



Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

Robert G. Smith, P.E.
Site Vice President

July 12, 2011

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

SUBJECT: Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
Docket No.: 50-293
License No.: DPR-35

Licensee Event Report 2011-004-00, "Technical Specification (TS) Required
Shutdown – Drywell to Torus DP"

LETTER NUMBER: 2.11.044

Dear Sir or Madam:

The enclosed Licensee Event Report (LER) 2011-004-00, "Technical Specification (TS) Required Shutdown – Drywell to Torus DP" is submitted in accordance with 10 CFR 50.73.

This letter contains no commitments.

Please do not hesitate to contact Mr. Joseph R. Lynch, (508) 830-8403, if there are any questions regarding this submittal.

Sincerely,

A handwritten signature in cursive script, appearing to read "Robert G. Smith".

Robert G. Smith, P.E.
Site Vice-President

FXM/fxm

Attachment: Licensee Event Report 2011-004-00, "Technical Specification (TS) Required Shutdown – Drywell to Torus DP" (5 Pages)

IE22
NRK



cc: Mr. William M. Dean
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U.S. Nuclear Regulatory Commission
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USNRC Senior Resident Inspector
Pilgrim Nuclear Power Station

Attachment 1
Letter Number 2.11.044

Licensee Event Report 2011-004-00,
"Technical Specification (TS) Required Shutdown – Drywell to Torus DP"

(5 pages)

LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Service Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOF-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME

Pilgrim Nuclear Power Station

2. DOCKET NUMBER

05000293

3. PAGE

1 OF 5

4. TITLE

Technical Specification (TS) Required Shutdown – Drywell to Torus DP

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	14	2011	2011	004	00	07	12	2011	N/A	05000
									N/A	05000

9. OPERATING MODE

N

10. POWER LEVEL

14%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

- ☐ 20.2201(b)
☐ 20.2201(d)
☐ 20.2203(a)(1)
☐ 20.2203(a)(2)(i)
☐ 20.2203(a)(2)(ii)
☐ 20.2203(a)(2)(iii)
☐ 20.2203(a)(2)(iv)
☐ 20.2203(a)(2)(v)
☐ 20.2203(a)(2)(vi)

- ☐ 20.2203(a)(3)(i)
☐ 20.2203(a)(3)(ii)
☐ 20.2203(a)(4)
☐ 50.36(c)(1)(i)(A)
☐ 50.36(c)(1)(ii)(A)
☐ 50.36(c)(2)
☐ 50.46(a)(3)(ii)
☒ 50.73(a)(2)(i)(A)
☐ 50.73(a)(2)(i)(B)

- ☐ 50.73(a)(2)(i)(C)
☐ 50.73(a)(2)(ii)(A)
☐ 50.73(a)(2)(ii)(B)
☐ 50.73(a)(2)(iii)
☐ 50.73(a)(2)(iv)(A)
☐ 50.73(a)(2)(v)(A)
☐ 50.73(a)(2)(v)(B)
☐ 50.73(a)(2)(v)(C)
☐ 50.73(a)(2)(v)(D)

- ☐ 50.73(a)(2)(vii)
☐ 50.73(a)(2)(viii)(A)
☐ 50.73(a)(2)(viii)(B)
☐ 50.73(a)(2)(ix)(A)
☐ 50.73(a)(2)(x)
☐ 73.71(a)(4)
☐ 73.71(a)(5)
☐ OTHER

Specify in Abstract below or in
NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME

Mr. Joseph R. Lynch, Licensing Manager

TELEPHONE NUMBER (Include Area Code)

(508)-830-8403

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
D	BF	VACB	G112	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ Yes (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 0245 hours on May 14, 2011, with the plant operating at approximately 14% power and the mode switch in RUN, Pilgrim Nuclear Power Station (PNPS) commenced a controlled shutdown of the reactor due to inoperable Drywell to Suppression Chamber (i.e., Torus) Vacuum Breakers. The Drywell to Torus vacuum breakers were declared inoperable due to inability to set the conditions necessary to demonstrate that Technical Specification (TS) limits for Drywell to Torus differential pressure decay rate were satisfied.

An investigation of the event determined that inability to maintain Drywell to Torus differential pressure was caused by improper sealing on three (3) of ten (10) Drywell to Torus vacuum breakers. The direct cause of improper valve sealing was identified to be improper magnet to striker plate clearance adjustment. The root cause of the event was identified to be lack of relevant information in a maintenance procedure.

The plant was shutdown and action was taken to locate the leakage path between the Drywell and Torus airspace. The leakage path was identified and corrective action was performed to restore Drywell to Torus vacuum breaker seal capability. This event posed no threat to public health and safety.

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CONTINUATION SHEET

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NARRATIVE

BACKGROUND:

The safety objective of the Primary Containment System (PCS) is to provide the capability, in conjunction with other safeguard features, to limit the release of fission products in the event of a design basis accident so that offsite doses would not exceed the guidelines set forth in 10 CFR 100. The PCS design employs a low leakage suppression containment system that houses the Reactor Vessel (RV), the Reactor Recirculation System loops, and other branch connections of the Reactor Primary System.

The PCS is designed to withstand the forces from any size breach of the nuclear system primary barrier up to and including an instantaneous circumferential break of the reactor recirculation piping, and provides a holdup time for decay of any radioactive material released. The PCS also stores sufficient water to condense the steam released as a result of a breach in the nuclear system primary barrier and to supply the Core Standby Cooling Systems (CSCS).

The Venting and Vacuum Relief System is part of the PCS design. The purpose is to equalize the pressure between the Drywell and the Torus and the Torus and the Reactor Building so the structural integrity of containment is maintained. Drywell to Torus vacuum breakers and Torus to Reactor Building vacuum breakers are provided for this purpose.

The Vacuum Relief System for the Drywell to the Torus consists of ten (10) vacuum relief valves (i.e., vacuum breakers). Vacuum breakers (X-201A thru K) are passive, normally closed and are required to open to relieve excessive Drywell to Torus differential pressure. These vacuum breakers are sized to limit the differential pressure between the Drywell and Torus during post accident Drywell cooling operations to the design limit of 2.0 psig (i.e., the external design pressure). The vacuum relief function can be ensured with two vacuum relief valves secured in the closed position and eight open valves. Instrumentation is provided to monitor the position status of the valves.

The Drywell to Torus vacuum breakers were also analyzed in safety analyses to remain closed when not needed for vacuum relief. These valves must remain closed to ensure the following functions are satisfied:

1. maintain a 1.17 psid differential pressure between the Drywell (DW) and Torus (or Wetwell, WW) airspace; and
2. limit steam bypass leakage from the Drywell to the Torus airspace.

The DW-WW differential pressure requirement was implemented during the Mark I Program and its purpose is to reduce containment loads and stress resulting from the suppression pool swell caused by Loss of Coolant Accident (LOCA) blowdown. The normal design requirement for LOCA blowdown loads requires stresses to remain below Service Level A limits from ASME Section III. Per TS 3.7.A.8.a.i requirements, the 1.17 psid differential pressure between the DW-WW airspace must be established when the mode switch is in RUN and within 24 hours after Core Thermal Power (CTP) is greater than 15% following startup.

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The purpose of limiting steam bypass leakage is to protect the pressure suppression function of Primary Containment by preventing excessive leakage from the vent system directly to the WW airspace. Direct leakage to the WW airspace increases WW temperature and pressure which in turn raises Drywell pressure during a LOCA. The analysis performed for the limiting scenario (a small break) is described in FSAR Section 5.2.4.11 and TS 3.7 Bases. The analytical maximum allowable bypass area is approximately 0.2 ft² [Ref. FSAR 5.2]. This is equivalent to a 6 inch diameter orifice. This function is ensured by TS 3.7.A.4 and associated surveillances.

TS 3.7.A.4 specifies the operability requirements for the Drywell to Torus vacuum breakers. Essentially, the vacuum breakers are required to be operable when Primary Containment is required except during testing and other certain conditions. Primary Containment is required when the reactor is critical or when the reactor vessel water temperature is greater than 212 degrees F except when performing certain low power tests. TS 3.7.A.5 specifies that if TS 3.7.A.1 thru 4 requirements can not be met, an orderly shutdown shall be initiated and the reactor shall be in Cold Shutdown within 24 hours.

Drywell to Torus vacuum breaker opening force testing was performed during Refueling Outage (RFO) 18 to verify the force necessary to open each vacuum breaker was within acceptance limits. This testing revealed that vacuum breakers X201D, X-201G, and X-201J required adjustment and rework in order to meet opening force test acceptance criteria.

EVENT DESCRIPTION:

At 0245 hours on May 14, 2011, with the plant operating at approximately 14% power and the mode switch in RUN, Pilgrim Nuclear Power Station (PNPS) commenced a controlled shutdown of the reactor due to inoperable Drywell to Suppression Chamber (Torus) Vacuum Breakers. The Drywell to Torus vacuum breakers were declared inoperable due to inability to set the conditions necessary to demonstrate that Technical Specification limits for Drywell to Torus differential pressure decay rate were satisfied.

This event was initially reported to the NRC via Event Report #46852 on 5/14/2011 pursuant to 10 CFR 50.72(b)(2)(i).

CAUSE:

The direct cause of the event was determined to be improper sealing of three (3) Drywell to Torus vacuum breakers (X-201D, X-201G, and X-201J) due to improper magnet to striker plate clearance. The root cause of the event identified that the vacuum breakers were incorrectly adjusted during maintenance in RFO 18 because the procedure lacked necessary instruction.

EXTENT OF CONDITION:

An extent of condition was performed on similar vacuum breakers and associated procedures. This review evaluated the Reactor Building to Torus vacuum breakers X-212A/B and the eight (8) safety relief valve discharge line vacuum reliefs (VRV-261-97A/B/C/D and VRV-261-98A/B/C/D). No similar concerns were noted.

CORRECTIVE ACTIONS:**Completed Actions:**

1. Correctly adjusted the breaker strike plate to magnet clearances on the X-201D, X-201G and X201J Drywell to Torus vacuum breakers. Proper valve sealing was verified after this adjustment.

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Open Actions:

1. Develop a new procedure or modify the existing maintenance procedure to provide enhanced instruction for maintaining and adjusting vacuum breakers.
2. Review the Root Cause Analysis during Continuing Training and use as a case study for all maintenance disciplines.

This event and the associated corrective actions were entered into the Site Corrective Action Program.

ASSESSMENT OF SAFETY CONSEQUENCES:

The event posed no threat to public health and safety.

The safety objective of the Primary Containment System (PCS) is to provide the capability, in conjunction with other safeguard features, to limit the release of fission products in the event of a design basis accident so that offsite doses would not exceed the guidelines set forth in 10 CFR 100. The degraded condition where three Drywell to Torus vacuum breakers did not fully close did not preclude capability of the PCS to perform its required function.

The failure of three Drywell to Torus vacuum breakers to seal closed does not affect capability of these valves to equalize pressure between the Drywell and the Torus. Therefore the vacuum breaker function necessary to protect the structural integrity of the containment from external pressure was maintained.

The condition where Drywell to Torus differential pressure could not be maintained at 1.17 psid without assistance from the Drywell and Torus Ventilation System fans did not impact plant safety. Safety analysis and TS 3.7.A.8 requirements do not require the 1.17 psid differential pressure to be maintained until 24 hours after Core Thermal Power is raised above 15%. This TS Limiting Condition for Operation (LCO) was not exceeded.

The steam bypass leakage limit from the Drywell to the Torus airspace is based on analyses that are described in the FSAR and TS Bases. The purpose of limiting bypass leakage is to protect the pressure suppression function of Primary Containment by preventing excessive steam leakage during a LOCA from the Drywell vent system directly to the WW airspace. Direct steam leakage to the WW airspace increases WW temperature and pressure which in turn raises Drywell pressure during a LOCA. The analysis performed for the limiting scenario (a small break) is described in FSAR Section 5.2.4.11 and TS 3.7 Bases. The analytical maximum allowable bypass area is 0.2 ft² which is equivalent to a 6 inch diameter orifice. Based on the FSAR analysis, reactor operation is permissible if the bypass area does not exceed the allowable bypass area. The equivalent leak path opening between the Drywell and Torus was estimated to be less than a 2 inch diameter pipe and the reactor was operated at reduced power levels. This indicates that the leak path was within the analytical maximum allowed value described in the FSAR and TS Bases. However, since the drywell to suppression chamber leakage did not satisfy the more conservative TS 4.7.A.4.b.4 limit (i.e., does not exceed differential pressure decay rate which would occur through a 1 inch diameter opening without the addition of air or nitrogen), the vacuum breakers were declared inoperable and the reactor was shutdown per TS 3.7.A.5.

For risk assessment purposes it was conservatively assumed that at least one Torus to Drywell vacuum breaker was unavailable, fully stuck open, and allowed bypass of the pressure suppression function in the event of a large break LOCA. An incremental core damage probability (ICDP) of 8.28E-8 was calculated. Since the ICDP was less than 1E-7, the impact on external events and large early release metrics is not considered significant.

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The vacuum breakers were repaired in accordance with an approved repair plan and there is no long term negative effect to the vacuum breakers.

REPORTABILITY:

This LER is submitted pursuant to the requirements of 50.73(a)(2)(i)(A) because a Technical Specification required shutdown was completed.

SIMILAR EVENTS:

A review was conducted of Pilgrim Station Licensee Event Reports (LERs) submitted since January 1994. The review focused on LERs which involved the Drywell to Torus vacuum breakers and requirements to shutdown the plant. The review identified that several LERs were issued that involved the Drywell to Torus vacuum breakers but none involved failure of the vacuum breaker to close resulting in a TS plant shutdown.

The following LERs were reviewed: LER 96-01 involved a pressure switch on the Reactor Building to Torus vacuum breakers; LERs 95-05 and 95-04 involved inadvertent opening of the vacuum breakers during plant operation; and LER 94-07 involved instrument lines associated with Drywell and Torus dP monitoring instrumentation.

FAILED COMPONENT IDENTIFICATION:

The following EISS codes are applicable to this report:

COMPONENTS

Breaker, Vacuum

CODES

VACB

SYSTEMS

Containment Vacuum Relief System

CODES

BF