Exelon Nuclear
Limerick Generating Station
P.O. Box 2300
Pottstown, PA 19464

www.exeloncorp.com

Exelon Nuclear

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Limerick Generating Station, Units 1 & 2
Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: Supplement to the Request for License Amendment Related to Proposed Changes to Control Rod Requirements, dated July 22, 2004

References:
(1) Letter from M. P. Gallagher (Exelon Generation Company, LLC) to US NRC, dated July 22, 2004
(2) Letter from Travis L. Tate (U. S. Nuclear Regulatory Commission) to Mr. Christopher M. Crane (Exelon Generation Company, LLC), dated October 8, 2004

This is a supplement to the Reference (1) License Amendment Request (LAR). The Reference (1) LAR proposed certain Technical Specification changes to the control rod operability and surveillance requirements specified in TS 3/4.1.3 at Limerick Generating Station (LGS), Units 1&2.

In the Reference (2) letter, the U. S. Nuclear Regulatory Commission requested additional information regarding the Limerick Control Rod LAR. Attachment 1 to this supplemental letter provides the responses to the questions associated with the request for additional information. Attachment 2 provides an additional commitment resulting from this RAI response.

There is no adverse impact to the No Significant Hazards Consideration submitted in the Reference (1) letter. There is one additional commitment contained within this letter.

If you have any questions or require additional information, please contact Doug Walker at (610) 765-5726.

I declare under penalty of perjury that the foregoing is true and correct.

Respectfully,

Executed on 12/3/04

Ron J. DeGregorio
Site Vice President
Limerick Generating Station
Exelon Generation Company, LLC

Attachment:
1. Responses to Questions
2. List of Commitments

cc R. R. Janati - Commonwealth of Pennsylvania

A001

**ATTACHMENT 1**

LIMERICK GENERATING STATION
UNITS 1 AND 2

Docket Nos. 50-352
50-353

License Nos. NPF-39
NPF-85

Supplement to Request for License Amendment Related to
"Proposed Changes to Control Rod Requirements"

Responses to Request for Additional Information

1. *In the July 22, 2004, submittal, it is indicated that the proposed changes are consistent with NUREG-1433, Rev. 2, "Standard Technical Specifications - General Electric Plants, BWR/4." The proposed change to Technical Specification (TS) 3.1.3.1.b.1.b involves the removal of the statement, "by drive water pressure within the normal operating range," from the Limiting Condition for Operation (LCO) statement. The NRC staff's review determined that the change to the proposed LCO is not consistent with the corresponding Standard Technical Specification (STS) 3.1.3.C of NUREG-1433, Rev. 2. LGS 1 and 2 TS 3.1.3.1.b.1.b requires that the insertion capability of a trippable but inoperable control rod be demonstrated by inserting the control rod one notch. STS 3.1.3.C requires the an inoperable control rod be fully inserted within 3 hours and the control rod drive is to be disarmed within 4 hours. The STS does not have a provision to allow an inoperable control rod to remain in a withdrawn position. The proposed change would remove the restriction on the drive water pressure. Please explain why the higher control rod drive pressure is not an indicator of a condition that inhibits the safety function of the control rod as indicated in Section 3.0, page 5, of the submittal. Provide a justification for why a required higher drive pressure, in addition to a condition that results in a rod being declared inoperable, is not the result of degradation that prohibits a rods' insertion capability.*

**RESPONSE:**

A) *Please explain why the higher control rod drive pressure is not an indicator of a condition that inhibits the safety function of the control rod as indicated in Section 3.0, page 5, of the submittal.*

The need to use increased drive water pressure to reposition a control rod is not an indicator of a condition that inhibits the safety function (ability to scram). Control Rod Drive Mechanism (CRDM) internal seal degradation is a condition that could necessitate the use of increased drive water pressure to reposition a control rod. Internal seal degradation is an expected condition that leads to increased insert and/or withdraw stall flow. Changes in seal leakage rates will cause the insert and/or withdrawal speed and pressure applied to the over-piston and/or under-piston area of the drive mechanism to change. As a result, the index tube may not travel far enough to latch before the movement sequence has completed. To address this condition, either a Directional Control Valve (DCV) adjustment can be made or drive water pressure can be increased to facilitate normal rod motion. The standard BWR Owners Group recommendation is to consider replacing any CRDM with an insert and withdraw stall flow of greater than 3.5 and 5 gpm, respectively. The Limerick Generating Station monitors for internal seal degradation and replaces CRDMs, as necessary, to ensure optimal system performance. Of greater significance is the fact that the Limerick control rods with increased seal leakage have demonstrated satisfactory scram performance.

Another potential reason why increased drive water pressure would be required to reposition a control rod is mechanical friction. Excessive mechanical friction can impact the safety function of a control rod drive mechanism. Mechanical friction is most commonly caused by fuel channel to control blade interference. Limerick is susceptible to fuel channel to control blade interference and is currently implementing the interim surveillance requirements specified in 10 CFR Part 21 Notifications SC03-08 and SC03-09. This issue is highlighted because General Electric has provided guidance to the station that would allow for the use of elevated drive water pressure to reposition

impacted control rods. The interim surveillance testing has conclusively proven that the safety function of the control rod drive mechanism is not compromised despite the need, or allowance, to use elevated drive water pressure to reposition an impacted control rod. It should also be noted that the site operating procedures contain limitations on the maximum allowable drive water pressure that may be used to insert a control rod. The limitations contained in the procedures provide assurance that the insertion forces would not exceed the analyzed values for fuel bundle lift or reactor internals components.

Limerick's routine exercise test and scram time test results were also examined to evaluate the acceptability of the proposed change. There are currently 21 control rods on both Units 1 and 2 that have required or currently require increased drive water pressure to be repositioned during the weekly control rod exercise test (TS 4.1.3.1.2.a). Although the subject control rods currently require or have required the use of increased drive water pressure to be repositioned during the exercise test, the scram performance is satisfactory. There is substantial margin between the current scram insertion times and the corresponding Technical Specifications (TS) limits for each of the 21 control rods.

The ability to reposition a control rod using drive water pressure within the normal band can also be impacted by the loss of a cooling water orifice, as documented in General Electric SIL No. 538. If the cooling water orifice were to be displaced, then a large portion of the normal insert drive flow would be diverted to the reactor vessel when attempting to reposition a control rod drive. The vendor stated that this condition could be compensated for by performing a DCV adjustment or by raising drive water pressure. The vendor has determined that there would be no significant degradation in scram performance, and that TS limits would be satisfied under all conditions.

Lastly, the current Limerick TS and the Improved Standard Technical Specifications (ISTS) were examined. The control rod exercise test, which is specified in Limerick TS section 4.1.3.1.2.a and ISTS sections 3.1.3.2 and 3.1.3.3, requires that the control rods be inserted one notch position; however, there is no limitation on the pressure that may be used to facilitate rod movement. The proposed change is consistent with the current surveillance testing requirements. The control rod exercise test is intended to demonstrate that the control rod is capable of performing its safety function. Over the course of a normal operating cycle, a sizable population of control rods will only be scram time tested once, at the beginning of cycle. In lieu of scram time testing all rods on a routine basis, the control rod exercise test is considered an acceptable method for demonstrating that the ability to scram is preserved. As stated above, drive water pressure is sometimes raised to reposition control rods during the exercise test, but the scram times have been well within the TS limits.

Based on the information provided above, Exelon has concluded that the use of increased drive pressure is not an indicator of a condition that inhibits the safety function of the control rods.

B) *Provide a justification for why a required higher drive pressure, in addition to a condition that results in a rod being declared inoperable, is not the result of degradation that prohibits a rod's insertion capability.*

Each condition that would require entry into Limerick TS section 3.1.3.1.b (control rods inoperable for causes other than being immovable/ untrippable) is examined below to

demonstrate that the use of increased drive water pressure to insert a control rod does not necessarily indicate a loss of safety function.

- TS 3.1.3.2.a

  The scram insertion time to notch position 05 must be less than or equal to 7 seconds. If the scram insertion time is greater than 7 seconds, then the control rod is declared inoperable. Since the control rod is not stuck or immovable and is capable scramming, the actions specified in TS section 3.1.3.1.b are applicable. In this case, the scram performance of the control rod is degraded. The ability to notch insert the control rod only confirms that the rod is not stuck or immovable and could be inserted via scram. Furthermore, the limitation on the pressure that may be used to insert the control rod one notch is considered an unnecessary operability constraint since the control rod was successfully scrammed.

  TS section 3.1.3.2.b requires that scram time testing be conducted more frequently when plant operation is continued with the scram time to notch position 05 for three or more control rods in excess of 7 seconds. It should also be noted that TS sections 3.1.3.3 and 3.1.3.4 verify that the safety function of the CRD System has not been compromised. The combination of increased frequency testing, complementary TS requirements (core average and 2X2 array scram time requirements), and limits on the number of inoperable control rods provides assurance that the CRD System will be capable of performing its design function.

- TS 3.1.3.4.a

  The average scram times for the fastest three control rods arranged in a 2X2 array must meet the requirements specified in TS section 3.1.3.4. If the average scram times are greater than those specified in TS section 3.1.3.4, then the control rod(s) with the slower than average scram times are declared inoperable. Since the control rod(s) of interest are not stuck or immovable and are capable of scramming, the actions specified in TS section 3.1.3.1.b are applicable. It is asserted that the pressure required to insert the inoperable control rod one notch is irrelevant given that the control rod was successfully inserted via scram.

- TS 3.1.3.5.a.1.b

  A control rod must be declared inoperable if its associated accumulator is inoperable for a period of more than eight hours. As shown in Figure 4.3 of NUREG/CR-5699, the loss of the accumulator at normal operating pressure will not have a significant effect on the control rod's scram performance. Although the control rod scram function will not be impacted by the loss of the accumulator and the fact that the control rod has satisfied all applicable TS requirements (TS 4.1.3.1.2, 4.1.3.2, 4.1.3.3, and 4.1.3.4), the inability to reposition the control rod using the normal drive water pressure range concurrent with an inoperable accumulator would require the control rod to be fully inserted and disarmed. Limerick's operational experience and vendor recommendations clearly show that the use of increased drive water pressure to insert a control rod does not indicate a loss of safety function.

- TS 3.1.3.7.a.3.a

  When operating within the preset power level of the Rod Worth Minimizer, a control rod with an inoperable position indication may need to be declared inoperable per TS section 3.1.3.1.b. Assuming the control rod was declared inoperable, it could remain in the withdrawn position if: 1) the separation criterion was satisfied, 2) the control rod could be inserted one notch, and 3) the control rod movement would be in compliance with the approved insertion and withdrawal sequences. In this case, there are no problems with the CRDM or HCU that required the control rod to be declared inoperable, but under the current TS requirements the need to increase drive water pressure to reposition the control rod would require it to be fully inserted. Since there is no problem with the CRDM or its associated HCU that would impact the ability to scram, fully inserting the control rod presents an unnecessary operational impact.

In each case outlined above, the requirement to insert the control rod one notch using the normal drive water pressure band provides no conclusive data relative to the capability of the scram function. Rather, the fact that the control rod was successfully inserted via scram or that the control rod has satisfied all routine surveillance requirements (TS 4.1.3.1.2, 4.1.3.2, 4.1.3.3, and 4.1.3.4) is a more accurate predictor of the ability to be inserted upon receipt of a scram signal.

C) *Additional Responses and Clarifications*

The NRC staff has stated that the proposed change to the LCO is not consistent with the ISTS. Limerick acknowledges that the ISTS and Limerick's TS differ in a number of ways – most notably in the definition of the "slow" control rod. However, the statement that the change is consistent with the ISTS is limited to the requirements contained in ISTS sections 3.1.3.2 and 3.1.3.3. ISTS sections 3.1.3.2 and 3.1.3.3 do not limit the pressure that may be used to insert a control rod. The proposed change removes the pressure limitation, thereby, making the existing Limerick TS consistent with sections 3.1.3.2 and 3.1.3.3 of the ISTS.

Additionally, the NRC staff has stated that the ISTS does not have provisions to allow inoperable control rods to remain withdrawn. While this is true, the ISTS does allow control rods with known issues to remain withdrawn. Under the ISTS, certain conditions require only that a control rod to be declared "slow", such as an inoperable accumulator or scram times in excess of the those specified in section 3.1.4.1. The Limerick TS have no comparable provision. Instead, control rods are declared inoperable per TS section 3.1.3.1.b. More importantly, the continued operability of "slow" control rods is confirmed via the routine exercise test. As was stated previously, the ISTS imposes no limitation on the pressure that may be used to reposition a control rod – including those declared "slow' – during the exercise test. This fact provides additional support for the elimination of the pressure limitation from Limerick TS section 3.1.3.1.b.

2. *TS 3.1.3.b.1.b uses the term "trippable" to distinguish the condition of an inoperable control rod. However, the associated TS Bases does not define the criteria used to declare an inoperable control rod as trippable. Please explain the criteria used to declare inoperable control rods as trippable. Explain the impact of the proposed change to remove the restriction on the drive water pressure on the trippable criteria.*

**RESPONSE:**

A control rod is considered trippable if it is capable of fully inserting upon receipt of a scram signal. The fact that the control rod is capable of fully inserting upon receipt of a scram signal does not imply that it meets the requirements specified in TS sections 3.1.3.2, 3.1.3.3, and 3.1.3.4. The proposed change to remove the restriction on the drive water pressure has no impact on the determination of whether or not a control rod is trippable.

3. *Please explain whether or not the associated TS Bases section will require modifications as a result of the proposed changes.*

**RESPONSE:**
The term trippable is not currently defined in the Limerick TS Bases. However, Limerick will enhance the TS Bases by defining the term "trippable".

References:

1. 10 CFR Part 21 Notification SC03-08, Revision 1, "Interim Surveillance Program for Fuel Channel Bow Monitoring," April 30, 2003.
2. 10 CFR Part 21 Notification SC03-09, Revision 1, "Bases for Interim Surveillance Program for Fuel Channel Bow Monitoring," July 15, 2003.
3. NUREG/CR-5699, ORNL-6666/V1, Vol. 1, "Aging and Service Wear of Control Rod Drive Mechanisms for BWR Nuclear Plants," November 1992.
4. NUREG-1433, Revision 2, "Standard Technical Specifications-General Electric Plants. BWR/4," June 2001.
5. SIL No. 538, "CRD Cooling Water Orifices," November 4, 1991.
6. Technical Paper No. BWROG-CRD-00-A, Revision 0, "Standard for the Selection of Control Rod Drive Mechanisms for Preventative Maintenance during Refueling Outages," September 2000.

**ATTACHMENT 2**

LIMERICK GENERATING STATION
UNITS 1 AND 2

Docket Nos. 50-352
50-353

License Nos. NPF-39
NPF-85

Supplement to Request for License Amendment Related to
"Proposed Changes to Control Rod Requirements"

List of Commitments

The following table identifies those actions committed to by Exelon in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

| Commitment | Scheduled Completion Date |
|---|---|
| Limerick will enhance the TS Bases by defining the term "trippable". | Upon Implementation. |