

April 25, 2007

Mr. Michael Kansler
President
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: PILGRIM NUCLEAR POWER STATION - ISSUANCE OF AMENDMENT RE:
SINGLE CONTROL ROD WITHDRAWAL ALLOWANCES (TAC NO. MC9018)

Dear Mr. Kansler:

The Commission has issued the enclosed Amendment No. 228 to Facility Operating License No. DPR-35 for the Pilgrim Nuclear Power Station. This amendment is in response to your application dated October 18, 2005, as supplemented on February 23, 2007.

The amendment provides allowances for single control rod withdrawal during Hot Shutdown and Cold Shutdown conditions consistent with the Standard Technical Specifications for Boiling Water Reactors (NUREG-1433, Revision 3). The amendment corrects a typographical error and administratively relocates the existing TS 3/4.10.D, "Multiple Control Rod Removal," to TS 3/4.14.E to be consistent with the intent and presentation of special operations.

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* Notice.

Sincerely,

/RA/

James Kim, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosures:

1. Amendment No. 228 to License No. DPR-35
2. Safety Evaluation

cc w/encls: See next page

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ENERGY NUCLEAR GENERATION COMPANY
ENERGY NUCLEAR OPERATIONS, INC.
DOCKET NO. 50-293
PILGRIM NUCLEAR POWER STATION
AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 228
License No. DPR-35

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment filed by Entergy Nuclear Operations, Inc. (the licensee) dated October 18, 2005 as supplemented on February 23, 2007, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B of Facility Operating License No. DPR-35 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 228, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of issuance and shall be implemented within 90 days.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Mark G. Kowal, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the License
and Technical Specifications

Date of Issuance: April 25, 2007

ATTACHMENT TO LICENSE AMENDMENT NO. 228

FACILITY OPERATING LICENSE NO. DPR-35

DOCKET NO. 50-293

Replace the following page of the Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove
3

Insert
3

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove
ii
iii
3/4.10-2
3/4.10-3
3/4.14-3

Insert
ii
iii
3/4.10-2

3/4.14-3
3/4.14-4
3/4.14-5
3/4.14-6
3/4.14-7
3/4.14-8
3/4.14-9
3/4.14-10

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 228 TO FACILITY OPERATING LICENSE NO. DPR-35

ENERGY NUCLEAR GENERATION COMPANY

ENERGY NUCLEAR OPERATIONS, INC.

PILGRIM NUCLEAR POWER STATION

DOCKET NO. 50-293

1.0 INTRODUCTION

By letter dated October 18, 2005, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML053040450) as supplemented on February 23, 2007 (Accession No. ML070650342), Entergy Nuclear Operations, Inc. (Entergy or the licensee) submitted a request for changes to the Pilgrim Nuclear Power Station (Pilgrim) Technical Specifications (TSs). The amendment would revise the Pilgrim TSs to provide allowances for single control rod withdrawal during Hot Shutdown and Cold Shutdown conditions. These proposed changes are consistent with the Standard Technical Specifications (STS) for Boiling Water Reactors (BWRs) NUREG-1433, "STS General Electric Plants, BWR/4," Revision 3.

This amendment would allow additional flexibility to perform certain control rod testing and maintenance during shutdown with the reactor vessel head bolts tensioned. Additional controls would be applied to ensure that adequate shutdown reactivity margin is maintained.

The February 23, 2007, supplemental letter provided additional information that clarified the application, but did not expand the scope of the application as originally noticed and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on January 3, 2006 (71 FR 148).

2.0 REGULATORY EVALUATION

The Pilgrim control rod drive (CRD) system performs three operational functions: rod insertion, rod withdrawal, and rapid shutdown during off normal reactor conditions commonly referred to as a "scram." Appendix A to Title 10 of the *Code of Federal Regulations* (CFR), Part 50, "General Design Criteria for Nuclear Power Plants (GDC)," provides the design criteria, construction, testing and performance requirements for structures, systems and components important to safety. Although the original approval basis for Pilgrim was the draft GDC, the licensees for Pilgrim have made changes to the facility over the life of the plant that may have invoked some of the final GDC. The extent to which the final GDC have been invoked can be found in specific sections of the Pilgrim Updated Final Safety Analysis Report (UFSAR) and in other Pilgrim design and licensing basis documentation.

The following 10 CFR Appendix A Criteria are applicable to the CRD system:

GDC 26, *Reactivity control system redundancy and capability*, which requires that the CRD system should be capable of rendering a reactor subcritical under conservative conditions with the control rod with the highest rod worth fully withdrawn from the core. The conservative conditions include the highest positive reactivity contributions due to effects such as temperature and power and the lowest negative reactivity contributions from poisons such as Xenon. Meeting the requirements of GDC 26 ensures that the CRD system will be capable of providing sufficient operational control, reliability and safety during reactivity changes, including those during normal operation and anticipated operational occurrences.

GDC 29, *Protection against anticipated operational occurrences*, requires that the protection and reactivity control systems shall be designed to ensure an extremely high probability of accomplishing their safety functions in the event of anticipated operational occurrences.

Pilgrim specifically conforms to the draft GDC for Nuclear Power Plant Construction Permits issued by the Atomic Energy Commission in July, 1967, which have equivalent requirements as the approved final GDC including the above applicable CRD system GDC.

The Nuclear Regulatory Commission (NRC) staff and nuclear steam supply owners groups developed the STS that established models of the Commission's policy for TSs, and improved the format and clarity of the specifications. NUREG-1433, Revision 3, was approved and issued for use by the NRC on June 30, 2004. The STS includes Special Operations TS limiting conditions for operation (LCOs) in Section 3.10, which allow specified TS requirements to be changed to permit performances of special tests and operations. These special tests and operations are necessary to demonstrate select unit performance characteristics, to perform special maintenance activities, and to perform special evolutions, which otherwise could not be performed if required to comply with the requirements of the TSs. A special operation may be performed either under the provisions of the appropriate Special Operations LCO or under the other applicable TS requirements. If it is desired to perform the special operation under the provisions of the Special Operations LCO, the requirements of the Special Operations LCO shall be followed.

In general, licensees cannot justify TS changes solely on the basis of adopting the STS. To ensure this, the NRC staff makes a determination that proposed changes maintain adequate safety. Changes that result in relaxation (less restrictive condition) of current TS requirements require a detailed justification.

The NRC staff reviewed the licensee's proposed changes for compliance with the applicable Pilgrim design criteria as established by the draft GDC, and the guidance established in the STS and the licensee's technical justification.

3.0 TECHNICAL EVALUATION

3.1 Proposed Changes to the Pilgrim TS Requirements

The licensee's submittal contains the following proposed changes:

- 3.1.1 New Special Operations TS 3/4.14.C, "Single Control Rod Withdrawal - Hot Shutdown," will be added, including Applicability, Actions, and Surveillance Requirements (SRs) modeled after STS, Specification 3.10.3. Proposed Bases drafts associated with these changes were provided for information.

- 3.1.2 New Special Operations TS 3/4.14.D, "Single Control Rod Withdrawal - Cold Shutdown," will be added, including Applicability, Actions, and SRs modeled after STS, Specification 3.10.4. Proposed Bases drafts associated with these changes were provided for information.
- 3.1.3 Existing TS 3/4.10.D, "Multiple Control Rod Removal," will be relocated as TS 3/4.14.E and associated Bases changes will be made. Additionally, the requirement specified in 3.10.D.1.b that invokes the source range monitors (SRMs) operability requirements of Specification 3.3.B.3 will be revised to invoke the SRMs operability requirements of 3.10.B.1 and 3.10.B.2. Similarly, SR 4.10.D.1.b will be revised to invoke the SRs of 4.10.B "Core Monitoring".
- 3.1.4 Administrative Changes:
 - a) A typographical error in Surveillance Requirement 4.10.D.1.f will be corrected, i.e., the misspelled word "road" will be changed to the correct word "rod".
 - b) The Table of Contents will be updated to reflect the changes described above.

3.2 Staff Evaluation of Proposed Changes

- 3.2.1 Proposed Special Operations TS 3/4.14.C, "Single Control Rod Withdrawal - Hot Shutdown," including Applicability, Actions, and SRs

This proposed addition to the Pilgrim TSs is modeled after the STS, Specification 3.10.3. The licensee technical justification for the single rod withdrawal allowance during Hot Shutdown conditions is provided in their submittal dated October 18, 2005.

The purpose of this Special Operations LCO is to permit the withdrawal of a single control rod for testing while in a Hot Shutdown condition. Hot Shutdown Mode as defined in the Pilgrim TS Section 1.0 requires the mode switch in shutdown and reactor coolant temperature greater than 212 °F with no core alterations being performed. When the mode switch is in the shutdown position all control rods are inserted and blocked from withdrawal by the reactor manual control system (RMCS).

Circumstances may arise while in a Hot Shutdown condition that require withdrawal of a single control rod for various tests (e.g., friction tests, scram timing, and coupling integrity checks). These single control rod withdrawals are accomplished by placing the reactor mode switch in the refuel position. With the mode switch in the refuel position, the RMCS refueling interlocks are in service enforcing restrictions to prevent inadvertent criticality by preventing more than one control rod from being withdrawn and by restricting movement of refueling equipment. The refueling interlocks reinforce operational procedures that prohibit taking the reactor critical during refueling operations when the reactor vessel head is normally removed. For this Special Operations LCO while in a Hot Shutdown condition, it is expected that the reactor vessel head would be in place with the closure bolts fully tensioned consistent with the definition for Hot Shutdown Mode in the STS Table 1.1-1.

This Special Operations TS LCO provides additional controls besides the refueling interlocks (TS LCO 3.14.C.2.), before a single control rod withdrawal is allowed in a Hot Shutdown

condition. The proposed TS LCO requires two SRMs to be operable (TS LCO 3.14.C.1.), the "full-in" control rod position indication for each control rod to be operable or the associated CRD to be disarmed (TS LCO 3.14.C.3.), all other control rods fully inserted (TS LCO 3.14.C.4.), and the withdrawn control rod to be operable, with associated reactor protection system (Scram) instrumentation trip functions operable (TS LCO 3.14.C.5.a) or all other rods in a 5 x 5 array centered on the withdrawn rod disarmed, allowing the single control rod to be withdrawn assumed to be the strongest worth rod (TS LCO 3.14.C.5.b).

These requirements, coupled with a shutdown margin requirement for the most reactive rod fully withdrawn, are adequate to prevent inadvertent criticality when a single rod is withdrawn for maintenance or testing. In addition, the operability requirement for SRMs would provide the operator early indication of an approach to criticality so that action can be taken to prevent this condition.

With the reactor mode switch in refuel, the accident analyses for control rod withdrawal during refueling are applicable. Explicit safety analyses in the Pilgrim UFSAR demonstrate that the functioning of the refueling interlocks and adequate shutdown margin (SDM) as required by the Pilgrim TS 3.3 and TS 4.3, will preclude unacceptable reactivity excursions during normal operation and anticipated operational occurrences.

The Pilgrim UFSAR Section 3.6.2.4 specifies the shutdown reactivity control requirements. The reactivity control must be such that the reactor core, in its most conservative reactive condition, can be maintained subcritical (k -effective less than or equal to 0.99) with the control rod of highest worth fully withdrawn and all others fully inserted.

The analyses which demonstrate that SDM can be maintained with the highest worth control rod withdrawn is discussed in UFSAR Section 3.6.2.4.1. The Pilgrim shutdown margin calculation is performed in accordance with General Electric (GESTAR) methodology, NEDE-24011-P-A-14-US, "Licensing Topical Report, General Electric Standard Application for Reactor Fuel (Supplement for United States), Global Nuclear Fuels," dated June 30, 2000, ADAMS Accession No. ML011230175.). This methodology has been approved by the NRC staff.

Further assurance of adequate SDM is demonstrated by periodic testing required by Pilgrim TS SR 4.3.A.1. This surveillance is completed during startup at the beginning of each operating cycle to demonstrate that sufficient shutdown margin exists. As described in the UFSAR Section 7.6, the refueling interlocks restrict the movement of control rods to reinforce operational procedures that prevent the reactor from becoming critical. These interlocks prevent the withdrawal of more than one control rod and restrict the movement of refueling equipment. Under these conditions, since only one control rod can be withdrawn, the core will always be shut down even with the highest worth control rod withdrawn.

The Pilgrim custom TSs require the Average Power Range Monitors (APRMs) scram function to be operable when the mode switch is in refuel in accordance with TS Table 3.1.1; the APRMs are credited in the Pilgrim FSAR as the means for processing a reactor scram in the event of a rod drop accident. In the proposed amendment, the APRMs scram function would not be required while operating under the conditions of the Special Operations TSs. This is a less restrictive change than the current Pilgrim TS requirements. In response to a request for additional information from the NRC staff, the licensee provided additional justification for not including the APRMs scram function in their proposed Special Operations TS LCO.

The licensee amendment request supplement dated February 23, 2007, stated that the two required SRMs would provide the operators an early indication of an approach to criticality so that action can be taken to prevent an inadvertent critical condition. Furthermore, the reactor protection system Intermediate Range Monitor (IRM) "high flux" and IRM "inoperative" scram functions will be operable in accordance with the proposed TS LCO.

The control rod scram function provides backup protection to normal refueling procedures and the refueling interlocks, which would also prevent an inadvertent criticality during special operation testing while the plant was in the Hot Shutdown condition with the mode switch in refuel. The APRM scram function is not needed for a single rod out configuration, because by plant design the reactor core has adequate shutdown margin to ensure the core remains subcritical with the highest worth rod fully withdrawn under the most reactive core state.

The new Special Operations TS also provides an alternative to the conditions required by proposed TS LCO 3.14.C.5.a. Consistent with the requirements of the STS, the new Pilgrim TS LCO 3.14.C.5.b would provide a conservative alternative in the event that any one of the TS 3.14.C.5.a requirements could not be met. A fully inserted and disarmed 5x5 control rod array provides a minimum separation between a withdrawn control rod and other control rods that could be withdrawn while in the refuel mode. In its supplement dated February 23, 2007, the licensee states that,

"The withdrawal of a second control rod is a highly improbable event, requiring two concurrent failures;

- 1) The Operator erroneously selects and initiates withdrawal of a second control rod (a procedure violation) and
- 2) The one-rod-out interlock or other control rod withdrawal block required to be operable fails, thereby enabling withdrawal of the second control rod.

By requiring that all control rods in a 5x5 array, centered on the inoperable control rod to be withdrawn are fully inserted and disarmed, in addition to the required one-rod-out interlock or other required control rod withdrawal block, the conditions that could lead to a challenge to the shutdown margin are precluded from occurring. Therefore, scram capability for the withdrawn control rod at the array center is unnecessary."

The NRC staff has determined that performance of special testing with one control rod withdrawn in the Hot Shutdown condition is bounded by the refuel mode accident and criticality analysis. In addition, this proposed Special Operations TS LCO and SRs are consistent with the STS Specification 3.10.3. Therefore, the NRC staff finds the proposed Special Operations TS 3/4.14.C, "Single Control Rod Withdrawal - Hot Shutdown," acceptable.

3.2.2 Proposed Special Operations TS 3/4.14.D, "Single Control Rod Withdrawal - Cold Shutdown," including Applicability, Actions, and SRs (SR)

This proposed addition to the Pilgrim TSs is modeled after the STS, Specification 3.10.4. The licensee technical justification for the single rod withdrawal allowance during Cold Shutdown conditions is provided in their submittal dated October 18, 2005.

The purpose of this Special Operations LCO is to permit the withdrawal of a single control rod for testing or maintenance while in a Cold Shutdown condition. Cold Shutdown Mode as defined in the Pilgrim TS Section 1.0 requires the mode switch in shutdown and reactor coolant temperature less than 212 °F with no core alterations being performed. When the mode switch is in the shutdown position all control rods are inserted and blocked from withdrawal by the RMCS. Circumstances may arise while in a Cold Shutdown condition that require withdrawal of a single control rod and or removal of the associated CRD if desired for maintenance. As with a single control rod withdrawal in Hot Shutdown condition, a single rod withdrawal in Cold Shutdown condition is accomplished by placing the reactor mode switch in the refuel position, which places the RMCS refueling interlocks in service enforcing restrictions to prevent inadvertent criticality. For this Special Operations LCO while in a Cold Shutdown condition, it is expected that the reactor vessel head would be in place with the closure bolts fully tensioned consistent with the definition for Cold Shutdown Mode in the STS Table 1.1-1.

This proposed Special Operations TS LCO provides controls similar to the Special Operations LCO discussed above for Hot Shutdown condition with an exception. The Pilgrim Special Operations TS 3.14.2.b would allow a control rod withdrawal block to be inserted as an administrative means to ensure that another control rod would not be withdrawn while completing tests or CRD maintenance under this Special Operations TS in Cold Shutdown. The discussion on shutdown margin and accident analysis for the Hot Shutdown TS LCO also apply in the case of the proposed Cold Shutdown TS LCO TS 3/4.14.D.

The NRC staff has determined that performance of special testing and/or CRD maintenance with one control rod withdrawn in the Cold Shutdown condition is bounded by refuel mode accident and criticality analysis. In addition, the proposed Special Operations TS LCO and SRs are consistent with the STS Specification 3.10.4. Therefore, the NRC staff finds the proposed Special Operations TS 3/4.14.D, "Single Control Rod Withdrawal - Cold Shutdown," acceptable.

3.2.3 Relocate TS 3/4.10.D, to TS 3/4.14.E and revise SRM operability requirements

The proposed relocation of the existing Pilgrim TS 3/4.10.D to TS 3/4.14.E is an administrative change to place the Pilgrim TS requirements for multiple control rod removal in a more applicable TS section for control rod withdrawal special operations. The change is administrative, with no technical impact and is consistent with the STS Special Operations TS LCO 3.10.6.

Additionally, the requirement specified in Pilgrim TS 3.10.D.1.b that invokes the SRM operability requirements of TS 3.3.B.3 is being revised to invoke the SRM operability requirements of TS 3.10.B.1 and TS 3.10.B.2. Similarly, TS SR 4.10.D.1.b will be revised to invoke the SRs of 4.10.B Core Monitoring. These proposed changes are consistent with the SRM operability requirements presented in the STS, LCO 3.3.1.2. They are more restrictive, as well as more pertinent, than the current requirements, in that periodic verification is required and the new SRM requirements in this proposed Special Operations TS section are not related to plant startup conditions. Therefore, the NRC staff finds the proposed relocation and SRM operability changes acceptable.

3.2.4 Administrative Changes

A typographical error in Pilgrim SR 4.10.D.1.f will be corrected, i.e., the misspelled word "road" will be changed to "rod", in addition, the revision to the Table of Contents to reflect the changes described above are administrative. These administrative changes are, therefore, acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Massachusetts State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes SRs. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (71 FR 148). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, 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) such activities 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 to the health and safety of the public.

Principal Contributors: J. Gilmer, J. Shea

Date: April 25, 2007

Pilgrim Nuclear Power Station

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