

September 18, 2015

MEMORANDUM TO: Michael T. Markley, Chief
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

FROM: Christopher P. Jackson, Chief /RA/
Reactor Systems Branch
Division of Safety Systems
Office of Nuclear Reactor Regulation

SUBJECT: REACTOR SYSTEMS BRANCH SAFETY EVALUATION INPUT:
PALO VERDE NUCLEAR GENERATING STATION, UNIT 2
EXIGENT LICENSE AMENDMENT REQUEST TO AMEND
TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENT
3.1.5.3 FOR CONTROL ELEMENT ASSEMBLY 88 FOR THE
REMAINDER OF UNIT 2, CYCLE 19 (TAC NO. MF6678)

By letter dated September 4, 2015, as supplemented by letter dated September 15, 2015 Arizona Public Service Company, the licensee for Palo Verde Nuclear Generating Station, Unit 2, requested to eliminate exercising Control Element Assembly (CEA) 88 for the remainder of operating Cycle 19, currently scheduled to end October 10, 2015. The proposed amendment would add a note to Surveillance Requirement 3.1.5.3 such that CEA 88 may be excluded from SR performance for the remainder of Cycle 19.

The Reactor Systems Branch (SRXB) has reviewed the application and determined it acceptable. The enclosed safety evaluation presents the basis for the staff's finding. This concludes SRXB review of efforts under Technical Assignment Control number MF6678.

Enclosure:
As stated

CONTACT: William I. MacFee, NRR/DSS/SRXB
301-415-1326

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Accession No.: ML15259A508

NRR-106

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DATE	9/16/2015	9/17/2015	9/18/2015

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
REQUEST TO ELIMINATE MOVEMENT OF CEA 88 FROM SR 3.1.5.3
FOR THE REMAINDER OF CYCLE 19
PALO VERDE NUCLEAR GENERATING STATION, UNIT 2,
ARIZONA PUBLIC SERVICE COMPANY
FACILITY OPERATING LICENSE NOS. NPF-51
DOCKET NOS. 50-529

1.0 INTRODUCTION

By letter dated September 4, 2015 (Agencywide Document Access and Management System (ADAMS) Accession No. ML15247A518), as supplemented by letter dated September 15, 2015 (ML15258A848) Arizona Public Service Company, the licensee for Palo Verde Nuclear Generating Station, Unit 2 (PVNGS-2), requested to revise the PVNGS-2 Technical Specifications (TSs). The proposed revisions would eliminate exercising Control Element Assembly (CEA) 88 for the remainder of operating Cycle 19, currently scheduled to end October 10, 2015. The proposed amendment would add a note to Surveillance Requirement (SR) 3.1.5.3 such that CEA 88 may be excluded from SR performance for the remainder of Cycle 19.

The U.S. Nuclear Regulatory Commission (NRC) staff evaluated the application to determine whether the requested revisions to PVNGS-2's TSs are acceptable.

2.0 REGULATORY EVALUATION

2.1 System Description

The CEAs for PVNGS-2 are used for reactivity control. The CEAs are divided into nine groups, of which five are Regulating Groups designated by Groups 1 through 5. CEA 88 is in Regulating Group 4, Subgroup 22. The Regulating Groups are withdrawn during reactor startup in a predetermined sequence and position overlap after the shutdown groups are withdrawn. During power operation, insertion limits are placed on the Regulating groups to ensure that power distribution and reactivity limits are preserved. While at power, the Regulating groups are fully withdrawn except for limited insertion of the first regulating group in order to compensate for minor variations in moderator temperature and boron concentration as well as performing SRs. Since CEA 88 is within Regulating Group 4, this CEA usually remains fully withdrawn when the reactor is at power except during performance of SR 3.1.5.3.

ENCLOSURE

2.2 Proposed Changes

SR 3.1.5.3 states the following:

Verify full strength CEA freedom of movement (trippability) by moving each individual full strength CEA that is not fully inserted in the core at least 5 inches.

SR 3.1.5.3 would be revised to state the following:

Verify full strength CEA freedom of movement (trippability) by moving each individual full strength CEA that is not fully inserted in the core at least 5 inches.
(NOTE)

NOTE – Not required to be performed for Unit 2 CEA 88 for the remainder of Cycle 19.

2.3 Applicable Regulatory Requirements

Section 182a of the Atomic Energy Act requires applicants for nuclear power plant operating licenses to include TS as part of the license. The Commission's regulatory requirements related to the content of the TS are contained in 10 *Code of Federal Regulations* (CFR) 50.36, "Technical specifications." The TS requirements in 10 CFR 50.36 include the following categories: (1) safety limits, limiting safety systems settings and control settings, (2) limiting conditions for operation, (3) SRs, (4) design features, and (5) administrative controls.

SRs in 10 CFR 50.36 are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.

10 CFR 50, Appendix A, General Design Criteria (GDC) for Nuclear Power Plants applicable to CEA design requirements are as follows:

GDC 23, "Protection System Failure Modes," states that the protection system shall be designed to fail into a safe state or into a state demonstrated to be acceptable on some other defined basis if conditions such as disconnection of the system, loss of energy (e.g., electric power, instrument air), or postulated adverse environments (e.g., extreme heat or cold, fire, pressure, steam, water, and radiation) are experienced;

GDC 25, "Protection System Requirements for Reactivity Control Malfunctions," states that protection system shall be designed to assure that specified acceptable fuel design limits are not exceed for any single malfunction of the reactivity control systems, such as accidental withdrawal (not ejection or dropout) of control rods;

GDC 26, "Reactivity Control System Redundancy and Capability," states that two independent reactivity control systems of different design principles shall be provided. One of the systems shall use control rods, preferably including a positive means for inserting the rods, and shall be capable of reliably controlling reactivity changes to assure that under conditions of normal operation, including anticipated operational occurrences, and with appropriate margin for malfunctions such as stuck rods, specified

acceptable fuel design limits are not exceeded. The second reactivity control system shall be capable of reliably controlling the rate of reactivity changes resulting from planned, normal power changes (including xenon burnout) to assure acceptable fuel design limits are not exceeded. One of the systems shall be capable of holding the reactor core subcritical under cold conditions;

GDC 27, "Combined Reactivity Control Systems Capability," states that the reactivity systems shall be designed to have a combined capability, in conjunction with poison addition by the emergency core cooling system, of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods the capability to cool the core is maintained;

GDC 28, "Reactivity Limits," states that reactivity control systems shall be designed with appropriate limits on the potential amount and rate of reactivity increase to assure that the effects of postulated reactivity accidents can be neither (1) result in damage to the reactor coolant pressure boundary greater than limited local yielding nor (2) sufficiently disturb the core, its support structure or other reactor pressure vessel internals to impair significantly the capability to cool the core. These postulated reactivity accidents shall include consideration of rod ejection (unless prevented by positive means), rod dropout, steam line rupture, changes in the reactor coolant temperature and pressure, and cold water addition.

GDC 29, "Protection Against Anticipated Operational Occurrences," states that the protection and reactivity control systems shall be designed to assure an extremely high probability of accomplishing their safety functions in the event of anticipated operational occurrences.

3.0 TECHNICAL EVALUATION

3.1 Summary of Technical Information Provided by Licensee

The licensee requested to revise the PVNGS-2 TS. The proposed revisions would eliminate exercising CEA 88 for the remainder of operating Cycle 19, currently scheduled to end October 10, 2015. The proposed amendment would add a note to SR 3.1.5.3 such that CEA 88 may be excluded from SR performance for the remainder of Cycle 19.

The licensee stated that during the August 27, 2015 performance of a monitoring program for all CEAs, CEA 88 had exceeded the monitoring threshold value for current noise and the holding function was transferred to the lower gripper coil. Upon transfer to the lower gripper coil, the Upper Gripper Coil (UGC) de-energized and remains de-energized. The high current noise was considered an indication of UGC degradation.

The purpose of SR 3.1.5.3 is to verify that the CEAs are moveable and trippable (i.e., otherwise free from mechanical binding). The licensee evaluated the degrading condition to avoid a rod drop accident or plant transient. The licensee concluded that CEA 88 remains trippable and is expected to remain so.

The Reactor Trip Circuit Breakers (RTCBs) open upon an automatic or manual reactor trip signal which removes power from both control and holding circuitry. All coils on each CEA de-

energize, resulting in all CEAs inserting into the core by gravity. In an event of a loss of power, the CEAs will insert into the core regardless of a reactor trip signal because of the fail-safe design. Any postulated failure mechanism that could prevent rod insertion is not influenced or impacted by coil failure, or control or holding circuitry failures. This was demonstrated in the Unit 2 CEA 15 drop event on November 6, 2014 (ADAMS Accession No. ML15005A045).

TS 3.1.2 specifies that shutdown margin (SDM) shall be greater than or equal to that specified in the Core Operating Limits Report (COLR). The licensee stated that the Cycle 19 COLR SDM operating limit is 6.5% $\Delta k/k$ in MODEs 3 through 5 with trip breakers closed. The licensee performed calculations at 450 Effective Full Power Days (EFPDs) through the remainder of Cycle 19 operation. It was determined that a minimum SDM of 7.27% $\Delta k/k$ would exist following a reactor trip assuming both CEA 88 and the single CEA of highest reactivity worth fail to insert. The licensee concluded that this calculated minimum SDM would be above the 6.5% $\Delta k/k$ SDM requirement of the COLR.

3.2 Summary of NRC Staff Review

The NRC staff reviewed the application and determined that additional information was required regarding the evaluation of the request. In a letter dated September 15, 2015, the licensee responded to the NRC staff's Request for Additional Information (RAI) regarding PVNGS-2 elimination of movement of CEA 88 from SR 3.1.5.3 for the remainder of Cycle 19.

The NRC staff requested that the licensee describe in detail what administrative controls were put in place to prevent energizing the UGC and causing further degradation. The licensee responded that the administrative controls start with a standing order with instructions to not move any CEA currently on lower gripper without permission from the Unit 2 Operations Manager. The standing orders are reviewed by new crews during shift turnover. In addition, the mode select switch for the Control Element Assembly Drive Mechanism System (CEDMCS) is flagged with an equipment status tag to reinforce the standing order and draw attention to the CEA 88 UGC condition.

The NRC staff requested the licensee explain how the administrative controls address possible automatic motion of CEA 88 and what would cause automatic motion of CEA 88 for the remainder of Cycle 19. The licensee responded that the administrative controls do not address automatic motion. The administrative controls are only to address manual movement of CEA 88. The licensee then went on to explain that there were two possible scenarios for CEA 88 automatic movement: Reactor Power Cutback (RPCB) or a reactor trip. In both scenarios, Regulating Group 4 (which CEA 88 is a part of) fully inserts into the core and the unit is taken offline. For any CEA movement to balance reactor power to secondary plant power, Regulating Group 5 would move first to bring power down at this point in core life. Power would have to reduce by 10% before Regulating Group 4 would have to move.

The NRC staff requested that the licensee confirm that SDM calculations were performed using NRC-approved methodologies currently used by PVNGS-2 to perform the TS surveillances. The licensee stated that the model used to calculate the minimum SDM was CASMO-4/SIMULATE-3. The use of CASMO-4/SIMULATE-3 was approved in License Amendment No. 132 (ML010860187). License Amendment No. 132 approves the use of CASMO-4/SIMULATE-3 for Shutdown Margin calculations. Based on the considerations above in the RAI Response

and information in the submittal, the NRC staff has determined the licensee has determined the licensee has adequately calculated the shutdown margin available if CEA 88 fails to trip. The NRC staff reviewed the license amendment request, as supplemented by the RAI response, provided by the licensee to eliminate exercising CEA 88 for SR 3.1.5.3 for the remainder of operating Cycle 19. The RAI response provided by the licensee provided adequate information for justification of excluding CEA 88 from SR performance for the remainder of Cycle 19. The NRC staff has concluded that the licensee identified the possible causes of the problems identified with CEA 88, the licensee has identified the failure modes, the licensee has established that CEA 88 will trip with reasonable certainty, and the licensee has shown there is adequate shutdown margin. Additionally, elimination of the exercising of CEA 88 will reduce the likelihood of a rod drop and a plant transient. The NRC staff concluded the elimination of exercising CEA 88 for SR 3.1.5.3 for the remainder of Cycle 19 to be acceptable.

4.0 CONCLUSION

The NRC staff reviewed the licensee's application to ensure that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) activities proposed will be conducted in compliance with the Commission's Regulations and (3) the issuance of the amendment will not be inimical to the common defense and security or the health and safety of the public. The NRC staff evaluated the licensee's proposed change to eliminate exercising Control Element Assembly (CEA) 88 for the remainder of operating Cycle 19 in accordance with SR 3.1.5.3. Based on the considerations discussed above, the NRC staff concludes that the proposed revision to SR 3.1.5.3 is acceptable.