

June 24, 2003

LICENSEE: Arizona Public Service Company (APS)
FACILITIES: Palo Verde Nuclear Generating Station
SUBJECT: MEETING WITH REPRESENTATIVES OF ARIZONA PUBLIC SERVICE COMPANY FOR PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3 (TAC NOS. MB6726, MB6727, AND MB6728)

A meeting was held on Wednesday, May 14, 2003, between the Nuclear Regulatory Commission (NRC) staff and the licensee for Palo Verde Nuclear Generating Station, Units 1, 2, and 3 (Palo Verde or PVNGS). The meeting was held at the request of NRC. Notices for the meeting were issued on May 5 and 7, 2003. The notices stated there would be meetings on May 14 and 15, 2003; however, a meeting only had to be conducted on May 14th. The second notice showed that the meetings were scheduled to be conducted until 5 p.m. each day and that there may be discussions on proprietary information submitted by the licensee.

Enclosure 1 is the list of attendees. Enclosure 2 is the slides handed out by the NRC staff. There was no handout from the licensee. Enclosure 3 is the request for additional information sent by the NRC staff to the licensee and Enclosure 4 is the draft information in response to the questions. Enclosure 4 was provided by the licensee in preparation for the meeting and none of the information is proprietary. Enclosure 5 is a list of acronyms used in this meeting summary and in Enclosures 2 through 4.

BACKGROUND

The licensee submitted an application dated November 7, 2002, to change the Technical Specifications. The changes are needed to support an upgrade to the core protection calculator (CPC) system to replace the current system due to parts obsolescence. The licensee stated that all CPC and control element assembly calculator (CEAC) systems are to be replaced with a functionally equivalent, digital Common Qualified (or Common-Q) CPC System provided by Westinghouse. The basic Common-Q CPC System design concept was approved by NRC in its Safety Evaluation, Acceptance for Referencing of Topical Report CENPD-396-P, Revision 01, "Common Qualified Platform" and Appendices 1, 2, 3, and 4, Revision 01, dated August 11, 2000.

The licensee requested that NRC approve the license amendment request (LAR) by July 1, 2003, with 90 days allowed for the implementation of the amendment. The licensee is planning to install the first CPC upgrade first at Unit 2 during the fall 2003 refueling outage, because this outage will be an extended outage, because of the steam generator replacement also planned for this outage. The installations for Units 1 and 3 would be done in later refueling outages for these units, but with the experience gained from the installation at Unit 2. The licensee's request for the amendment to be issued by July 1, 2003, was to allow time to complete the planning and scheduling to install the CPC upgrade in the Unit 2 fall refueling outage which begins late September 2003.

With the application for the amendment submitted November 7, 2002, the NRC staff expected to complete its review of the LAR in May 2003; however, because of the retirement of the lead reviewer in March 2003, the NRC staff has had to reconsider the schedule requested by the licensee. It is the NRC staff's belief that installing the CPC upgrade in the Unit 2 fall outage is worthwhile in terms of safety, because the extended outage will allow the licensee more time to install, test, and work with the upgrade. Therefore, the NRC staff decided to expedite its review of the LAR to try to complete its review in time so that the upgrade can be installed in the Unit 2 fall outage if the LAR is acceptable.

This meeting was requested by the NRC staff to assist in identifying additional information needed from the licensee. The meeting was scheduled such that the NRC staff would have time to review Enclosure 4 prior to the meeting.

The agenda for the meeting was for the NRC staff to (1) discuss with the licensee the current status of the following three reviews that comprise the NRC staff evaluation of the CPC upgrade LAR and (2) identify what additional information may be needed from the licensee for the NRC staff to complete the reviews:

- Instrumentation and Control Systems (ICS) Review
- Human Factors (HF) Review
- Reactor Systems (RS) Review
- Documenting Information Provided by the Licensee

The discussion in these three review areas is addressed below:

ICS Review Results

The expectations and additional information needed by the NRC staff based on the ICS review to date are in Enclosure 3. This was discussed with the licensee. The slides provide the history of the interaction between the NRC staff and the licensee in the ICS review area. Some of ICS documents reviewed by the NRC staff were reviewed in the Westinghouse Rockville, Maryland office. The NRC staff identified additional information needed for this review area. For example, in terms of the responses to NRC staff questions in Enclosure 4:

- For Question 1, an explanation of how nonsafety system channels may affect safety systems is needed.
- For Question 5, copies of related implementing procedures are needed.
- For Question 10, licensee needs to expand on the draft response.
- For Question 16, licensee needs to expand its response to Plant Specific Action Item (PSAI) 6.11, which is on pages 24 to 26 of the second enclosure to the application dated November 7, 2002.

The 10 questions shown on page 7 of Attachment 2 were discussed with the licensee in the meeting.

As stated on page 8 of Attachment 2, further additional information may be identified by the NRC staff since it has not completed its review in this area. Also, visits to Westinghouse and

the licensee to conduct a software audit and review licensee activities with respect to the CPC upgrade are shown.

The licensee gave the NRC staff the following three drawings: "Reed Switch Assy," CEDM-E-R1000, Rev. 08; "CPC/PMS Data Link Fiber Optic Cable," C-14273-416-410, Rev. 02; and "Control Wiring Diagram Plant Computer System," 02-E-RJF-001, Rev. 13, Sheet 7.

HF Review Results

The NRC staff conducted a conference call with the licensee on March 6, 2003. The licensee explained that some work remained to be done in the human factors area for the CPC upgrade. The licensee submitted a discussion of this work in the letter dated April 25, 2003 (ADAMS Accession No. ML031270090), which included proprietary and non-proprietary versions of the Westinghouse topical report WCAP-16076-P, "Requirements Phase Human Factors Review for the Common Q Phase 3 Core Protection Calculator System Project," dated March 2003.

A conference call was conducted in the meeting with the author of the above topical report. The NRC staff discussed the information in the topical report and in the licensee's letter dated April 25, 2003, and concluded that no additional information was needed beyond what the licensee had submitted.

RS Review Results

A conference call was held with the licensee on May 15, 2003, that discussed the draft information in the RS review area in Enclosure 4. The licensee stated that it would expand on some of the responses in the second part (15 pages) of Enclosure 4, including the evaluation of accuracy in the response to NRC Question 2 that is stated to be described later. The NRC staff concluded that it did not need any to add any new questions on the CPC upgrade beyond those given in Enclosure 3.

Documenting Information Provided by the Licensee

The draft information provided by the licensee in Enclosure 4, and the additional information requested by the NRC staff in (1) the discussions held in the above three areas of review and (2) any future request for information, will be submitted by the licensee in a letter or letters to the NRC. These letters will be placed on the Palo Verde dockets for the three units. The final evaluation of the CPC upgrade LAR by the NRC staff will not be based on the draft information in Enclosure 4, but on the information to be submitted by the licensee in letters to the NRC and which will have gone through the licensee's quality assurance/quality control review.

The NRC staff completed its presentations and the meeting was closed.

/RA/

Jack Donohew, Senior Project Manager, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-528, 50-529, and 50-530

Enclosures:

1. List of Meeting Attendees
2. NRC Staff Meeting Handout
3. Request for Additional Information Sent to Licensee
4. Draft Information Provided by Licensee
5. List of Acronyms

cc w/encls: See next page

The NRC staff completed its presentations and the meeting was closed.

/RA/

Jack Donohew, Senior Project Manager, Section 2
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Division of Licensing Project Management
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 5. List of Acronyms

cc w/encls: See next page

DISTRIBUTION:

PUBLIC

PDIV-2 Reading

RidsNrrDlpm (JZwolinski/TMarsh)

RidsNrrDlpmLpdiv (HBerkow)

RidsNrrDlpmLpdiv-2 (SDembek)

RidsNrrPMJDonohew

RidsNrrLAMMcAllister

RidsOgcRp

RidsAcrcAcnwMailCenter

MWaterman (NRR/DE/EEIB)

PLoeser (NRR/DE/EEIB)

MFields (EDO)

CDoutt (NRR/DSSA/SPSB)

EMarinos (NRR/DE/EEIB)

MChiramal (NRR/DE/EEIB)

CGraham (NRR/DE/EEIB)

JCai (NRR/DIPM/IEHB)

REckenrode (NRR/DIPM/IEHB)

MKowal (NRR/DSSA/SRXB)

LSmith, RIV

VHall (NRR/DE/EEIB)

RidsRgn4MailCenter (Ahowell)

TMensah (NRR/DSSA/SPLB)

DTiftt (RES)

ADAMS Accession No.: ML031750226

NRC-001

| OFFICE | PDIV-2/PM | PDIV-1/LA | SRXB | EEIB | IEHB | PDIV-2/SC |
|--------|-----------|-------------|---------|---------|------------|--------------------|
| NAME | JDonohew | MMcAllister | MKowal | CGraham | REckenrode | RGramm for SDembek |
| DATE | 6/17/03 | 6/10/03 | 6/18/03 | 6/23/03 | 6/24/03 | 6/24/03 |

DOCUMENT NAME: G:PDIV-2\PaloVerde\Summary05-14-03MTG.pvngs.wpd

OFFICIAL RECORD COPY

LIST OF ATTENDEES AT MEETING OF MAY 14, 2003

EXPECTATIONS OF AND INFORMATION NEEDED BY NRC STAFF

CPC UPGRADE LICENSE AMENDMENT REQUEST REVIEW

| <u>NAME</u> | <u>AFFILIATION</u> |
|------------------|----------------------------|
| J. Donohew | NRC/NRR/PDIV-2 |
| S. Dembek | NRC/NRR/PDIV-2 |
| E. Marinos | NRC/NRR/EEIB |
| C. Graham | NRC/NRR/EEIB |
| M. Waterman | NRC/NRR/EEIB |
| P. Loeser | NRC/NRR/EEIB |
| V. Hall | NRC/NRR/EEIB |
| D. Tifft | NRC/NRR/EEIB |
| C. Doutt | NRC/NRR/SPSB |
| J. Cai | NRC/NRR/IEHB |
| M. Chiramal | NRC/NRR/EEIB |
| R. Eckenrode | NRC/NCR/IEHB |
| M. Kowal | NRC/NCR/SRXB [#] |
| T. Weber | APS |
| D. Gregoire | APS ^{**} |
| A. Tasufiq | APS |
| F. Swirbul | APS ^{**} |
| M. Stofko | Westinghouse |
| W. Odess-Gillett | Westinghouse |
| W. Gardner | Westinghouse |
| R. Fuld | Westinghouse ^{##} |

Where:

| | |
|--------|--|
| APS | = Arizona Public Service Company |
| NRC | = Nuclear Regulatory Commission |
| NRR | = Office of Nuclear Reactor Regulation |
| PDIV-2 | = Project Directorate IV-2 |
| EEIB | = Electrical and Instrumentation and Controls Branch |
| IEHB | = Equipment and Human Performance Branch |
| SPSB | = Probabilistic Safety Assessment Branch |
| SRXB | = Reactor Systems Branch |
| DE | = Division of Engineering |

^{**} Also attended at NRC headquarters the conference call on the reactor systems review area on May 15, 2003.

[#] Only attended the conference call on May 15, 2003.

^{##} Participated by conference phone.

ENCLOSURE 1

NRC STAFF HANDOUT FOR MAY 14, 2003, MEETING

ADAMS ACCESSION NO. ML031490635

ENCLOSURE 2

REQUEST FOR ADDITIONAL INFORMATION SENT TO LICENSEE

Requests for additional information were sent to the licensee by emails for the Electrical and Instrumentation and Controls Branch and the Reactor Systems Branch. The emails and the questions sent to the licensee are given below.

Electrical and Instrumentation and Controls Branch:

From: Jack Donohew
Sent: Thursday, March 20, 2003 11:40 AM
To: Weber, Thomas N(Z00499)
Cc: Paul Loeser
Subject: Electrical Branch RAI for CPC Upgrade LAR

Send me a reply that you have received this RAI.
Review the questions quickly to see if you have any immediate questions on the RAI questions because I am in the office this afternoon, but will be out of the office tomorrow. Otherwise we will talk at the next weekly call about any questions your staff has.
<JND>

REQUEST FOR ADDITIONAL INFORMATION

CPC UPGRADE LICENSE AMENDMENT REQUEST

PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3

Arizona Public Service Company (APS, the licensee) submitted its core protection calculator (CPC) upgrade license amendment request in its application dated November 7, 2002 (102-04864). The NRC staff has reviewed the application and the following additional information is needed for the staff to complete its review. If it is appropriate to reference Westinghouse topical reports (TRs) or NRC safety evaluations (SEs) as part of the response to a question, the TR or SE title, revision number, issuance date, section, and page number needs to be included.

1. Provide the following documentation:
 - a. software requirements specification (SRS) for the PVNGS CPC.
 - b. procurement document that APS is using to procure the CPC.
 - c. system requirements specification (SysRS) for the PVNGS CPC.
 - d. copy of any plant procedures which will change as a result of this upgrade.
 - e. copy of the human/machine interface (HMI) review. (see page 23 of the attachment to the application, PSAI 6.7)

ENCLOSURE 3

2. Discuss the operation of the CPC using a more detailed diagram than provided in the application (i.e., Figure 2-2). As an example of what detail to include in the response, consider the following (not a complete list):

- Diagram of the RPSTs (resistor ladder ?)
- Connectivity from all sensors to the RPS
- other connectivity (plant computer, other)
- Communication protocols used
- Sensor input type (analog 4-20 ma, digital, smart sensor)
- connectivity between 4 proposed channels of the CPC

Note that the staff would prefer an engineering level drawing.

3. Provide an assembly drawing for one channel of CPC to allow the staff to understand the front level view of the system.

4. Provide the schematic capture drawings written in the application specific software that will allow the staff to trace the flow path from field inputs to the reactor protection system (RPS). Include the calculation algorithms in diagram form to allow the staff to view where and how the system meets the SRS and SysRS.

5. Discuss the organizational structure that exists at APS that ensures the software system life-cycle activities are carried out. The response should be detailed enough to allow the staff to view the software quality assurance (SQA) process APS personnel use for the CPC. If APS does not have a Configuration Control Board, how will the configuration be controlled, and who will be responsible.

6. What differences exist between the system to be delivered to PVNGS and the system approved by NRC staff? As part of answering this question please consider new software versions, hardware design changes, corrections or modifications as a result of testing.

7. Please discuss CPC and operations personnel responses to the following scenarios:

- A disparity between redundant RPSTs
- Multiple failed reed switches
- Channel penal factor disparity
- Recovery of channel form loss of power

8. Please provide a hardware listing of one channel of the CPC. This listing can be at the card and rack level. For example analog input card, digital output card, PC node box, FPDS, etc.

9. How does the close out generic open items, as addressed in the staff safety evaluation issued February 24, 2003, for TR CENPD-396-P, Revision 1, affect the application.

10. For justification to remove technical specification (TS) Condition E in the application, CPC cabinet high temperature, the application mentions "extensive online diagnostics." Please provide a justification that the diagnostics mentioned in Section 2.2, page 3, of the application meet the intent of the original TSs which requires a channel functional test (i.e. how do you ensure that the diagnostics provide sufficient coverage to perform the functional test as originally intended).
11. For Condition F, the TS discussion on page 4 of the application, discuss the corrective actions intended for the following: during a 12 hour period, the maintenance staff performs a restart of a channel three or more times.
12. The application regarding TS 3.3.1 proposes changes that would remove all limiting conditions for operation (LCO) requirements associated with the CPC. Please justify why no LCO conditions exist in the proposed TSs for the CPC upgrade. When considering your response, you should provide more than just a qualitative answer regarding the existence of diagnostics.
13. In the discussion of Factory Acceptance Test (FAT), the application states in part, "inputs calculated to exercise branches in C code."
 - What C code is the application referring to?
 - How many lines of code are there?
 - Please rank the code complexity considering and providing: number of branches, recursion, function calls variable and similar items to help the staff understand how testing will "stress the system."
 - Please provide any fault injection methods used at the unit or module level.
 - What calculations are performed to determine appropriate exercising of branches and conditional statements.
14. Provide the FAT and site acceptance test (SAT) for the proposed CPC upgrade.
15. For PSAI 6.1 in the attachment to the application, the APS response discusses the input/output (I/O) subsystem and meeting of the SysRS. Discuss if APS is using S600 I/O modules and if, so address the PSAI 6.1 assessment of S600 I/O modules.
16. Provide the plant specific failure modes and effects analysis (FMEA) mentioned in the APS responses to PSAIs 6.3 and 6.10. Include a diagram of sufficient detail that will allow the staff to follow the FMEA to confirm its adequacy and completeness.
17. Provide the timing requirements of the CPC. What is the response time required by the Palo Verde Updated Final Safety Analysis Report.

Reactor Systems Branch:

> From: Jack Donohew
> Sent: Friday, February 14, 2003 10:23 AM
> To: Weber, Thomas N(Z00499)
> Subject: Fwd: Palo Verde CPC Upgrade
>
> > <<Palo Verde CPC Upgrade>>

REQUEST FOR ADDITIONAL INFORMATION

CPC UPGRADE LICENSE AMENDMENT REQUEST

PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3

REFERENCE: Letter from D. Mauldin, Palo Verde Nuclear Generating Station (PVNGS), to US NRC, "Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2 and 3, Docket Nos. STN 50-528/529/530, Request for Amendment to Technical Specifications: 3.2.4, Departure From Nucleate Boiling Ratio (DNBR), 3.3.1, Reactor Protective System (RPS) Instrumentation - Operating, 3.3.3, Control Element Assembly Calculators (CEACs)," dated November 7, 2002.

In the above referenced letter, APS submitted a License Amendment Request proposing to make changes to PVNGS Technical Specifications (TS) associated with an upgrade of the Core Protection Calculator System (CPCS). SRXB is reviewing the proposed change to TS 3.2.4 regarding DNBR and has the following Draft RAI questions:

DRAFT QUESTIONS

1. The licensee's post-installation test program includes using a Core Protection Calculator (CPC) simulation program after startup that calculates local power density (LPD) and departure from nucleate boiling ratio (DNBR) based on actual plant parameters and compares to CPC LPD and DNBR values.
 - a. At what power level(s) will this testing be performed? Include a discussion of the consequences should an anticipated operational occurrence which relies on these trips occur during power ascension and prior to the testing being completed and verified.
 - b. Please provide the acceptance criteria values which will be used to determine that the CPC calculated LPD and DNBR values are acceptable. Also provide the basis for these acceptance criteria.
 - c. Please discuss any benchmarking or validation process used to ensure the accuracy of the CPC simulation program.

2. The licensee states that the PVNGS UFSAR Chapter 15 analyses are not impacted by the upgraded CPCS. Please provide quantitative results which demonstrate that the UFSAR Chapter 15 assumptions for CPC performance, response time and accuracy will continue to be satisfied with the upgraded CPCS.
3. The licensee states that the upgraded CPCS will utilize safety-related algorithms which are functionally identical to the existing CPCS. Please define exactly what is meant by "functionally identical" (e.g., calculation method, frequency of calculation,...) and discuss any verification and validation processes performed to ensure identical functionality.
4. Please discuss any impacts of the upgraded CPCS on the relationship and compatibility with the Core Operating Limit Supervisory System (COLSS).
5. The Control Element Assembly Calculators (CEAC) calculate CEA position related penalty factors for use in the CPCs. Is the CEAC calculation of the penalty factors in the upgraded CPCS identical to the method used in the current system? Please provide a discussion and justification for any differences.
6. Please discuss any impacts of the upgraded CPCS on the CPC Addressable Constants.

DRAFT INFORMATION PROVIDED BY LICENSEE

ADAMS PACKAGE ACCESSION NO. ML031490460

1. Draft Responses to Electrical and Instrumentation and Control (E&IC) Branch, 34 pages, ADAMS Accession Number ML031490455.
2. Draft responses to Reactor Systems Branch, 15 pages, ADAMS Accession Number ML031490458.

ENCLOSURE 4

LIST OF ACRONYMS

| | |
|-------|--|
| APS | Arizona Public Service Company |
| CEA | Control element assembly |
| CEAC | Control element assembly calculators |
| COLSS | Core operating limit supervisory system |
| CPC | Core protection calculator |
| CPCS | Core protection calculator system |
| DNBR | Departure from nucleate boiling ratio |
| Docs | Documents |
| FAT | Factory acceptance test |
| FMEA | Failure modes and effects analysis |
| HDD | Hardware design description |
| HMI | Human/machine interface |
| HF | Human factors |
| ICS | Instrumentation and control systems |
| LAR | License amendment request |
| LPD | Local power density |
| PVNGS | Palo Verde Nuclear Generating Station |
| PSAI | Plant specific action item |
| RS | Reactor systems |
| SDD | system design description |
| SE | Safety evaluation |
| SQA | Software quality assurance |
| SRS | Software requirements specification |
| SysRS | System requirements specification |
| TR | Topical report |
| UFSAR | PVNGS Updated Final Safety Analysis Report |

Palo Verde Generating Station, Units 1, 2, and 3

cc:

Mr. Steve Olea
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, AZ 85007

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

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
P. O. Box 40
Buckeye, AZ 85326

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
Harris Tower & Pavillion
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

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

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

Mr. Craig K. Seaman, Director
Regulatory Affairs/Nuclear Assurance
Palo Verde Nuclear Generating Station
P.O. Box 52034
Phoenix, AZ 85072-2034

Mr. Hector R. Puente
Vice President, Power Generation
El Paso Electric Company
2702 N. Third Street, Suite 3040
Phoenix, AZ 85004

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

Mr. Jarlath Curran
Southern California Edison Company
5000 Pacific Coast Highway Building DIN
San Clemente, CA 92672

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

Terry Bassham, Esq.
General Counsel
El Paso Electric Company
123 W. Mills
El Paso, TX 79901

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

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

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