UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

MAR 2 4 2000

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

SUBJECT: MEETING TO DISCUSS CORROSION IMPACTS ON UNDERGROUND PIPING SYSTEMS (SPECIFIC EMPHASIS ON THE FIRE PROTECTION SYSTEM)

Dear Mr. Overbeck:

This refers to the meeting conducted in the Region IV office on March 21, 2000. This meeting was related to corrosion impacts on underground piping systems at the Palo Verde Nuclear Generating Station, Units 1, 2, and 3, facility.

During this meeting Mr. David Maudlin, Vice President - Engineering and Support, and other members of your staff, provided the ongoing efforts to identify, evaluate, and correct corrosion effects on the underground piping systems at Palo Verde Nuclear Generating Station. Additionally, your staff presented current Palo Verde Nuclear Generating Station initiatives regarding engineering calculations.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter will be placed in the NRC Public Document Room.

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

Sincerely,

Dale A. Powers

Dr. Dale A. Powers, Acting Chief
Engineering and Maintenance Branch
Division of Reactor Safety

Docket Nos.: 50-528; 50-529; 50-530
License Nos.: NPF-41; NPF-51; NPF-74

Enclosures:
1. Attendance List
2. Licensee Presentation

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bcc to DCD (IE01)

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*previously concurred OFFICIAL RECORD COPY

ENCLOSURE 1

ATTENDANCE LIST

MANAGEMENT MEETING ATTENDANCE	
LICENSEE/FACILITY	ARIZONA PUBLIC SERVICE COMPANY PALO VERDE NUCLEAR GENERATING STATION UNITS 1, 2, AND 3
DATE/TIME	MARCH 21, 2000 1 p.m.
CONFERENCE LOCATION	REGION IV, TRAINING CONFERENCE ROOM ARLINGTON, TEXAS

NAME (PLEASE PRINT)	**ORGANIZATION**	**TITLE**
Shabbir Pittalwala	PVNGS	Dept. Leader
Mike Winsor	PVNGS	Director, Eng
A.K. Krainik	PVNGS-APS	Director, Reg Affairs
David Mauldin	PVNGS-APS	Vice President Engr and Spprt.
FRANK GARRETT	PVNGS-APS	DEPT. LEADER
Leonard Willoughby	NRC: DRP: Branch A	Project Engineer
RAYMOND P. MULLIKIN	NRC-DRS-EMB	SR. REACTOR INSP.
DALE POWERS	NRC - DRS	SR TECH ANALYST
Art Howell	NRC - DRS, RIV	Director
Pat Gwynn	NRC - RIV	Deputy Regional Administrator
Kriss Kennedy	NRC-RIV	Senior Project Engineer
Nancy L. Salgado	NRC-RIV	Resident Inspector

ENCLOSURE 2

LICENSEE PRESENTATION

Underground Piping Status and Station Update

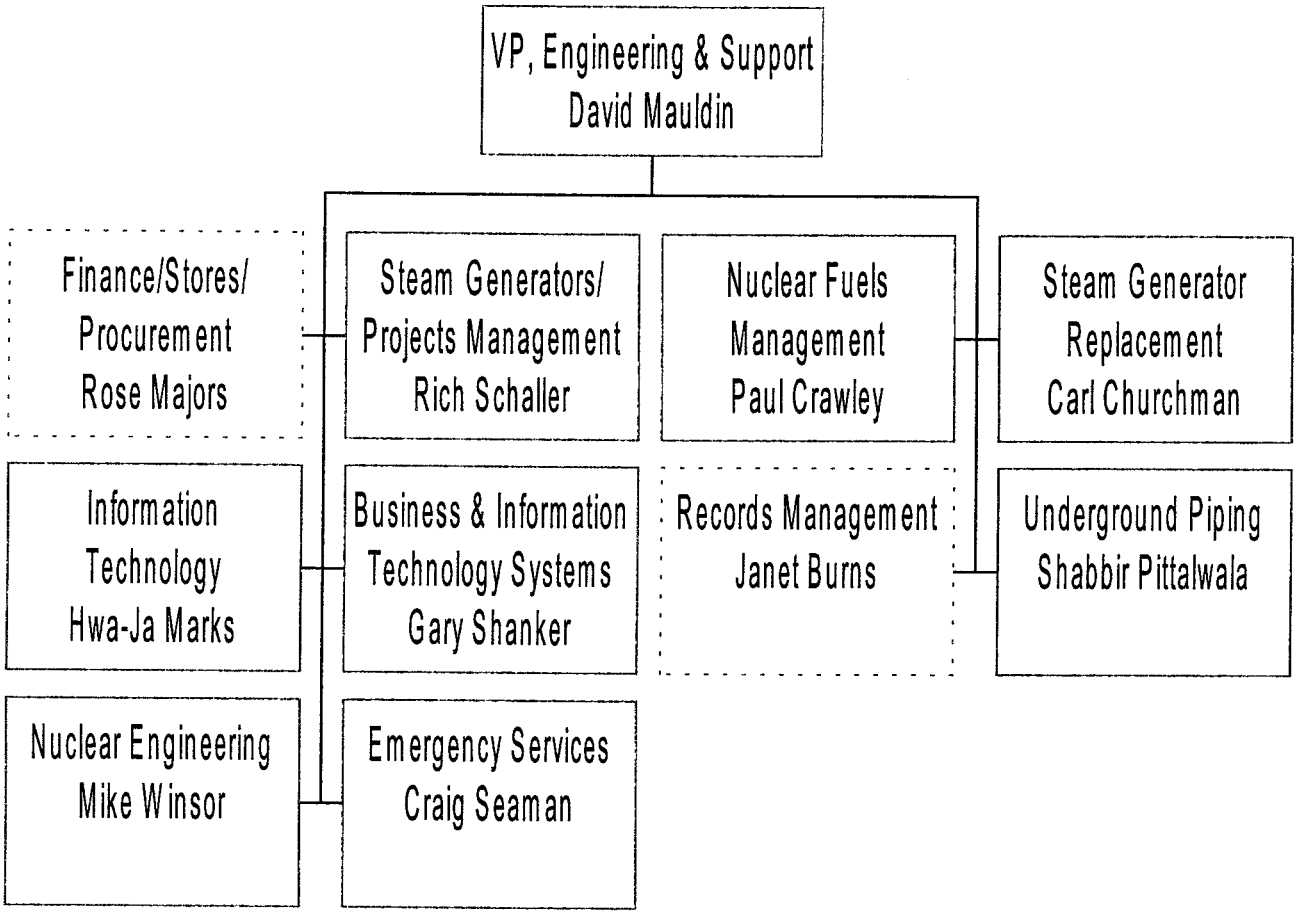
March 21, 2000

Agenda

- Introduction - David Mauldin
- Engineering Calculations - Mike Winsor
- Fire Protection - Frank Garrett
- Underground Piping - Shabbir Pittalwala

PALO VERDE

Palo Verde Engineering Organization



PALO VERDE

Palo Verde 2000 Strategic Focus

- Prevent Events/improve human performance
- Equipment Reliability - No failures in service
- Work management efficiency
- Thermal Performance enhancements
- Expand use of information technology

Engineering Calculations

Mike Winsor

Problem Statement

- NAD trending and NRC SSEI identified problems, such as:
  - Errors in calculations
  - Judgment not fully documented
  - Impacted calculations not revised
  - Identification of interrelationships lacking
- NAD Top 10
- Low safety significance

Human Performance Evaluation Of Condition

- No common causal factor
- Error precursors present
- Process weaknesses identified
- Conclusion — human performance cause

Actions

- Survey Region IV stations
- Train preparers, reviewers and leaders
- Enhance procedure
- Develop improved tool for impact reviews
- Develop monitoring/feedback tools
- Perform self-assessments

Long Term Perspective

- Maintain the design and licensing basis
- Develop and implement programs that provide:
  - Barriers to avoid common problems
  - Proper balance between knowledge and formal procedures
- Create a Prevent Events culture within Engineering

Palo Verde Fire Protection

Frank Garrett

Fire Protection Defense-In-Depth Elements

Design features such as non-combustible construction and circuit separation

Fire prevention and administrative controls

Fire detection

Manual fire suppression

Automatic fire suppression

Passive fire barriers

Fire Protection Water Supply Basic Requirements

Able to supply anticipated fire water requirements in accordance with design and licensing basis

Indicating valves provided for isolation during maintenance/repair without shutting off entire system

Independent fire water supplies

Palo Verde Configuration

Two independent 500,000 gallon supplies

Three backup water supply locations (cooling tower basins)

Three 50 percent capacity fire pumps capable of 4,500 gpm combined capacity (rated)

Extensive fire main system with sectional isolation capability

Redundant feeds to safety-related areas

Fire Protection Piping System Improvements

Cathodic protection system — 1987/1999

Relined fire water tanks — 1995

Fire water tank anode replacement — 1990/95

Fire water tank/domestic water separation — 1995

Fire Protection Piping System Improvements

Deep well pump casings repaired — 1993/94

Chemical Addition System — 1995

Installation of air dryers for pre-action pipe systems — 1997

Corrosion rate monitoring — 1989/2000

more ...

Fire Protection Piping System Improvements

Post indicator valve replacement — 1999

Underground pipe wall thickness mapping — 2000

Operations controls

- System flushing
- Pre-action system drop-leg draining -
- Loop flow testing

more...

Fire Protection Piping System Improvements

System team ownership

Senior management oversight

- Level 1
- OSRC

more...

Fire Protection Piping System Status

Corrosion rates trending below 1.0 MILS/year

Water chemistry within desired range

Fire pump availability exceeding goal of 90 percent

Fire pump hydraulic performance acceptable

more...

Current System Status

Underground loop hydraulic performance acceptable

- Last test 4,654.8 gpm at 104 psi
- Requirement 4,000 gpm at 80 psi

Ability to isolate system

System leaks infrequent for piping supplying safety-related areas

Fire Safety Significance

Water supply capability far exceeds nuclear safety needs

Limited reliance on fire-water suppression systems for Appendix R compliance

System performance closely monitored

2000 Underground Piping Project

Shabbir Pittalwala

Purpose

Ensure long-term health and reliability of piping systems

Pipe failures (WRSS) and leaks (FP, CM, DS) - since 1996
Inspection/repairs - 1997

Refine inspection/repair techniques - 1998

Form Underground Piping Group - 1999

Focused enchancement efforts - 2000

Note: Operational impacts mitigated by redundant/loop design and aggressive remedial actions.

Description Of Problem

Operating experience

External corrosion:
corrosive soils-chlorides and sulfates

Internal corrosion:
acids, chlorides in process fluids and
Microbial Influenced Corrosion (MIC)

Site priorities to address experiences

Pipe Categories

Concrete pipe systems

CW, TBMU, TBBD, PW

Metallic pipe systems

AF, CC, CD, CH, CI, CM, CT, DF, DS, DW, FP, GA, IA, LO, NC, OS, OW, RP, RS, SC, SP, SPD, ST, TC

These are safety-related systems.

Priority Ranking System

Safety related significance/risk significance (PRA review)

Pipe operational experience inspections, failure history, industry operating experience, lessons learned

Impact to environmental requirements-consequence of failure

Impact to plant operations-plant/unit/ system outages or compensatory actions

Ranking Results

Concrete pipe

Priority A	Priority B
TBMU-redundant	PW-Inspection ongoing: Unit 1 good
TBBD	
CW-inspected, repairs ongoing	

Ranking Results

Metallic pipe

Priority A	Priority B	Priority C
CM	CD	CC
	CH	CT
FP	DF	DS
	DW	GA
SP	OW	IA
	NC	LO
	SC	OS
	TC	SPD
		ST

System Status

Chlorine Injection/Chemical Waste - degraded piping replaced

Fire Protection - separated from Domestic Water, chemical/biocide treatment, cathodic protection upgraded, valve replacement/inspections ongoing

more...

System Status

Essential Spray Pond - visual examination, chemical treatment, harvested spool examined (pit depth .035" in .365" pipe metal)

Enhanced inspection/repair techniques

Actions Taken

Cataloged, categorized and prioritized all underground piping

Developed inspection plans

Commenced replacement/repair

Enhanced inspection/repair techniques

Ongoing Actions

Baseline inspection and condition evaluation-FP, SP, PW, CW, OW

Repair/replacement of degraded piping-CI, CM, FP, TB, CW, WRSS

Conclusions

Piping was designed with accepted protection: redundant trains/loop design, corrosion resistant coatings and linings, non-corrosive materials, cathodic protection, chemistry controls

Pipe corrosion has occurred due to internal/external corrosive attack

Focused attention and deliberate actions are ongoing to ensure reliability

System Names

Acronym	Name
AF	Auxiliary Feedwater
CC	Chemical Production
CD	Condensate
CH	Chemical and Volume Control
CI	Chlorine Injection
CM	Chemical Waste
CT	Condensate Transfer and Storage
CW	Circulating Water

System Names

Acronym	Name
DF	Diesel Fuel Storage and Transfer
DS	Domestic Water
DW	Demineralized Water
FP	Fire Protection
GA	Service Gases
IA	Instrument and Service Air
LO	Lube Oil
NC	Nuclear Cooling

System Names

Acronym	Name
OS	Lube Oil Storage, Transfer and Purification
OW	Oily Waste
PW	Plant Cooling Water
RP	Raw Water
RS	Raw Water Supply
SC	Secondary Chemical Control
SP	Essential Spray Pond
SPD	Settling Pond Drain

System Names

Acronym	Name
ST	Sanitary Drainage
TBBD	Cooling Tower Blowdown
TBMU	Cooling Tower Make Up
TC	Turbine Cooling
WRSS	Water Reclamation Supply System