Generic Licensing Topics and Policy Issues for SMRs

NRC TWFN Auditorium

April 5, 2012

The Importance of Safety Culture and the U.S. Nuclear Regulatory Commission's Role in Oversight of Safety Culture

Diane J. Sieracki
Senior Safety Culture Program Manager
Office of Enforcement

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Overview

- History of safety culture theory
- Definitions of safety culture
- What safety culture is not
- NRC's Mission
- NRC's Scope of Responsibility
- Safety Culture Background in US
- Safety Culture Policy Statement

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Roots of the Safety Culture Concept

- Anthropology
- Sociology
- Organizational psychology

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

History: Anthropology

- "Culture…is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society."
- "More or less" consistent patterns of thinking, feeling and behaving
- Observable in myths, symbols, artifacts

History: Sociology

- Focus on social structures and institutions
- Introduced concepts of
  - Roles
  - Status
  - Norms
  - Values

History: Organizational Psychology

- Focus on human performance in the work environment
- Different levels of analysis
  - Individual differences
  - Intra- and inter-group interactions
  - Leadership (and management)
  - Organizational/corporate behavior
  - External influences

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Schein: Organizational Culture

- "A pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way you perceive, think, and feel in relation to those problems."

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Many Definitions of Safety Culture

- INSAG (1991) - That assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance.

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

What Safety Culture is Not

- It's not separate or different from organizational culture
- It's not a "thing" with an objective tangible existence
- It's not a policy, program or procedure

Importance of Safety Culture

- Operating experience has demonstrated a nexus between safety culture and events
- Safety culture contributes to the safe and secure use of radioactive materials
- NRC recognizes that licensees bear the primary responsibility for the safe use of nuclear materials while the NRC, as the regulator, must consider the importance of safety culture in its oversight programs

NRC Safety Culture Background
1989: Conduct of Operations Policy Statement

- Expectations for a Safety Culture:
  - Full attention to safety matters
  - Personal dedication and accountability of all individuals engaged in any activity which has a bearing on nuclear power plant safety
  - Management fosters the development of a ‘safety culture’ at each facility and promotes a professional working environment in the control room, and throughout the facility, that assures safe operations

NRC Safety Culture Background
1996: Safety Conscious Work Environment (SCWE) Policy Statement

- Establish and maintain a SCWE
- Intended to assure the freedom of employees in the nuclear industry to raise safety concerns without fear of retaliation
- Applies to all NRC-regulated activities of licensees, contractors, and applicants

NRC Safety Culture Background
2000: Reactor Oversight Process Implemented

- Monitors the "Cornerstones" that are the basis of plant safety:
  - Reactor safety
  - Radiation safety
  - Safeguards (Security)
- "Cross-Cutting" areas:
  - Human performance
  - Safety Conscious Work Environment (SCWE)
  - Problem Identification and Resolution (PI&R)

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Davis-Besse Reactor Vessel Head Degradation Event – 2002

Red Rusty Boric Acid Deposits on Vessel Flange (12RFO)

- Cavity in the top of the reactor pressure vessel head caused by corrosion from boric acid deposits
- Licensee root cause identified a weak safety culture
- Plant shut down February 2002; restart authorized March 2004

2004 NRC Commission Direction

- Enhance the Reactor Oversight Process to more fully address safety culture/train inspectors
  - Develop a process for determining the need for a specific safety culture evaluation of plants with degraded performance

NRC Safety Culture Background
2006: Reactor Oversight Process Enhanced

- Safety culture definition
- 13 safety culture “components”
- Requirements added to specifically focus on safety culture evaluation for plants with degraded performance
- Safety culture training provided to NRC inspection personnel and safety culture features added to selected NRC inspection procedures

NRC Safety Culture Background
2008: Commission Direction
(SRM-COMGBJ-08-0001A)

- Develop a draft safety culture policy statement
- Address the unique aspects of security
- Applicable to all licensees and certificate holders
- Increase attention to safety culture in the material area

NRC Safety Culture Background
2009: Further Commission Direction (SRM-SECY-09-0075)

- Publish the draft safety culture policy statement for public comment
- Continue to engage a broad range of external stakeholders and the Agreement States
- Seek opportunities to achieve common safety culture terminology with existing standards and references
- Consider making the policy statement applicable to vendors and suppliers

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Outreach Activities

- Draft Policy Statement published for public comment
- February 2010 workshop – diverse panel reached alignment on safety culture definition and traits

Outreach Activities

- Presentations on development of policy at various industry forums
- September 2010 Final Draft Policy Statement published for comment
- September 2010 workshop – provided continued support for February workshop definition and trait

Final Draft Safety Culture Definition

"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."

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Safety Culture Traits

Leadership Safety Values and Actions	**Problem Identification and Resolution**	**Personal Accountability**
Leaders demonstrate a commitment to safety in their decisions and behaviors	Issues potentially impacting safety are promptly identified, fully evaluated, and promptly addressed and corrected commensurate with their significance	All individuals take personal responsibility for safety
Work Processes	**Continuous Learning**	**Environment for Raising Concerns**
The process of planning and controlling work activities is implemented so that safety is maintained	Opportunities to learn about ways to ensure safety are sought out and implemented	A safety conscious work environment is maintained where personnel feel free to raise safety concerns without fear of retaliation, intimidation, harassment or discrimination
Effective Safety Communications	**Respectful Work Environment**	**Questioning Attitude**
Communications maintain a focus on safety	Trust and respect permeate the organization	Individuals avoid complacency and continually challenge existing conditions and activities in order to identify discrepancies that might result in error or inappropriate action

Leadership Trait Exercise
February 2010 Workshop
Example of Potential Tier 3 Behaviors

- Management is in the field enforcing standards
- Commitment to maintaining equipment
- Resolves conflict
- Rewards safe behavior
- Rewards (incentives) and sanctions used to reinforce desired positive nuclear safety behaviors
- Respects differing opinions
- Actions match words
- Schedules are realistic and do not challenge safety standards

Preamble to the Safety Culture Traits

A trait, in this case, is a pattern of thinking, feeling, and behaving that emphasizes safety, particularly in goal conflict situations, e.g., production vs. safety, schedule vs. safety, and cost of the effort vs. safety. It is the Commission's expectation that all organizations and individuals overseeing or performing regulated activities involving nuclear materials should take the necessary steps to promote a positive safety culture by fostering these traits. Additionally, it should be noted that although the term "security" is not expressly included in the traits, safety and security are the primary pillars of the NRC's regulatory program. Consequently, consideration of both safety and security issues commensurate with their significance, is an underlying principle of the Statement of Policy.

Current Status

- Final proposed Policy Statement presented to Commission for review in January 2011
- Commission approved the Policy Statement in March 2011, and it was published in the Federal Register on June 14, 2011.
- Based on Commission Direction, we will continue outreach activities to all NRC regulated communities to increase attention to safety culture to further dialogue and education.
- Commission Briefing on activities on March, 2012

Resources

- NRC safety culture website:
  http://www.nrc.gov/about-nrc/regulatory/enforcement/safety-culture.html
- Diane Sieracki, Senior Safety Culture Program Manager

  (e-mail: external_safety_culture.resource@nrc.gov)

Standard Review Plan 19 Revision

Mark Caruso
Sr. Reliability & Risk Engineer
NRO/DSRA/SPRA

Robert Vettori
Fire Protection Engineer
NRO/DSRA/BPFP

Overview of SRP 19 Update

- SRP 19.0 PRA & Severe Accidents for New Reactors
- SRP 19.1 Technical Adequacy of PRA Results
- SRP 19.2 Review of Risk-informed Licensing Basis changes
- SRP 19.3 Regulatory Treatment of Non-Safety Systems
- SRP 19.4 Loss of Large Area Due to Explosions and Fire
- SRP 19.5 Aircraft Impact Assessment

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

SRP 19.0 Update
PRA & Severe Accidents for New Reactors

- SRP 19.0 Updated to incorporate:
  - DC/COL-ISG-03 PRA Info for DC/COL Applications
  - DC/COL-ISG-20 PRA Based Seismic Margins Analysis
  - DI&C-ISG-03 Risk-Informed Digital I&C Review
  - New Reactor Review Experience
    - ESBWR
    - AP1000
    - EPR
    - APWR

SRP 19.0
New Guidance Based on New Reactor Review Experience

- General
- Level I PRA Technical Adequacy
- Review Procedures Specific to Passive Designs
- Review Procedures Specific to iPWRs
- Level II PRA Results
- Results of PRA for Non-Power Modes of Operation
- Treatment of Internal Fire Initiators
- Treatment of High Winds Initiators
- Review Procedures for Specific PRA Audit Topics
- Severe Accident Evaluation

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

SRP 19.3
Regulatory Treatment of Non-Safety Systems (RTNSS)

- Overview
  - SECY papers and SRMs from mid-1990s provide Commission policy on which RTNSS review guidance is based.
  - SRP 19.3 provides generic top level guidance.
  - SRPs that address specific SSCs provide additional detailed guidance.
  - Review responsibility is spread widely over the technical staff.

SRP 19.3 - RTNSS

- Areas of Review
  - Selection of RTNSS SSCs using the five RTNSS scoping criteria
  - Functional design of RTNSS SSCs
    - Adequacy of functional design requirements
    - Compliance with functional design requirements
    - Design improvements to minimize adverse interaction between passive safety systems and non-safety active systems
  - Focused PRA sensitivity studies
  - Augmented design standards for RTNSS “B” SSCs
  - Regulatory treatment of RTNSS SSCs
  - Reliability of active non-safety SSCs for achieving Cold Shutdown

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

SRP 19.3 - RTNSS

- Acceptance Criteria
  - Complete specification of RTNSS SSCs
  - Tech Spec established for highly risk-significant RTNSS SSCs
  - Functional design requirements adequate
  - RTNSS SSCs meet their functional design requirements
  - Adverse interaction between passive safety systems and active non-safety back-up systems minimized by design
  - Description of Focused PRA studies adequate
  - Regulatory treatment of SSCs commensurate with risk-significance of SSCs
  - Non-safety system for reaching cold shutdown is highly reliable

Standard Review Plan 19.4
Loss of Large Areas of the Plant Due to Explosions and Fires

- SRP has been peer reviewed.
  - Incorporates DC/COL-ISG-016
  - Considers conformance with NEI 06-12 Rev 3 an acceptable method

Standard Review Plan 19.5
Aircraft Impact Assessment

- SRP in the process of being peer reviewed.
  - Reflects Reg Guide 1.217 Rev 0
  - Considers conformance with NEI 07-13 Rev 8 an acceptable method

SRP 19 Revision Schedule

- New and revised SRPs have been drafted and are undergoing internal technical staff peer review
- Issue for public comment – June 2012
- 60 day comment period
- ACRS/CRGR review
- Issue final - November 2012

Design Specific Review Standard (DSRS) Updates

Stewart Magruder, Chief
Projects Branch
Division of Advanced Reactors and Rulemaking
Office of New Reactors

Summary of mPower DSRS Categorization

Description	No.
Total number of mPower DSRS sections	289
Number of sections categorized as: A)Use SRP Section "as-is" (minor comments)	40
Number of sections categorized as: B) Delete SRP Section for DSRS (N/A)	31
Number of sections categorized as: C) Modify SRP Section for DSRS	212
Number of sections categorized as: D) Develop new DSRS Section • These are the I&C Chapter 7 pilot	6

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

mPower DSRS Timeline

Approximate Timeline for Finalizing the mPower Design Specific Review Standard (DSRS)

September 2012~	Draft mPower DSRS is finalized and labeled *For Interim Use and Comment*
October 2012~	Internal Concurrence; OCG NLO obtained
November 2012~	Federal Register Notice FRN is prepared and mPower DSRS is issued for public comment • Document and Memo sent to **ACRS** • Document and Memo sent to CRGR • Notice sent to OMB for Congressional Review Act review
February 2013~	Public Comment Period
March -August 2013~	Resolve Public Comments revise document as appropriate Prepare Final mPower DSRS Document
May 2013~	SRP Updates Finalized to Support mPower DC Review
September 2013~	Internal Concurrence; OCG NLO obtained **ACRS** letter received
November 2013~	Prepare FRN and issue final *mPower DSRS* • Document and Memo sent to **ACRS** • Document and Memo sent to CRGR