UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

February 25, 2005

Gregg R. Overbeck, Senior Vice
President, Nuclear
Arizona Public Service Company
P.O. Box 52034
Phoenix, Arizona 85072-2034

SUBJECT: MEETING SUMMARY DISCUSSING PALO VERDE APPARENT VIOLATIONS

Dear Mr. Overbeck:

This refers to the Pre-decisional Enforcement and Regulatory Conference conducted at the NRC Region IV Office, Arlington, Texas, on February 17, 2005. The meeting attendance list and a copy of the presentations are included as Enclosures 1 and 2. No commitments were made by the licensee during the conference.

In accordance with Section 2.390 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and its enclosures will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Should you have any questions concerning this matter, we will be pleased to discuss them with you.

Sincerely,

Troy W. Pruett, Chief
Project Branch D
Division of Reactor Projects

Dockets: 50-528
50-529
50-530
Licenses: NPF-41
NPF-51
NPF-74

Enclosures:
1. Meeting attendance list
2. Presentations

cc w/enclosures:
Steve Olea
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, AZ 85007

Douglas K. Porter, Senior Counsel
Southern California Edison Company
Law Department, Generation Resources
P.O. Box 800
Rosemead, CA 91770

Chairman
Maricopa County Board of Supervisors
301 W. Jefferson, 10th Floor
Phoenix, AZ 85003

Aubrey V. Godwin, Director
Arizona Radiation Regulatory Agency
4814 South 40 Street
Phoenix, AZ 85040

M. Dwayne Carnes, Director
Regulatory Affairs/Nuclear Assurance
Palo Verde Nuclear Generating Station
Mail Station 7636
P.O. Box 52034
Phoenix, AZ 85072-2034

Hector R. Puente
Vice President, Power Generation
El Paso Electric Company
310 E. Palm Lane, Suite 310
Phoenix, AZ 85004

Jeffrey T. Weikert
Assistant General Counsel
El Paso Electric Company
Mail Location 167
123 W. Mills
El Paso, TX 79901

John W. Schumann
Los Angeles Department of Water & Power
Southern California Public Power Authority
P.O. Box 51111, Room 1255-C
Los Angeles, CA 90051-0100

John Taylor
Public Service Company of New Mexico
2401 Aztec NE, MS Z110
Albuquerque, NM 87107-4224

Cheryl Adams
Southern California Edison Company
5000 Pacific Coast Hwy. Bldg. DIN
San Clemente, CA 92672

Robert Henry
Salt River Project
6504 East Thomas Road
Scottsdale, AZ 85251

Brian Almon
Public Utility Commission
William B. Travis Building
P.O. Box 13326
1701 North Congress Avenue
Austin, TX 78701-3326

Electronic distribution by RIV:
Regional Administrator **(BSM1)**
DRP Director **(ATH)**
DRS Director **(DDC)**
DRS Deputy Director **(MRS)**
Senior Resident Inspector **(GXW2)**
Branch Chief, DRP/D **(TWP)**
Senior Project Engineer, DRP/D **(GEW)**
Team Leader, DRP/TSS **(RLN1)**
RITS Coordinator **(KEG)**
RidsNrrDipmLipb

SISP Review Completed: __TWP__ADAMS: √ Yes ☐ No Initials: __TWP_
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2/24/05	2/25/05			

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ENCLOSURE 1

PREDECISIONAL ENFORCEMENT & REGULATORY CONFERENCE ATTENDANCE

LICENSEE/FACILITY	Palo Verde Nuclear Generating Station
DATE/TIME	February 17, 2005 8:00 a.m.
CONFERENCE LOCATION	USNRC Region IV Offices Arlington, Texas
EA NUMBER	EA-04-221

NRC REPRESENTATIVES

NAME (PLEASE PRINT)	ORGANIZATION	TITLE
Bruce Mallett	USNRC Region IV	Regional Administrator
Art Howell	USNRC Region IV	Director, DRP
Tony Vegel	USNRC Region IV	Deputy Director, DRP
Troy Pruett	USNRC Region IV	Chief, Projects Branch D
Mike Hay	USNRC Region IV	Action Chief, Projects Branch C
Scott Schwind	USNRC Region IV	SRI, Cooper Nuclear Station
Gary Sanborn	USNRC Region IV	Director, ACES
Karla Fuller	USNRC Region IV	Regional Counsel
David Loveless	USNRC Region IV	Senior Reactor Analyst
Greg Warnick	USNRC Region IV	SRI, PVNGS
Greg Werner	USNRC Region IV	Senior Project Engineer, Branch D
Nick Taylor	USNRC Region IV	Project Engineer, Branch D
Jeff Clark	USNRC Region IV	Chief, Engineering Branch, DRS
Linda Smith	USNRC Region IV	Chief, Plant Engineering Branch, DRS

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NRC REPRESENTATIVES

NAME (PLEASE PRINT)	ORGANIZATION	TITLE
Victor Dricks	USNRC Region IV	Public Affairs Officer
Neil Keith	USNRC Region IV	Plant Engineering Branch, DRS
Greg Morell	USNRC Office of Enforcement	Enforcement Specialist
Charlie Stancil	USNRC Region IV	Project Engineer, Branch B
Mark Schaeffer	USNRC Region IV	Deputy Director, DRS
John Huang	USNRC Office of Nuclear Reactor Regulation	Division of Engineering
Charlie Stancil	USNRC Region IV	Project Engineer, Branch A
Steven Alferink	USNRC Region IV	Reactor Inspector, DRS
Cale Young	USNRC Region IV	Reactor Engineer, DRP TSS
Jared Nadel	USNRC Region IV	Reactor Inspector, DRS
Dan Livermore	USNRC Region IV	Plant Engineering Branch, DRS
Bo Pham	USNRC Office of Nuclear Reactor Regulation	DLPM
Andrew Howe	USNRC Office of Nuclear Reactor Regulation	DSSA/SPSB
Bill Cook	USNRC Region I	Branch Chief, DRP

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NRC REPRESENTATIVES

NAME (PLEASE PRINT)	ORGANIZATION	TITLE
Warren Lyon	USNRC Office of Nuclear Reactor Regulation	DSSA/SRXB

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NAME (PLEASE PRINT)	ORGANIZATION	TITLE
Robert E. Henry	FAI	Sr V.P.
Robert J. Hammersley	FAI	V.P.
F.P. Ferraraccio	Westinghouse	Fellow Engr. / Proj. Mgr.
Robert Lindquist	APS	Consulting Engineer
Ruben Espinosa	Westinghouse	Principal Engineer
Mark Janke	Westinghouse	Principal Engineer
Hans Giesecke	MPR Associates Inc	Engineer
Robert W. Henry	SRP	Site Rep.
George Andrews	APS	Rx Eng Section Leader
Jim MacDonald	PNW	
Gerald Sowers	APS	PRA Section Leader
Scott Bauer	APS	Reg Affairs Dept. Ldr
Tom Weber	APS	Licensing Section Ldr
Terry Radtke	APS	Operations Director

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LICENSEE REPRESENTATIVES

NAME (PLEASE PRINT)	ORGANIZATION	TITLE
Dave Smith	APS	Plant Manager
Jim Levine	PNW	Exec VP Generation
Mike Winiar	APS	Nuclear Engineering Director
M. Dwayne Carnes	APS	Director, Reg Affairs/Nuc Assurance
Mark Radspinner	APS	Systems Engineering Sect Ldr
Glenn Michael	APS	Senior Engineer, Licensing
RODNEY WILFERD	APS	PROJECT MANAGER

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PUBLIC ATTENDEES

NAME (PLEASE PRINT)	ORGANIZATION	TITLE
JIMMY SEAWRIGHT	TXU POWER	REG AFFAIRS
ERIC SHOUSE	EL PASO ELECTRIC	SITE PV REPRESENTATIVE
FRED MADDEN	TXU POWER	
DAVID LOCHBAUM	UNION OF CONCERNED SCIEN	NUCLEAR SAFETY ENGINEER
KEN MANN	PINNACLE WEST CAPITAL CORPORATION	

ENCLOSURE 2

PREDECISIONAL ENFORCEMENT AND REGULATORY CONFERENCE AGENDA

CONFERENCE WITH ARIZONA PUBLIC SERVICE COMPANY

February 17, 2005

NRC REGION IV, ARLINGTON, TEXAS

8:00 - 8:30 a.m.

Introductions & Opening Remarks	Art Howell, Director, Division of Reactor Projects
	Tony Vegel, Deputy Director, Division of Reactor Projects
Enforcement process	Gary Sanborn, Director, Allegation Coordination & Enforcement Staff (ACES)
Apparent Violations	Scott Schwind, Senior Resident Inspector, Project Branch C, Division of Reactor Projects

8:30 a.m. - 12:00 p.m. (Breaks at 10 a.m. and 12:00 p.m. for public comment)

Opening Remarks	Jim Levine, Executive Vice President, Generation
System & Investigation Overview	Mike Winsor, Director, Nuclear Engineering
Testing Results and Safety Analysis	Mark Radspinner, Section Leader, System Engineering, Mechanical NSSS
Risk Significance Evaluation	Gerry Sowers, PhD, Section Leader, Probability/Risk Assessment

12:00-1:00 p.m.

Lunch Break

1:00 - 4:30 p.m. (Break at 2:00 p.m. for public comment)

Root-cause Investigation	Gerry Sowers, PhD, Section Leader, Probability/Risk Assessment
10 CFR 50.59	Tom Weber, Section Leader, Licensing
CRDR/OD	George Andrews, Section Leader, Reactor Engineering
Operational Decision-Making Lessons Learned	Terry Radtke, Director, Operations

NRC Enforcement Program

Predecisional Enforcement Conference with
Arizona Public Service Co.
February 17, 2005
Arlington, Texas

Key Points

- Most violations at power reactors processed under SDP
- 10 CFR 50.59 violations processed under Enforcement Policy
- Main difference are CP factors
- Significance of 50.59 violations determined by risk
- No final decisions have been made

Decision Process

- Determine whether violation occurred
- Determine significance of violation
- Evaluate all circumstances
- Determine sanctions

Factors in Determining Significance

- Actual safety consequences
- Potential safety consequences
- Impact on NRC's regulatory process
- Willfulness

Significance of 50.59 violations

Enforcement Policy, Supplement I:

Severity Level III .... A failure to obtain prior Commission approval required by 10 CFR 50.59 for a change, in which the consequence of the change, is evaluated as having low to moderate, or greater safety significance (i.e., white, yellow, or red) by the SDP.

Possible Outcomes

- No action
- Notice of Violation
- NOV with Civil Penalty ($)
- Order

Key Points About Civil Penalties

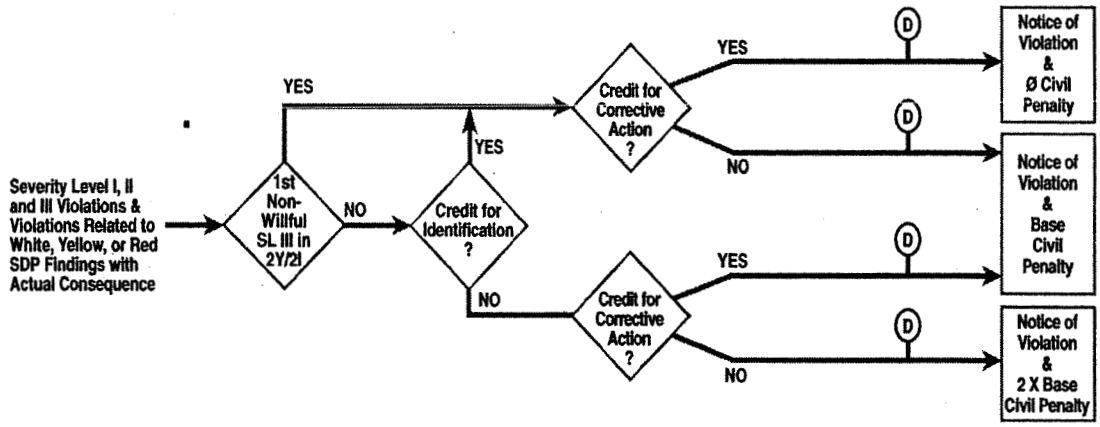
- Considered for Level I, II, and III violations
- May be assessed for each violation or grouping of violations and for each day violation occurred
- Based on type of license and significance of violations
- Current base penalty for power reactors is $130,000 (for Level I violation)*

*$120,000 in this case

Factors in Assessing Civil Penalties

- History of significant violations
- Willfulness
- Circumstances surrounding identification
- Corrective action taken
- Discretion (judgment)

CP Flow Chart



Post-Conference Process

- Review all information
- Panel to reach final decision
- Develop actions
- Notify licensee & issue actions
- Issue press release for civil penalties and orders

Appeal Rights

- Any agency action may be challenged
- Challenge may result in reconsideration of action or hearing
- Civil penalties and orders provide hearing rights

Operational Decision Making Lessons Learned

Terry Radtke
Director
Operations

Operational Decision Making Lessons Learned

- Four major issues identified from the RAS sump event
  - Control room notification of issues impacting operability not performed in a timely manner
  - Operability assessment not performed in a timely manner
  - Compensatory action credited without a completed 50.59 review
  - Indeterminate condition not recognized, requiring entry into LCO 3.0.3

Operational Decision Making Lessons Learned

- Management review team process implemented
  - Engages diverse and specialized expertise to discuss issues
  - Shift manager's role has been clarified to station personnel and reinforced with shift managers to ensure they are
    - Immediately notified
    - Involved in the technical discussions as they evolve
    - Continuously assessing operability
    - Ultimately responsible for making operability determinations

Operational Decision Making Lessons Learned

- Management review team process implemented
  - Operational decision-making practice utilized
    - Defines scope of condition
    - Operational significance determined
    - Determines best technical solutions
    - Considers operational challenges, licensing compliance and effects on safety margin
    - Appoints designated skeptic

Operational Decision Making Lessons Learned

- We have had a number of opportunities to exercise the MRT concept since the RAS sump event
  - Areas of improved performance
    - Shift managers are engaged
    - Heightened sensitivity to enter the operability determination process
    - Roles and responsibilities are established for making and implementing decisions
    - A designated skeptic challenges decision making

Operational Decision Making Lessons Learned

- Areas of improved performance
  - Implementation plans are developed to effectively communicate actions, responsibilities, compensatory measures and contingencies to ensure successful outcomes
  - Potential consequences of operational challenges are clearly defined, and alternative solutions are rigorously evaluated
  - Provides structured, facilitative approach using a specialized and diverse group of people

Operational Decision Making Lessons Learned

- Areas where improvement is still needed
  - Promptly reporting conditions that potentially challenge safe, reliable operation to the control room for resolution
  - Recognizing corrective actions that, in themselves, create a degraded or non-conforming issue that require an operability determination
  - Continuing to lower the threshold for when the operability determination process is entered

Operational Decision Making Lessons Learned

- Conclusions
  - We have learned
    - Prompt notification of issues impacting operability to the control room is essential
    - Implementation and execution of the operability determination and 50.59 processes has to be flawless
    - Shift managers have to be engaged in the technical discussions, continuously assessing operability and ultimately making the operability calls
    - Heighten the sensitivity and lower the threshold for entering the operability determination process

Operational Decision Making Lessons Learned

- **Conclusions**
  - **What we have changed**
    - Implemented MRT process for significant events and issues
    - Clarified and reinforced the shift manager's role
    - Revised the operability determination procedure
    - Updated procedures and communicated expectations to station personnel concerning prompt notification to the control room on issues impacting operability
    - Established an operational decision making tool

Station Response

George Andrews
Section Leader
Reactor Engineering

Agenda

- Review of NRC inspection report finding
- Evolutionary/background information
- Corrective action program
- Operability determination program

NRC Inspection Report Finding
Non-Cited Violation (NCV)

"...failure of Engineering and Operations personnel to implement requirements in the station's condition reporting and operability determination procedure following identification of a degraded condition."

- We agree with this finding

Background Information

- Station evolution to remove potential distractions from the control room
  - Work Control process
  - Site manager position
  - Role of STA section leader
  - Engineering desire to provide a solution to a problem

Corrective Action Program
Agenda

- Sequence of events/discussion
- Causes
- Transportability
- Corrective actions
- Summary of conclusions

Corrective Action Program
Sequence of Events/Discussion

Condition reporting procedure requirements

If the condition meets either of the following criteria:

1. The condition requires immediate action to ensure the safety of plant personnel or equipment,

OR

2. The condition is a non-conforming condition or may cause a degraded condition (i.e., loss of quality or function) in a plant system, structure or component

Then the originator SHALL:

1. Promptly notify the Shift Manager of the affected unit(s)

2. Initiate and/or take any required immediate actions

Corrective Action Program
Sequence of Events/Discussion
Thursday, July 29

- (1527) The design engineer initiated a condition report (CRDR) and electronically selected "control room review" required option but did not notify the shift manager
- The Design Engineering section leader did not review the CRDR verbiage and also did not ensure that the shift manager was notified of the condition

Corrective Action Program
Sequence of Events/Discussion
Friday, July 30

- (~0700) The Design Engineering section leader requested operations support from the Shift Technical Advisor section leader
- (~0730) STA Section Leader immediately informed the shift managers and Operations director
- (~0800) Operations, including the shift managers discussed the condition and entered the operability determination program

Corrective Action Program
Causes and Transportability

- **Causes**
  - Failure to follow the condition reporting procedure (timeliness of notification of shift manager)
  - Inadequate knowledge of electronic condition reporting process
- **Transportability**
  - Work control process
  - Deficiency work order (DFWO) process

Corrective Action Program
Corrective Actions

Condition reporting procedure revision (*complete*)

If the condition noted requires

1. Immediate action to ensure the safety of personnel or plant equipment

OR

2. The condition is a non-conforming condition or may cause a degraded condition (i.e., a loss of quality or function) in a plant system, structure or component

The originator SHALL

(A) Immediately notify (in person or by telephone) the shift manager of the affected unit(s)

AND

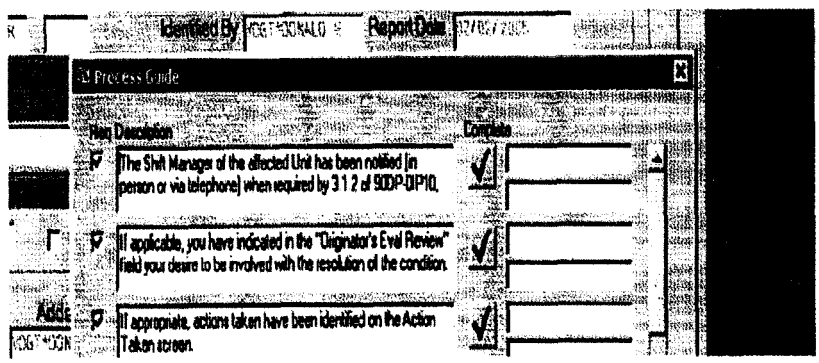
(B) Initiate and/or take any required compensatory actions

Corrective Action Program
Corrective Actions

- Site-wide communications via For Your Information (FYI) process (*complete*)
- Formal briefing on condition reporting procedure requirement *(complete)*
- Revise work control process (*complete*)
- Revise DFWO process (*complete*)
- Revise electronic CRDR process to route to control room directly (*complete*)

Corrective Action Program
Corrective Actions

- Electronic CRDR tool enhancement (*complete*)



Corrective Action Program
Corrective Actions

- Engineering Industry Events Training,
  - *To be completed by March 31, 2005*
- Classroom training for procedure use and adherence for all station personnel
  - *To be completed by December 31, 2005*

Corrective Action Program
Conclusion

- In this situation, station personnel failed to correctly implement the condition reporting procedure resulting in untimely notification of the shift manager of a significant condition adverse to quality

Operability Determination Program
Agenda

- Sequence of events/discussion
- Causes
- Transportability
- Corrective actions
- Summary of conclusions

Operability Determination Program
Sequence of Events/Discussion

- Design engineer identified the condition
- Previous design engineer was out of town, unavailable to provide support
- Design Engineering section leader wanted to perform further review and believed he had three working days to complete review
- Engineering contacted STA section leader for additional support

Operability Determination Program

Sequence of Events/Discussion
Friday, July 30

- (~0730) STA section leader notified the shift managers and Operations management of issue
- (~0800) Engineering, Operations and management believed the condition was too obvious to have gone undetected for such a long period of time
  - Nothing had changed for 20 years
  - "A calculation or evaluation of the configuration must exist"
- (~0800) The operability determination program was entered

Operability Determination Program

Sequence of Events/Discussion
Friday, July 30

- (~0800) STA section leader stated immediate operability call must be made by end of shift
- (~0800) Engineering began system behavior evaluation
- (~1000) Operations began developing process to fill the empty pipes
- (~1100) Compensatory action was identified to eliminate large portion of void

Operability Determination Program
Sequence of Events/Discussion
Friday, July 30

- (~1300) Engineering stated that a calculation could be done but it would not be completed by the end of shift
  - Issue #1
- (~1300) Engineering evaluation concluded that the void would not vent back to containment following a RAS
  - Issue #1

Operability Determination Program
Sequence of Events/Discussion
Friday, July 30

- (~1400) Compensatory action was discussed and accepted by Operations management to eliminate large portion of void
  - Issue #1
- Shift managers were aware of condition but were not directly involved in discussions between Engineering and Operations management
  - Issue #2

Operability Determination Program

Sequence of Events/Discussion
Friday, July 30

- (~1400) Engineering's understanding: No further immediate support required as Operations was going to eliminate void via compensatory action and addition of water
- (~1700) Operations' understanding: The compensatory action would eliminate the large portion of the void and only the small void must then be addressed prior to the end of the current shift

Operability Determination Program

Sequence of Events/Discussion
Friday, July 30

- (~1730) At the end of the shift, Engineering provided judgment that the small void would not impact pump operation
- (~1800) Operations completed the "immediate" operability assessment, concluding ECCS was operable based on compensatory action and engineering judgment on the small void
  - Issue #3

Operability Determination Program
Sequence of Events/Discussion
Friday, July 30 – Saturday, July 31

- Recognizing the significance of relying on the compensatory action, direction was given to expeditiously fill the piping with borated water
- In the process of developing a method to fill the piping, it was determined necessary to fill the containment sumps as well

Operability Determination Program
Sequence of Events/Discussion

- Issue #1: The immediate operability determination was not timely
- Issue #2: An indeterminate condition was not recognized and thus Technical Specification LCO 3.0.3 was not entered
- Issue #3: A compensatory action was inappropriately credited to maintain operability and without completion of a 50.59 evaluation

Operability Determination Program
Causes and Transportability

- Causes
  - Failure to follow the operability determination procedure
  - Management failed to recognize the significance of the issue
  - Operations management – directive versus facilitative
    - Took lead to ensure an evaluation complete by the end of shift
    - Inadvertently insulated/failed to keep shift managers informed of evolution of information
  - Misconception of how to apply 10 CFR 50.59 to compensatory actions to maintain operability

Operability Determination Program
Causes and Transportability

- Transportability
  - Previous operability determinations with compensatory actions
    - 10 CFR 50.59 reviews performed after crediting the action

Operability Determination Program
Corrective Actions

Training

- **Training for Operations' licensed personnel and shift technical advisors on operability determination program, process and requirements (*complete*)**
- **Targeted training on operability determination process and the use of compensatory actions**
  - ***To be completed by December 31, 2005***

Operability Determination Program
Corrective Actions

Operability determination procedure revision

- **Requires the shift manager to make and document an immediate operability call ASAP and generally within two hours following notification of Operations (*complete*)**
- **Management review team concept is required (*complete*)**
- **Clarifies requirements associated with crediting compensatory actions and review pursuant to 10 CFR 50.59 (*complete*)**
- **Includes a checklist and flow chart to aid the shift manager in the immediate operability determination (*complete*)**

Operability Determination Program
Corrective Actions

Operational decision making process

- External assessment of Operations leadership style and operational decision making
  - in progress, to be completed by February 28, 2005
- Internal assessment of operational decision making
  - scheduled for 3rd quarter 2005

Operability Determination Program
Conclusion

- In this situation, station personnel failed to correctly implement the operability determination procedure resulting in an untimely and incorrect assessment of operability

Containment ECCS Sump Suction Line Root Cause Investigation

Gerald Sowers, PhD
Section Leader
Probability Risk Assessment

Agenda

- Investigation team
- Condition description
- Cause of condition
- Transportability
- Extent of condition
- Missed opportunities

Investigation Team Charter

Perform required significant CRDR investigation associated with ECCS sump suction piping found unfilled including

- **Root cause and contributing causes**
- **Transportability of the physical condition to other structures, systems and components**
- **Extent of the condition**
- **Determine through review of internal and external operating experience**
  - **Opportunities that existed to identify the problem earlier**
  - **Identify lessons learned from those opportunities**

Investigation Team

- **Engineering**
  - **Team leader**
  - **3 design engineers**
  - **1 system engineer**
  - **1 maintenance engineer**
- **Operations**
  - **1 operations standards advisor**
  - **1 STA (part time)**
- **Performance Improvement International consultant**
- **Essentially full time from September to December**

Condition Description

- A section of ECCS suction piping was discovered to be unfilled. This was
  - Contrary to the original design intent, and
  - Unanalyzed
- This unanalyzed condition has existed since plant start-up and went unaddressed until July 2004

Cause Investigation

Review of

- All operation, surveillance and test procedures related to the sump suction line and
- Interviews with plant operators

confirmed that there never was a procedural requirement to fill the section of sump piping as a prerequisite to placing the system in operation

Cause Investigation

- Three potential failure modes
  1. The design requirement was specified, but the end user failed to consider the design requirement and did not incorporate it into station procedures
  2. The design requirement was recognized, but there was a breakdown in communicating the design requirement to the end user
  3. The design requirement was not recognized by the responsible design organization

Cause Investigation

- A review of the historical documents used as references for the development of operating and test procedures found no mention of the need to maintain the sump suction line filled
  - System Description Manual (Bechtel)
  - Design Criteria Manual (Bechtel)
  - CE procedure guidelines
  - CE interface requirements
  - Engineering Evaluation Requests (APS)
  - Startup documents

Cause Investigation

- Three peripheral documents were identified that referred specifically to the need to fill this section of pipe
  - Independent design review transcripts (May 1981)
  - CE letter to Bechtel about leaking seats on the sump isolation valves and the need for Type C testing (1/5/1984)
  - CE calculation providing information for NRC Bulletin 85-03 (MOV switch settings) response (11/26/1986, after Unit 1 license)
- None of these documents were intended or expected to be used by procedure authors as references for operating procedure development

Cause Investigation

- Several documents (FSAR, PVNGS SER) refer to filling the SI piping in general with no reference to specific parts of the system, in the context of prevention of water hammer
- Technical Specifications only required verifying that the discharge piping was full and did not mention the suction piping

Cause of Condition

- Cause #1 – A breakdown in communicating the design requirement to the end user
  - The documents used as references for writing the operating and test procedures did not include the requirement to maintain the sump line in a filled condition
- Corrective action — Added the requirement to the Safety Injection Design Basis Manual (complete)
- Corrective action — Changed procedure to require filling the pipe with borated water (complete)

Cause of Condition

- Cause #2 — The PVNGS technical specifications only required verifying full the discharge piping and did not mention the suction piping
  - This is consistent with the prevention of water hammer
- Corrective action — Added periodic verification that ECCS sump containment penetration lines are full to station procedures (complete)

Cause of Condition

- Contributing cause - The design of the system did not facilitate filling this section of piping
  - The original "vent and drain" connections were installed to facilitate leak rate tests
  - The connections were not standard vent and drain connections
  - No fill source was provided
- Corrective action – Changed the design to add vents, drains and a fill source (complete U3; to complete U1 and U2 in 2005)

Transportability Approach

- The transportability started with the obvious look for other sections of unfilled pipe
- The transportability evaluation was extended to identify parts of systems not normally in use and not periodically functionally tested

Transportability Scope

- Safety-related and selected important to safety systems
  - Fluid systems
  - I&C systems
    - GL 96-01, testing of safety-related circuits
  - Electrical systems

Transportability Results

- Fluid systems
  - No other piping sections identified as not filled
  - Not flow tested
    - A Section of the containment spray piping
      - CRDR 2760630, piping verified filled
    - RMWT to AF pumps (RMWT is not the safety-related water source; it is a backup to the CST)
  - No problems found

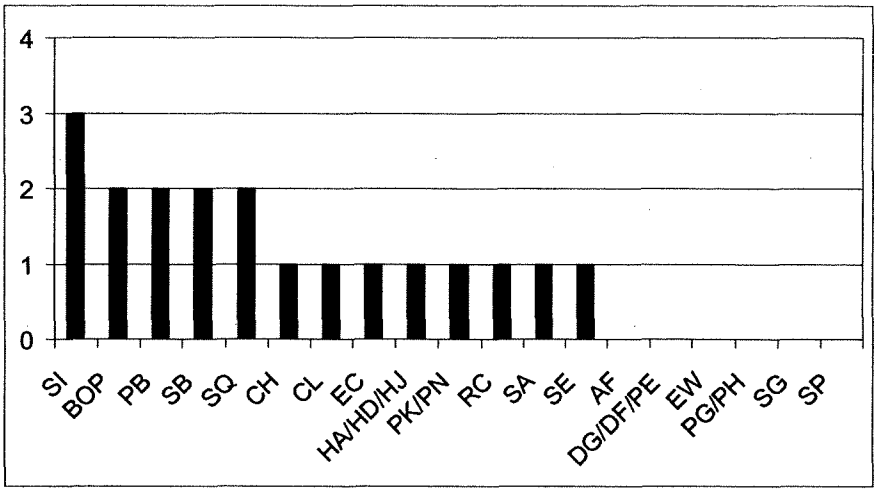
Transportability Results

- I&C systems – Generic Letter 96-01 reviewed for untested actuation circuits
  - Initial GL review was comprehensive
- Electrical systems - Circuits either normally energized, periodically energized (e.g., alternate battery chargers) or periodically tested
  - No problems found

Extent of Condition Approach

- All LERs since initial operation were reviewed to establish instances in which a similar condition was identified
  - LERs documenting failure to implement design requirements into operating basis
  - LERs categorized into three generic failure modes
- Distribution of failures examined to establish extent of condition
  - Global
  - Local
  - Isolated

Extent of Condition (LERs)



Extent of Condition

- More instances (three) in SI than other systems
- SI instances appear to be unrelated
- A review of all 19 LERs did not identify issues related by cause
- Condition is considered to be isolated

Missed Opportunities

- Two "direct" opportunities identified
  - Instruction Change Request 58646 - 11/16/1992
    - Failed to initiate a corrective action document
  - Design basis reconstitution project
    - Failed to follow project procedures

    Action – Review sample of IDR transcripts (Sept. 2005)

Conclusions

- Configuration was not maintained as the design intended due to failure of the original design organizations to adequately communicate the design requirement to the operating organization
- Isolated case

Palo Verde Investigation of Unfilled Emergency Core Cooling Piping

Mike Winsor

Director Nuclear Engineering

Investigation Director

Agenda

MORNING SESSION

Evaluation of Condition and Significance Determination

– System & Investigation Overview	Mike Winsor Director Nuclear Engineering
– Testing Results and Safety Analysis	Mark Radspinner Section Leader System Engineering Mechanical NSSS
– Risk Significance Evaluation	Gerry Sowers, PhD Section Leader Probability/Risk Assessment

Agenda

AFTERNOON SESSION

Evaluation of Condition and Significance Determination

– Root-cause Investigation	Gerry Sowers, PhD Section Leader Probability Risk Assessment

Plant Response

– 10 CFR 50.59	Tom Weber Section Leader Licensing
– CRDR/OD	George Andrews Section Leader Reactor Engineering
– Operational Decision-Making Lessons Learned	Terry Radtke Director Operations
– Concluding Remarks	Jim Levine

System Overview

- Combustion Engineering safety injection system
  - Two independent trains
    - High-pressure safety injection pump (HPSI)
    - Containment spray pump (CS)
    - Low-pressure safety injection pump (LPSI)
    - Recirculation sump
  - Inboard and outboard containment isolation valves
  - Recirculation actuation signal (RAS) opens valves and stops LPSI
  - System response to a LOCA scenario

Significant Investigation

- A significant investigation was initiated in accordance with our corrective action program to
  - Determine root cause of why the condition existed, the missed opportunities to identify the condition and extent of the condition/cause
  - Evaluate the safety significance of the as-found condition
  - Perform an assessment of the adequacy of the station response upon discovery of the condition

Investigation Overview

- Three teams formed, comprised of more than 20 Palo Verde and consulting personnel
- Contracted with testing, engineering and industry experts
  - Westinghouse
  - Fauske and Associates
  - Wyle Labs
  - MPR and Associates
  - Performance Improvement International
  - LeBlond and Associates
- Established an independent oversight group using recognized industry and academic experts

Investigation Oversight Committee

- Chartered by executive management to
  - Review team charters
  - Periodically review team direction
  - Review findings and proposed corrective actions
    - Provide critical feedback and consultation on methods, scope, results, corrective actions and conclusions for all areas of the investigation

Executive Oversight Committee

Committee members

Ed Fox – Executive Chairman, APS VP Communication, Environmental and Safety

Warren Peabody – PVNGS Nuclear Oversight Committee, retired Utility Executive

Joe Callan – PVNGS Nuclear Oversight Committee, retired NRC

Andy Kaufman – Senior Associate, Continuum Dynamics, Inc.

Norton Shapiro – Senior Consultant Engineer Safety Analysis, Westinghouse

Michael Mancini – Consultant, former VP, Ingersoll Pump Co.

Root Cause and Extent of Condition

- Charter
  - Determine root cause for leaving the piping unfilled since plant startup
  - Identify and evaluate causes for missed opportunities to correct the condition
  - Determine the extent of cause and condition

Plant Response

- Charter
  - Review adequacy of plant response
    - Condition reporting
    - Timeliness of control room notification
    - Operability determination
    - Compensatory actions
    - 50.59 adequacy, including program review
    - Human performance analysis

Safety Significance

- Charter
  - Develop a full understanding of the system response to the void and the resulting fluid conditions delivered to the pumps
  - Determine pump performance from the resulting fluid conditions
  - Using the pump and system response to the as-found condition, determine the safety significance

Plant Response
Significant CRDR Investigation

Tom Weber
Section Leader
Licensing

Plant Response Significant CRDR Investigation

- Charter
  - 10 CFR 50.59 program
  - Corrective action program (CRDR)
  - Operability determination program (OD)

Plant Response Significant CRDR Investigation

- Investigation director
  - Michael Winsor
- Team members
  - Jon Sears, qualified CRDR investigator
  - Thomas Weber, lead for 10 CFR 50.59
  - George Andrews, lead for CRDR/OD
  - Peter LeBlond, LeBlond and Associates

Violations

- Apparent violation
  - 1992 procedure change
- Green non-cited violation
  - Three examples

Apparent Violation

1992 Procedure Change

1992 Procedure Change

- Technical specification surveillance test
  - Emergency core cooling system (ECCS) leakage test
    - Tested every 18 months during outages
    - Performed in Mode 5 or lower when ECCS is not required to be operable
  - Test sequence (prior to procedure change)
    - Attach temporary test rig
    - Fill piping with demineralized water
    - Pressurize line to >40 psig
    - Walk down system to identify leakage
    - Remove temporary test rig

1992 Procedure Change

- ASME Section XI surveillance test
  - ECCS sump valves stroke test
    - Tested every quarter
    - Performed in any mode
    - Performed subsequent to ECCS leakage test
  - Test sequence
    - Valves stroked open then closed
    - Resulted in demineralized water being drained into RAS sump

1992 Procedure Change

- Instruction Change Request 61008, May 1992
  - Written against ECCS leakage test
  - Concerned with cleanup needed after demineralized water drained into RAS sump
  - Requested steps to remove demineralized water after TS testing was complete
  - TS surveillance test procedure changed – June 1992 (10 CFR 50.59 determined to be not applicable)

1992 Procedure Change

- Procedure change was maintenance activity
  - Removed demineralized water (test medium) after testing (prior to ASME test)
  - Restored piping to as-found condition (no change)
  - Perpetuated erroneous plant configuration (piping not filled)

10 CFR 50.59 Non-cited Violation

- Manually open inboard ECCS suction valves
- Filling the ECCS sump
- 10 cubic feet of air

Manually Open Inboard ECCS Suction Valves

- Two concerns with 50.59 review
  - Not completed prior to implementation
  - Ended at screening step

Manually Open Inboard ECCS Suction Valves

- Not completed prior to implementation
  - Cause
    - Failure to follow procedure
  - Completed corrective actions
    - STAs instructed to complete 10 CFR 50.59s prior to implementation
    - Revised the operability determination procedure

Manually Open Inboard ECCS Suction Valves

- Ended at screening step
  - Cause
    - Focused on degraded condition
    - Failed to understand change under review
  - Completed corrective action
    - Withdrew compensatory action and cancelled screening
  - Pending formal training, licensing review required prior to implementation
    - 10 CFR 50.59s needed for OD/compensatory actions
    - OD procedure revised to include this interim measure

Filled ECCS Sump

- Not completed prior to implementation
  - Cause
    - Failed to re-evaluate the change after the decision was made to add water to sump
      - Initially only piping was planned to be filled
      - Scope changed to include sump
  - Completed corrective actions
    - Entered condition in corrective action program
    - Performed the 10 CFR 50.59

Filled ECCS Sump

- Ended at screening step
  - Cause
    - Failed to demonstrate change was NOT adverse
    - Evaluation criteria used in screening step
  - Completed corrective action
    - Completed 10 CFR 50.59 evaluation

10 Cubic Feet of Air

- Area of disagreement with inspection report
  - The NRC cited Palo Verde for not performing a written safety evaluation prior to filling the line
- NEI 96-07, Rev 1, Section 4.4 states
  - "Three general courses of action are available to licensees to address nonconforming and degraded conditions. Whether or not 10 CFR 50.59 must be applied, and the focus of the 10 CFR 50.59 evaluation if one is required, depends on the corrective action plan chosen by the licensee."

10 Cubic Feet of Air

- Three courses of action
  1. The licensee intends to restore the structure, system or component back to as-designed condition. The activity is not subject to 10 CFR 50.59
  2. An interim compensatory measure is taken to address the condition. 10 CFR 50.59 applies to the interim compensatory measure, not the degraded condition
  3. The licensee intends to accept the condition "as-is" resulting in something different than its as-designed condition, or to change the facility or procedures. The final corrective action becomes the proposed change that would be subject to 10 CFR 50.59

10 Cubic Feet of Air

- The 10 cubic feet of air was a non-conforming condition subject to GL 91-18
  - The acceptability of the non-conforming condition was evaluated in the OD process
  - Was not the final corrective action
  - Final corrective action was to fill the piping with borated water to restore to original design condition
- NEI 96-07, Rev 1, Section 4.4 states
  - "This activity is not subject to 10 CFR 50.59."
- In compliance with NEI 96-07 and GL 91-18, no 10 CFR 50.59 performed

Extent of Condition

- Reviewed 283 operability determinations
  - Four previous ODs had 10 CFR 50.59s associated with compensatory actions
    - All four 10 CFR 50.59s were completed after the actions were implemented
    - Two of the four 10 CFR 50.59s inappropriately stopped at the screening step
  - Condition was limited to STAs in completing 10 CFR 50.59s for OD compensatory actions

Extent of Condition

- Completed corrective actions
  - Revised the OD procedure
  - Completed the evaluation for the 10 CFR 50.59 that inappropriately stopped at the screening step
- Additional corrective actions
  - Provide formal training to STAs
    - OD compensatory actions and the application of 10 CFR 50.59 by May 31, 2005

10 CFR 50.59 Program Review

- Oversight/Evaluations
  - Program manager review
    - 80% of the screenings and evaluations
  - NRC Inspection Report (10 CFR 50.59 program inspection)
    - 8 evaluations and 14 screenings
    - No findings
  - PVNGS self-assessment
  - Trend CRDR

10 CFR 50.59 Program Review

- Areas requiring attention
  - Program entry requirements
  - Screening vs. evaluation
  - Thoroughness of documentation
- Qualified 10 CFR 50.59 personnel to complete enhanced requalification training
  - Individuals who have not completed the training by March 31 will have their qualifications revoked

Summary

- Problem identified with performing 10 CFR 50.59s for compensatory actions within ODs
- Corrective actions implemented
- Areas requiring attention are being addressed

Risk Significance Determination

Gerald Sowers, PhD
Section Leader
Probability Risk Assessment

Significance

- Calculation assumptions
- Calculation
- Conclusion

Significance

Region IV analysis assumptions without testing results	PVNGS analysis assumptions with testing results
HPSI always fails on RAS	HPSI fails on RAS for breaks < 2.3" diameter
CS always fails on RAS	CS never fails
Operators recover HPSI	No recovery
Operators recover CS	CS never fails
No backup to HPSI	Depressurize, LPSI or CS as backup per EOPs
RCP seal LOCAs contribute to risk	RCP seal LOCA does not contribute to risk

Significance Calculation - Internal Events

Initiating Event	Region IV Approx. (ΔCDP)	PVNGS (ΔCDP)
Large LOCA	1.44e-06	0
Medium LOCA	1.06e-05	0
Small LOCA	9.15e-07	4.5e-6
Transients (PSV)	2.89e-06	2.7e-7
LOOP (RCP seal LOCA)	9.72e-08	0
Total	1.59e-05	4.8e-6

Significance Calculation – External Events

Initiating Events	Region IV (ΔCDP)	PVNGS (ΔCDP)
Seismic	7.90e-06	4.7e-7
Internal Floods	2.44e-09	1.0e-8
Fire	9.26e-07	1.8e-6
Total External	8.83e-06	2.3e-6

Significance Calculation Conclusions

Events	Region IV (ΔCDP)	PVNGS (ΔCDP)
Internal Events	1.6e-05	4.8e-6
External Events	8.8e-06	2.3e-6
Total	2.5e-05	7.0e-6