in their organizations and among individuals who are overseeing or performing regulated activities. In this respect:
 - The draft policy statement addresses what is important in a positive safety culture, but does not address how licensees should implement the NRC's expectations of safety culture in their organization.
 - NRC encourages proactive initiatives by industry in this area.

- The NRC, as a regulator, has an independent oversight role, for example, through inspection and assessment processes.

In October 2009, the Commission approved publication of the draft Safety Culture Policy Statement in the *Federal Register* for public comment. In its SRM to SECY 09-0075, the Commission provided additional direction to the staff on the content of the policy statement, including:

- The staff should consider incorporating suppliers and vendors of safety related components into the Safety Culture Policy Statement; and
- The staff should seek opportunities to comport NRC terminology, where possible, with that of existing standards and references maintained by those that NRC regulates.

| NRC Staff Exhibit [39NRC000041](#).

As part of this effort, the staff has been working, with stakeholder input, to develop a definition of safety culture and a set of descriptions/traits of what constitutes a positive safety culture that could be contained in the final policy statement. Additional details on the proposed safety culture terminology under development are described in A16 and A17.

Q16. How does the NRC currently define safety culture?

A16. (Cai) The 1989 policy statement, "Policy Statement on the Conduct of Nuclear Power Plant Operation," states, "the phrase 'safety culture' refers to a very general matter, the personal dedication and accountability of all individuals engaged in any activity which has a bearing on the safety of nuclear power plants." NRC Staff Exhibit [35NRC000030](#).

The proposed definition in the proposed draft Safety Culture Policy Statement (SECY 09-0075) is: "Safety Culture is that assembly of characteristics, attitudes, and behaviors in organizations and individuals which establishes that as an overriding priority, nuclear safety and security issues receive the attention warranted by their significance." NRC Staff Exhibit [38NRC000040](#).

As part of the staff's efforts to further engage all NRC-regulated entities in developing the final Safety Culture Policy Statement, the NRC held a large public workshop in February

2010 (see additional details about the workshop in A13). The panelists, representing a diverse range of stakeholders, developed the following definition of safety culture: “Nuclear safety culture is the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment.”

The staff is currently in the process of evaluating the draft policy statement and workshop definitions, as well as sets of characteristics/traits (described in more detail in A17), with comments received during the public comment period, to develop a final set of terminology to propose to the Commission.

Q17. What are the elements of safety culture?

A17. (Cai) The draft Safety Culture Policy Statement (SECY 09-0075) includes the following characteristics of a positive safety culture:

- personnel demonstrate ownership for nuclear safety and security in their day-to-day activities;
- processes for planning and controlling work ensure that individual contributors, supervisors, and work groups communicate, coordinate, and execute their work in a manner that supports safety and security;
- the organization maintains a safety conscious work environment in which personnel feel free to raise safety and security concerns without fear of retaliation;
- the organization ensures that issues potentially impacting safety or security are promptly identified, fully evaluated, and promptly addressed and corrected commensurate with their significance; the organization ensures that the personnel, equipment, tools, procedures, and other resources needed to ensure safety and security are available; the organization’s decisions ensure that safety and security are maintained;
- roles, responsibilities, and authorities for safety and security are clearly defined and reinforced; and
- the organization maintains a continuous learning environment in which opportunities to improve safety and security are sought out and implemented.

| NRC Staff Exhibit [38NRC000040](#).

The panelists at the February 2010 workshop described in the response to A13

developed the following set of traits of a positive safety culture:

- the organization ensures that issues potentially impacting safety or security are promptly identified, fully evaluated, and promptly addressed and corrected commensurate with their significance;
- everyone is personally responsible for nuclear safety;
- processes for planning and controlling work activities are implemented such that safety is maintained;
- organizational learning is embraced;
- leaders demonstrate commitment to safety;
- effective communication is essential to maintain focus on safety;
- the organization maintains a safety conscious work environment in which personnel feel free to raise concerns without fear of retaliation; and
- trust and respect permeate the organization.

The staff is currently in the process of evaluating both sets of characteristics and traits, along with comments received during the public comment period, to develop a final set of terminology to propose to the Commission.

Q18. How is the NRC's policy on safety culture implemented for operating reactors?

A18. (Cai) Oversight of an operating reactor licensee's safety culture is implemented by the ROP. See A19 for the implementation details. Once the final Safety Culture Policy Statement is approved by the Commission and published, the staff will evaluate the agency's oversight programs, including the ROP, to identify if any changes would be needed to implement the expectations contained in the policy statement as appropriate for that type of licensee/certificate holder.

Implementation of NRC Safety Culture For Operating Reactors

Q19. How does the Reactor Oversight Process (ROP) capture safety culture?

A19(a). (Keefe) The Reactor Oversight Process (ROP) may use multiple inputs as indications into safety culture at NRC licensed facilities. These inputs include: NRC

assessment and inspection findings and reports, licensee event reports (LERs) and root cause evaluations. In some cases, if more information about the health of the site's safety culture is needed, the NRC will also review licensee self and independent safety culture assessments. There are nine safety culture components and corresponding attributes which are located under the cross-cutting areas of human performance, safety conscious work environment, and problem identification and resolution to guide the identification of safety culture inputs. The ROP may use these cross-cutting areas to guide the identification and evaluation of safety culture issues.

A19(b). (Klett) The ROP is a risk-informed and performance-based oversight process, meaning that as licensee performance declines, the NRC increases its oversight, including a more in-depth review of safety culture.

The ROP provides for the oversight of a licensee's safety culture in four ways. First, the ROP provides for the review of a licensee's safety culture in a graded manner when that licensee has significant performance issues. The level of the staff's oversight is determined by the safety significance of the performance issues. This review and evaluation is described in the ROP's supplemental inspection program in Inspection Procedures ("IP") 95001 (NRC Staff Exhibit [22NRC000013](#)), IP 95002 (NRC Staff Exhibit [23NRC000042](#)), and IP 95003 (NRC Staff Exhibit [24NRC000026](#)). An IP 95001 inspection is usually performed when a licensee enters the Regulatory Response Column of the ROP Action Matrix (see NRC Staff Exhibit [25NRC000043](#)). This procedure requires NRC staff to verify that the licensee's root cause evaluation appropriately considered safety culture components. An IP 95002 inspection is usually performed when a licensee enters the Degraded Cornerstone Column of the ROP Action Matrix. This procedure requires the NRC staff to independently determine that the licensee appropriately considered whether any safety culture component caused or significantly contributed to any risk-significant performance issue. If a weakness in any safety culture component did cause or significantly contributed to such an issue, and the licensee's evaluation

did not recognize this, then the NRC will request the licensee to perform an independent safety culture assessment. An IP 95003 inspection is performed when a licensee enters the Multiple/Repetitive Degraded Cornerstone Column of the ROP Action Matrix. When this occurs, the NRC expects the licensees to perform a third-party safety culture assessment. The staff will review the results of the assessment and perform sample evaluations to verify the results.

Second, the ROP's reactive inspection program evaluates a licensee's response to an event, including consideration of contributing causes related to the safety culture components, to fully understand the circumstances surrounding an event and its probable causes.

Third, the ROP provides continuous oversight of licensee performance as inspectors evaluate inspection findings for cross-cutting aspects. Cross-cutting aspects are aspects of licensee performance that can potentially affect multiple facets of plant operations and usually manifest themselves as the root causes of performance problems. A cross-cutting aspect is a performance characteristic that is the most significant contributor to a performance deficiency that resulted in an inspection finding. Inspectors will review available causal information to determine if the cause of an inspection finding relates to one of the cross-cutting aspects. A declining trend in licensee performance involving a cross-cutting aspect would warrant the identification of a substantive cross-cutting issue if the licensee is having difficulty correcting the trend.

Fourth, the ROP provides for the review of a licensee's safety culture if that licensee has difficulty correcting long-standing substantive cross-cutting issues. In these cases, the NRC will request the licensee to perform a safety culture assessment, and the NRC Staff will evaluate the results and the licensee's response to the results.

Q20. How was the ROP changed in 2006 to enhance treatment of safety culture?

A20. (Keefe & Klett) In 2004, the Staff received SRM-SECY 04-0111, "Recommended Staff Actions Regarding Agency Guidance in the Areas of Safety Conscious Work Environment and Safety Culture," (August 30, 2004) (NRC Staff Exhibit [42NRC000044](#)). In 2005, the Staff

received SRM-SECY 05-0187, "Status of Safety Culture Initiatives and Schedule for Near-Term Deliverables," (December 21, 2005) (NRC Staff Exhibit [43NRC000045](#)). These SRMS directed Staff to:

- Enhance the Reactor Oversight Process (ROP) treatment of cross-cutting issues to more fully address Safety Culture,
- Ensure inspectors are properly trained,
- Develop a process for determining the need for a specific safety culture evaluation of plants with degraded performance, and
- Ensure modifications to the ROP are consistent with ROP development principles

Additionally, the SRMs directed the Staff to continue to monitor the industry's efforts. As a result, the Staff started a working group chartered with defining safety culture and developing the ROP changes. With input from internal and external safety culture experts, international research, and industry operating experience, the working group developed thirteen components of safety culture, nine of which are tied directly to the ROP cross-cutting areas. Of these thirteen components, nine are used in the baseline inspection program, and all thirteen are used in the supplemental inspection program. The cross-cutting components are reviewed on a semi-annual basis to determine if there's a trend in a licensee's performance in an aspect of the component. If the licensee has trouble correcting the trend, and if the trend persists for more than eighteen months, the NRC would typically request the licensee to perform a safety culture assessment. The components are discussed further in later responses.

Under the 2006 changes, the Staff's oversight of safety culture is applied in a graded manner, depending on the safety significance of licensees' performance issues, as described in the responses to A19. In 2006, the Staff updated several baseline and supplemental inspection procedures to incorporate the changes and the components, and enhanced the agency's inspector training program to ensure inspectors would be able to appropriately use the new components. The staff also revised reactive inspection procedures, which are performed to evaluate the licensee's response to events, to direct inspectors to consider contributing causes

related to the safety culture components as part of their efforts to fully understand the circumstances surrounding an event and its probable causes.

Initial implementation of the ROP safety culture changes took eighteen months. After slight modifications based on stakeholder feedback, the final ROP changes were implemented in 2006.

Q21. Why was the ROP changed in 2006 to enhance treatment of safety culture?

A21. (Keefe & Klett) In 2002, severe boric acid corrosion of the Davis-Besse reactor vessel head was discovered, and a weak safety culture was found to have contributed in large part to this significant safety issue. The NRC's Davis-Besse lessons-learned task force and the General Accounting Office ("GAO") (now called the Government Accountability Office) conducted assessments of the environment (i.e., procedures, processes, programs, etc.) in which this significant degraded condition developed at Davis-Besse. The task force recommended that the NRC review its baseline inspections and plant assessment processes to determine whether they were sufficient to identify and appropriately disposition the types of problems experienced at Davis-Besse. Additionally, the task force recommended that the NRC provide more structured and focused inspections to assess licensees' employee concerns programs and safety conscious work environment. The GAO recommended that the NRC develop a methodology to assess licensee safety culture. Accordingly, the Commission directed the staff to:

- Include inspection requirements to evaluate a licensee's safety culture for plants with significant performance issues;
- Enhance the ROP's treatment of cross-cutting issues to more fully address safety culture; and
- Ensure that the safety culture enhancements were consistent with regulatory principles that guided the development of the ROP (i.e., that they be transparent, understandable, objective, predictable, risk-informed and performance-based).

In June 2006, the ROP was revised to more fully address safety culture. Regulatory Issue Summary 2006-13, "Information on the Changes Made to the Reactor Oversight Process

to More Fully Address Safety Culture,” dated July 31, 2006 (NRC Staff Exhibit [44NRC000046](#)), describes the changes made to the ROP to address safety culture, which were summarized in my responses to A19 and A20.

Q22. Is the ROP’s treatment of safety culture likely to change in the future?

A22. (Keefe) The NRC has issued a draft safety culture policy statement which describes the agency’s expectation that all NRC licensees and certificate holders maintain a positive safety culture. The final policy statement is expected to be issued in 2011. One expected outcome of the final policy statement initiative is the adoption of a common safety culture definition and terminology throughout the nuclear industry and the NRC. The subsequent implementation of the common definition and terminology is the responsibility of the NRC program offices. It is anticipated that NRR will adopt and replace the current safety culture definition in the ROP with the common definition and evaluate whether the components will need to be modified as a result of the final safety culture policy statement. The effective impacts will likely be in the area of inspector training and changes to the inspection manual chapters since the common definition and terminology will probably not change the intent of the definition and components in the current ROP.

Q23. Which ROP programs address safety culture?

A23. (Keefe & Klett) The ROP is comprised of several programs, including the assessment program (Inspection Manual Chapter (“IMC”) 0305 (NRC Staff Exhibit [40NRC000011](#))), the performance indicator program (IMC 0608 (NRC Staff Exhibit [44NRC000047](#))), the inspection program (IMC 2515 (NRC Staff Exhibit [8NRC000010](#))), IMC 0612 (NRC Staff [43NRC000015](#))), and inspection procedures, the significance determination process (IMC 0609 (NRC Staff Exhibit [42NRC000014](#))), the ROP self-assessment process (IMC 0307 (NRC Staff Exhibit [45NRC000048](#))), inspector training program (IMC 1245 (NRC Staff Exhibit [47NRC000049](#))), and the industry trends program (IMC 0313 (NRC Staff Exhibit [48NRC000050](#))). The ROP addresses safety culture in its inspection,

assessment, training, and self-assessment programs.

The ROP is a risk-informed and performance-based oversight process, meaning that as licensee performance declines, the NRC increases its oversight, including a more in-depth review of safety culture. The ROP framework describes three cross-cutting areas that contain the nine safety culture components. These cross-cutting areas, identified as human performance, problem identification and resolution, and safety conscious work environment, slice across each cornerstone of the ROP, meaning they can affect every aspect of reactor safety, radiation safety, and safeguards. The relationship between the three cross-cutting areas and the nine safety culture components is depicted in the chart below:

| Cross-Cutting Area | Cross-Cutting Components |
|---------------------------------------|--|
| Problem Identification and Resolution | <ul style="list-style-type: none">• Corrective action program• Self- and independent assessments• Operating experience |
| Human Performance | <ul style="list-style-type: none">• Decision-making• Resources• Work control• Work practices |
| Safety Conscious Work Environment | <ul style="list-style-type: none">• Environment for raising safety concerns• Preventing, detecting, and mitigating perceptions of retaliation |

The ROP baseline inspection program requires inspectors to evaluate inspection findings to determine if any aspect of the nine cross-cutting components is applicable. The ROP supplemental and reactive inspection programs consider the nine safety culture components above and four additional safety culture components, which are: (1) accountability, (2) continuous learning environment, (3) organizational change management, and (4) safety policies. All thirteen components and their corresponding aspects are described in IMC 0310, “Components within the Cross-Cutting Areas” (NRC Staff Exhibit [49NRC000017](#)). In addition to considering all thirteen safety culture components, the supplemental inspection program also provides for the review of independent or third-party safety culture assessments obtained by the licensee.

The ROP assessment process looks at long-standing substantive cross-cutting issues to determine if safety culture assessments need to be performed and reviewed. The ROP training program provides safety culture-related training for inspectors. The ROP self-assessment program evaluates the perceived effectiveness of ROP safety culture enhancements. The NRC also may draw insights into a licensee's safety culture from the agency's allegation program.

Q24. How often does the ROP evaluate a plant's safety culture?

A24. (Klett) The ROP allows for continuous oversight of licensee performance and indications that may relate to safety culture. By evaluating baseline, reactive, and supplemental inspection findings for cross-cutting aspects and trending those aspects every six months, the NRC can determine if the licensee is effectively correcting any performance issues related to the safety culture areas and components. The NRC requests a licensee to perform a safety culture assessment if it has difficulty correcting a long-standing (i.e., 18 months) substantive cross-cutting issue. The NRC will evaluate the results of this assessment to determine that the licensee is taking adequate corrective actions to address the results. The NRC also monitors allegations, which may provide insights to a site's safety conscious work environment. Additional information is provided in the response to A25.

The ROP provides for non-routine reviews as well. Through its supplemental inspection program, the NRC will perform a more in-depth review of a licensee's safety culture if licensee performance declines. The NRC also looks into the safety culture components as they relate to the causes of events (e.g., an unexpected plant shutdown).

Q25. Which ROP baseline inspections are directed at safety culture? How often are they performed?

A25. (Klett) The ROP does not have a routine baseline inspection procedure for developing a conclusion about a licensee's overall safety culture. The supplemental inspection procedure that directs this type of evaluation, IP 95003 (NRC Staff Exhibit [24NRC000026](#)), is performed when a licensee has safety-significant performance issues and enters the

Multiple/Repetitive Degraded Cornerstone Column of the ROP Action Matrix. Inspectors may also use aspects of this procedure to evaluate the results from safety culture assessments performed in response to long-standing SCCIs.

The NRC's baseline inspection program provides for continual oversight of cross-cutting aspects. Although it is not intended to provide a conclusion about a licensee's overall safety culture, the ROP baseline inspection procedure, IP 71152, "Problem Identification and Resolution," (NRC Staff Exhibit [24NRC000051](#)) evaluates licensees' corrective action programs, employee concerns programs, safety conscious work environments, and licensees' progress in addressing any cross-cutting themes. This procedure has four types of reviews: routine (daily) reviews, semi-annual trend reviews, annual sampling, and biennial team inspections. The routine, semi-annual trend, and annual sample reviews allow for the NRC to monitor a licensee's progress in addressing cross-cutting themes. The biennial team inspection looks at licensees' employee concerns programs, safety conscious work environments, cross-cutting themes, and periodic self-initiated and NRC-requested safety culture assessments.

Q26. How does the NRC determine if a licensee has a safety culture issue?

A26. (Keefe) The staff would typically rely on the results of a safety culture assessment to provide a conclusion about overall safety culture. The staff will either perform or request the licensee to perform a safety culture assessment in response to long-standing substantive cross-cutting issues ("SCCI") (i.e., older than 18 months) or safety-significant performance issues.

Q27. What is an SCCI?

A27. (Klett) An SCCI is defined in IMC 0305 (NRC Staff Exhibit [40NRC000011](#)) as a cross-cutting theme, about which the NRC staff has a concern with the licensee's scope of efforts or progress in addressing the cross-cutting theme. For the problem identification and human performance cross-cutting areas, a cross-cutting theme exists when multiple inspection findings (i.e., four or more) are assigned the same cross-cutting aspect within a one-year

assessment period. A cross-cutting theme exists in the safety conscious work environment (SCWE) area if at least one of the following three conditions exists: (1) a finding has a documented cross-cutting aspect in SCWE and the impact on SCWE was not isolated, or (2) the licensee has received a chilling effect letter, or (3) the licensee has received correspondence from the NRC that transmitted an enforcement action with a Severity Level of I, II, or III, and that involved discrimination or a confirmatory order that involved discrimination.

Q28. What is an SCCI in the area of human performance?

A28. (Klett) A substantive cross-cutting issue in the area of human performance is a human performance-related cross-cutting theme, about which the NRC staff has a concern with the licensee's scope of efforts or progress in addressing the cross-cutting theme. In evaluating whether the NRC staff has a concern with the licensee's scope of efforts or progress in addressing the cross-cutting theme, the staff considers if any of the following situations exists:

- The licensee had not identified or recognized the cross-cutting theme(s) affected other areas and had not taken actions to address the theme(s).
- The licensee recognized the cross-cutting theme(s) affected other areas but failed to schedule or take appropriate corrective action.
- The licensee recognized the cross-cutting theme(s) affected other areas but did not implement timely corrective actions commensurate with the significance of the issue(s).
- The licensee has implemented a range of actions to address the crosscutting theme(s); however, these actions have not yet proven effective in substantially mitigating the cross-cutting theme(s) even though a reasonable duration of time has passed.

Q29. What is the significance of the Staff identifying an SCCI in the area of human performance?

A29. (Klett) The purpose of identifying an SCCI in the area of human performance is to inform the licensee on the docket that the NRC has a significant level of concern with the licensee's performance in the human performance cross-cutting area. SCCIs are not assigned a risk significance characterization, nor does the NRC implement enforcement actions for SCCIs. However, SCCIs are considered during the ROP assessment process. SCCIs are

identified in publicly available assessment letters to licensees, when applicable. While the ROP Action Matrix does not prescribe NRC regulatory actions for SCCIs, they can influence the range of actions taken when Action Matrix thresholds are crossed. For example, the NRC may adjust the scope of a supplemental inspection performed in response to a safety-significant inspection finding to focus inspection efforts on the SCCI. The NRC may also focus baseline problem identification and resolution inspection samples on SCCIs. The NRC will monitor SCCIs to determine if licensees are correcting the human performance issues and whether the human performance issues continue to be a causal factor in inspection findings.

Q30. Does Staff identification of a SCCI in area of human performance indicate inadequate safety culture?

A30. (Keefe & Klett) The staff's identification of an SCCI in the area of human performance, in and of itself, does not indicate an overall inadequate safety culture. A human performance SCCI indicates a weakness in the licensee's scope of efforts to address a trend of performance deficiencies involving one of the human performance cross-cutting aspects. Because an SCCI focuses on only one cross-cutting area, and usually only one aspect in that area, the staff would not rely on an SCCI alone to provide an indication of an overall weak or inadequate safety culture. The staff would request a licensee to perform a safety culture assessment when that licensee has difficulty correcting a long-standing SCCI (i.e., an SCCI that is older than 18 months). The staff would typically rely on the results of this safety culture assessment to develop a conclusion about the licensee's overall safety culture.

Q31. How is a SCCI in the area of human performance addressed by the NRC?

A31. (Klett) If the NRC identifies an SCCI in the area of human performance, the NRC will issue a publicly available assessment letter to the licensee that summarizes the SCCI, how the staff will monitor the SCCI, and the criteria that must be met to close the SCCI. The staff will monitor the SCCI during its baseline problem identification and resolution inspections performed in accordance with IP 71152 (NRC Staff Exhibit [24NRC000051](#)) and at subsequent assessment

reviews. At the next assessment review, the regional office will determine to close the SCCI or hold it open based on whether the licensee met the closure criteria. Examples of closure criteria may include fewer findings with the same aspect and increased NRC confidence in the licensee's ability to correct the SCCI.

In the second consecutive assessment letter identifying the same SCCI with the same cross-cutting theme, the NRC may request that: (1) the licensee provide a response at the next annual public meeting, (2) the licensee provide a written response to the SCCIs, or (3) a separate meeting be held with the licensee.

In the third consecutive assessment letter identifying the same SCCI with the same cross-cutting theme, the NRC may request that the licensee perform an assessment of safety culture. The regional office, in consultation with the NRR Division of Inspection and Regional Support Health Physics and Human Performance Branch staff, would review the safety culture assessment results and the licensee's response to the results. The NRC would document its conclusions regarding whether the SCCI closure criteria were met in next assessment letter.

Q32. How is an SCCI in the area of human performance addressed by the licensee?

A32. (Keefe & Klett) When the NRC identifies a substantive cross-cutting issue in the mid-cycle or annual assessment letter, the licensee would typically place this issue into its corrective action program or some other problem identification and resolution program (e.g., the employee concerns program), perform an analysis of causes of the issue, and develop appropriate corrective actions.

Q33. What does the NRC do to verify that safety culture weaknesses are addressed?

A33. (Keefe & Klett) The objective of safety culture in the ROP is to promote the early identification and correction of potential safety culture issues at a plant in order to prevent any further decline in the licensee's overall performance. When the NRC identifies a substantive cross-cutting issue in the mid-cycle or annual assessment letter, the licensee should place this issue into its corrective action program, perform an analysis of causes of the issue, and develop

appropriate corrective actions. If a licensee conducts a safety culture assessment, the results would typically be added into the corrective action program to ensure that safety culture issues are identified and corrected. The NRC inspects and assesses the licensee's corrective action programs to verify use and effectiveness through the bi-annual IP 71152 Problem Identification and Resolution inspection (NRC Staff Exhibit [24NRC000051](#)).

The NRC will typically verify the effectiveness and sustainability of a licensee's corrective actions in response to identified safety culture weaknesses; however, the NRC's level of oversight to verify that licensees address safety culture weaknesses will depend on the licensee's unique situation and which aspect of safety culture is affected. The NRC will typically use IP 71152 (NRC Staff Exhibit [24NRC000051](#)) to verify that licensees are addressing safety culture-related weaknesses identified in safety culture assessments and long-standing cross-cutting issues. For licensees with safety-significant (i.e., greater-than-green) performance issues, the NRC's supplemental inspection program (e.g., IP 95003 (NRC Staff Exhibit [24NRC000026](#))) is used to verify licensees are addressing any safety culture weaknesses identified in safety culture assessments.

Q34. Under the ROP when does the NRC require licensees to perform an independent safety culture assessment?

A34. (Keefe & Klett) The NRC does not require licensees to perform safety culture assessments. The NRC would request a licensee to perform an independent safety culture assessment under the following two circumstances:

- The NRC identified during an IP 95002 inspection (and the licensee did not recognize) that one or more safety culture component deficiencies caused or significantly contributed to the risk-significant performance issues, and
- A third consecutive assessment letter identified the same substantive cross-cutting component with the same cross-cutting area.

If the NRC requests a licensee to take an action, and the licensee refuses, the Agency can perform that action (i.e., the safety culture assessment) for them. This would mean that the

NRC may perform that aspect of IP 95003, “Supplemental Inspection for Repetitive Degraded Cornerstones, Multiple Degraded Cornerstones, Multiple Yellow Inputs or One Red Input” (NRC Staff Exhibit [24NRC000026](#)).

Q35. Under the ROP when does the NRC require licensees to obtain a third-party safety culture assessment?

A35. (Klett) The NRC does not require licensees to perform safety culture assessments. A licensee third-party safety culture assessment is performed by qualified individuals who are not members of the licensee’s organization or utility operators of the plant. The NRC will request a licensee to perform a third-party safety culture assessment when it enters the Multiple/Repetitive Degraded Cornerstone or Unacceptable Performance Columns of the ROP Action Matrix and in preparation for the IP 95003 inspection.

Q36. Are there any examples whereby the ROP addressed indications of a declining safety culture?

A36. (Keefe) The ROP inspection process provides insights into aspects of safety culture at the nuclear power plants. These insights help to inform the inspection process of possible weaknesses in a licensee’s safety culture. Safety culture is the responsibility of the licensee. The ROP may be useful in identifying cross-cutting issues that may reflect underlying organizational issues (including safety conscious work environment and perhaps even safety culture issues), however the ROP does not correct those issues. The NRC requires that licensee’s have a corrective action program which ensures that conditions adverse to quality are promptly identified and corrected (10 CFR 50 Appendix B). If a licensee conducts a safety culture assessment, the results should be added into the corrective action program to ensure that safety culture issues are identified and corrected. The NRC inspects and assesses the licensees’ corrective action programs to verify their use and effectiveness.

The NRC conducted an IP 95003 inspection at Palo Verde Nuclear Power Station in 2007. The inspection was the first one used after the changes to enhance safety culture were

added to the ROP. This inspection was in response to repeated performance deficiencies at the site and was the first one conducted with the newly adopted safety culture components and aspects. The revised 95003 allowed the NRC to look more deeply into safety culture at a plant than ever before. The inspection staff conducted intensive interviews and focus groups with twenty percent of licensee personnel, participated in behavioral observations in the control rooms, and inspected the licensee's training program, corrective action program, and employee concerns program to gain a better understanding of the problems facing the site. The inspection report (NRC Staff Exhibit [45NRC000052](#)) provides more details about the results of the inspection.

Q37. Has the effectiveness of the ROP in addressing safety culture been assessed?

A37. (Klett) The ROP has a self-assessment process, which is described in IMC 0307 (NRC Staff Exhibit [45NRC000048](#)), to determine the ROP's effectiveness in achieving its goals of being objective, risk-informed, understandable, and predictable, as well as the applicable agency performance goals in the NRC's Strategic Plan. This process is also used to develop improvements to the ROP and to inform the Commission, NRC senior management, and the public of the results of the self-assessment. The staff continuously performs this assessment, and issues an annual Commission SECY paper. The ROP's safety culture oversight is one of the topics discussed in this paper.

The NRC reviews feedback from internal and external surveys – each type of survey is issued every other year – to determine if the ROP met its self-assessment process metric for the perceived effectiveness of the ROP safety culture enhancements (IMC 0307, App A (NRC Staff Exhibit [46NRC000053](#))). The ROP also has a feedback form process that enables NRC staff to generate comments, questions, and recommendations for improving ROP guidance. The NRC's regional offices conduct ROP reliability initiatives to use cross-regional experience to identify best practices and any needed changes to the ROP, including those related to the SCCI process.

Prairie Island's Safety Culture

Q38. Would you agree that, as PIIC asserts, placement of Prairie Island Unit 1 in the Regulatory Response Column due to a White Finding in the Public Radiation Safety cornerstone in the first quarter of 2009 and a White Finding in the Mitigating Systems cornerstone in the fourth quarter of 2008 indicates that PINGP's safety culture is inadequate?

A38(a). (Keefe) No. I do not agree. Placement of a licensee into a Column of the Action Matrix is determined by inspection findings and performance indicators and is not necessarily indicative of inadequate safety culture. Safety culture is addressed through the use of cross-cutting issues which do not relate to the Action Matrix column that a plant may be placed in. More information, such as self and independent safety culture assessments, is needed for the staff to make an assessment as to the health of Prairie Island's safety culture.

A38(b). (Klett) I do not agree with PIIC's assertion. Movement across the ROP Action Matrix results only from safety-significant inspection findings and/or performance indicators, not from safety culture assessment results or SCCIs. Therefore, conclusions about a licensee's safety culture cannot be made based only on ROP Action Matrix movement. Movement to the Regulatory Response Column of the ROP Action Matrix triggers an IP 95001 inspection, which requires that inspectors verify that the licensee evaluated whether any of the safety culture components contributed to the performance issues. The NRC would not expect a licensee to have performed an independent or third-party safety culture assessment in preparation for this inspection.

The NRC supplemental inspection report 05000282/2009011 (~~NRC Staff~~Applicant Exhibit ~~46~~NSP000034) documents the IP 95001 inspection performed for the fourth quarter 2008 White Mitigating Systems Cornerstone Finding. The inspectors found that the licensee identified concerns in three cross-cutting aspects, and the licensee assigned corrective actions to resolve these concerns. The inspectors determined that the licensee's evaluations included a proper consideration of whether a weakness in any safety culture component was a root cause

or a significant contributing cause of the issue. The inspectors also documented that the licensee initiated a human performance improvement plan to address human performance issues at the plant.

The NRC supplemental inspection report 05000282(306)/2009015 ([NRC Staff Applicant Exhibit 47NSP000036](#)) documents the IP 95001 inspection performed for the first quarter 2009 White Public Radiation Safety Cornerstone Finding. The inspectors found that the licensee identified concerns in five cross-cutting aspects, and the licensee assigned corrective actions to address these concerns. The inspectors identified one more cross-cutting aspect that had contributed to the issue; however, the licensee had taken corrective actions to address this aspect. The inspectors determined that the licensee's evaluations included a proper consideration of whether a weakness in any safety culture component was a root cause or a significant contributing cause of the issue. The inspectors also documented that the licensee initiated a human performance improvement plan to address human performance issues at the plant.

I do not agree with PIIC's assertion because the ROP Action Matrix Column designation is not dependent on the results of a safety culture assessment and the results of the above-mentioned supplemental inspection reports do not conclude that the licensee's safety culture was inadequate.

Q39. Would you agree that, as PIIC asserts, placement of Prairie Island Unit 2 in the Regulatory Response Column due to a White Finding in the Public Radiation Safety cornerstone in the first quarter of 2009 and a White Finding on Mitigating Systems cornerstone in the third quarter of 2009, indicates that PINGP's safety culture is inadequate?

A39(a). (Keefe) No, I do not agree. See A38(a).

A39(b). (Klett) I do not agree with PIIC's assertion. My response is similar to that to A38(b) regarding the white Public Radiation Safety Cornerstone finding. At the time of this written testimony, I have not had an opportunity to review the results of the supplemental

inspection performed for the third quarter 2009 White Mitigating Systems Cornerstone Finding because the report has not been issued. I cannot agree with PIIC's assertion because the ROP Action Matrix Column designation is not dependent on the results of a safety culture assessment and the results of the above-mentioned supplemental inspection report does not conclude that the licensee's safety culture is inadequate.

Q40. Would you agree that, as PIIC asserts, that the NRC's identification of a substantive cross-cutting issue in the area of human performance in the mid-cycle performance review indicates that safety culture at Prairie Island Units 1 and 2 is inadequate ([NRC Staff Applicant Exhibit 48NSP000039](#))?

A40(a). (Keefe) No, I do not agree. There is not enough information available in the inspection reports to make an adequate judgment on the overall health of Prairie Island's safety culture.

A40(b). (Klett) I do not agree with PIIC's assertion. As discussed in my response to A30, the staff's identification of an SCCI in the area of human performance, in and of itself, does not indicate an overall weak safety culture. A human performance SCCI indicates a weakness in the licensee's scope of efforts to address a trend of performance deficiencies involving one of the human performance cross-cutting aspects. Because an SCCI focuses on only one cross-cutting area, and usually on one component in that area, the Staff would not rely on an SCCI alone to provide an indication of an overall weak safety culture. The Staff would request a licensee to perform a safety culture assessment when that licensee has difficulty correcting a long-standing SCCI (i.e., an SCCI that is older than 18 months). The Staff would typically rely on the results of this safety culture assessment to develop a conclusion about the licensee's safety culture. Therefore, I do not agree with the PIIC's assertion because an SCCI alone would not provide enough information to draw a conclusion about a licensee's overall safety culture.

Q41. Would you agree that, as PIIC asserts, that concerns raised in the NRC's

Biennial Problem Identification and Resolution Inspection Report (~~NRC Staff~~Applicant Exhibit 49NSP000054) indicate inadequate safety culture at PINGP?

A41(a). (Keefe) There is not enough information available in the inspection reports to make an adequate judgment on the overall health of Prairie Island's safety culture.

A41(b). (Klett). I do not agree with PIIC's assertion. As previously discussed in my response A25, the biennial problem identification and resolution inspections do not provide an overall assessment of a licensee's safety culture. Inspection Report 05000282(306)/2009009 (~~NRC Staff~~Applicant Exhibit 49NSP000054) documents the inspectors' conclusions about the licensee's corrective action program and safety conscious work environment. The inspectors documented concerns and findings related to the licensee's implementation of its corrective action program. The inspectors also concluded that "the licensee maintains an accessible, functioning [employee concerns] program, promotes a safety conscious work environment to employees, and periodically assesses employee attitudes through email surveys and a safety culture assessment by an outside team from the Utilities Service Alliance. Based on the [corrective action program documents] generated at the plant, discussions with employees, and survey results, the SCWE at the plant appeared adequate and no concerns were identified by the inspectors."

This report indicated weaknesses with the licensee's problem identification and resolution, which is one of the cross-cutting areas. If the licensee had difficulty correcting a long-standing substantive cross-cutting issue regarding an aspect of problem identification and resolution, then the NRC would request the licensee to perform a safety culture assessment. The staff's review of the results of this assessment would allow the staff to draw conclusions about the overall safety culture at Prairie Island.

Q42. In your opinion, is the ROP adequate to verify adequate safety culture at PINGP during the requested period of extended operation?

A42. (Klett) The ROP assesses current performance through inspection findings and

performance indicators to verify that nuclear power plants are operated in a manner that provides adequate protection of public health and safety and the environment, and protection against radiological sabotage and the theft or diversion of special nuclear materials. As licensee performance declines, or if the licensee has difficulty in addressing long-standing substantive cross-cutting issues, the ROP provides for a more in-depth review of a licensee's safety culture. Therefore, consistent with the NRC's risk-informed and performance-based regulatory approach, the ROP is adequate to verify that licensees are ensuring an adequate safety culture. Because the ROP is continuously improving through its self-assessment and feedback programs, the ROP will remain adequate to verify that this licensee ensures an adequate safety culture during the period of extended operation and to respond accordingly if the licensee's performance indicates otherwise.