Exelon Generation

200 Exelon Way
Kennett Square, PA 19348
www.exeloncorp.com

10 CFR 50.55a

TMI-13-068
April 17, 2013

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Three Mile Island Nuclear Station, Unit 1
Renewed Facility Operating License No. DPR-50
NRC Docket No. 50-289

Subject: Response to Request for Additional Information - Relief Request PR-01 Associated with the Fifth Inservice Testing (IST) Interval

References:

1) Letter from M. Jesse (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Submittal of Relief Requests Associated with the Fifth Inservice Testing (IST) Interval," dated November 7, 2012

2) Letter from P. Bamford (U.S. Nuclear Regulatory Commission) to M. Pacilio (Exelon Generation Company, LLC), "Three Mile Island Nuclear Station, Unit 1 - Request for Additional Information Regarding Fifth Inservice Test Interval Relief Request PR-01 Nuclear Services Closed Cooling Water Flow Measurement (TAC No. MF0046)," dated March 19, 2013

In the Reference 1 letter, Exelon Generation Company, LLC (Exelon) submitted for your review and approval Relief Request PR-01 associated with the fifth Inservice Testing (IST) interval for Three Mile Island Nuclear Station (TMI), Unit 1. In the Reference 2 letter, the U.S. Nuclear Regulatory Commission Staff requested additional information. Attached is our response.

There are no regulatory commitments in this letter.

If you have any questions concerning this letter, please contact Tom Loomis at (610) 765-5510.

Respectfully,

David P. Helker
Manager - Licensing
Exelon Generation Company, LLC

Attachments: 1) Response to Request for Additional Information - Relief Request PR-01
2) Relief Request PR-01, Revision 2

cc: Regional Administrator, Region I, USNRC
USNRC Senior Resident Inspector, TMI
Project Manager, [TMI] USNRC

Attachment 1

Response to Request for Additional Information - Relief Request PR-01

Question:

1.) In the attachment to letter dated November 7, 2012, Relief Request PR-01, Section 6, "Proposed Alternative and Basis for Use," it is stated that, "Individual pump flow rates will be calculated and compared against individual pump flow rate reference values." Please describe the methodology used to calculate the individual pump flow rates and how the reference values were established.

Response:

The quarterly Group A testing of the three Nuclear Services Closed Cooling Water pumps is done during normal plant operation. The procedure operates the pumps in the three different combinations of pump pairs. For each test, the two operating pumps are throttled, using the discharge isolation valves for the individual pumps, to a test condition of 58 psid (pounds per square inch differential) pump head. The pump head (differential pressure) is determined from the local suction and discharge pressure gauge readings for each pump. These three flow readings are designated as AB, AC, and BC in the equations below and individual pump flows in gallons per minute (gpm) are calculated using the following equations:

	Method
NS-P-1A flow	(AB + AC – BC)/2 = ____ gpm
NS-P-1B flow	(AB + BC – AC)/2 = ____ gpm
NS-P-1C flow	(BC + AC – AB)/2 = ____ gpm

The Inservice Testing (IST) reference values were established using this test methodology. The following table summarizes the raw data and results from those tests:

Test Date	Pump Pairs		Discharge Pressure	Suction Pressure	Pump Head	Total Flow
March 5, 2007	Test 1	NS-P-1A	116 psig	58 psig	58 psi	6400 gpm
		NS-P-1C	117 psig	59 psig	58 psi	
	Test 2	NS-P-1A	116 psig	58 psig	58 psi	6300 gpm
		NS-P-1B	117 psig	59 psig	58 psi	
	Test 3	NS-P-1B	117 psig	59 psig	58 psi	6000 gpm
		NS-P-1C	117 psig	59 psig	58 psi	

The individual pump flow rates were determined from this data as follows:

- NS-P-1A flow = (6300 + 6400 – 6000) / 2 = 3350 gpm
- NS-P-1B flow = (6300 + 6000 – 6400) / 2 = 2950 gpm
- NS-P-1C flow = (6000 + 6400 – 6300) / 2 = 3050 gpm

These individual pump flow rates were used as the initial reference values.

Subsequently, a new reference value for the NS-P-1A pump was established using the following data:

Test Date	Pump Pairs		Discharge Pressure	Suction Pressure	Pump Head	Total Flow
March 14, 2008	Test 1	NS-P-1A	117 psig	59 psig	58 psi	5875 gpm
		NS-P-1C	116.5 psig	58.5 psig	58 psi	
	Test 2	NS-P-1A	117.5 psig	59.5 psig	58 psi	5875 gpm
		NS-P-1B	116.5 psig	58.5 psig	58 psi	
	Test 3	NS-P-1B	116 psig	58 psig	58 psi	5750 gpm
		NS-P-1C	116.5 psig	58.5 psig	58 psi	

The individual pump flow rates were determined from this data as follows:

- NS-P-1A flow = (5875 + 5875 – 5750) / 2 = 3000 gpm
- NS-P-1B flow = (5875 + 5750 – 5875) / 2 = 2875 gpm
- NS-P-1C flow = (5750 + 5875 – 5875) / 2 = 2875 gpm

The NR-P-1B and NR-P-1C flows were slightly lower than the existing reference values, but within the ASME OM Code ±10% acceptance criteria limit. Therefore, the reference values were not revised for these pumps.

Based on the described methodology, the flow reference values for each pump are as follows (except as noted):

- NS-P-1A flow = (5875 + 5875 – 5750) / 2 = 3000 gpm
- NS-P-1B flow = (6300 + 6000 – 6400) / 2 = 2950 gpm (the current value for NS-P-1B was later revised to 2949 gpm based on additional analysis)
- NS-P-1C flow = (6000 + 6400 – 6300) / 2 = 3050 gpm

These reference values provide substantial margin over the minimum design flow requirement of 1972 gpm for each of the NS-P-1A/B/C pumps.

In addition to the above discussion, Relief Request PR-01 has been revised (see Attachment 2) to reflect a proposed alternative in accordance with 10 CFR 50.55a(a)(3)(i).

Attachment 2

Relief Request PR-01, Revision 2

Relief Request Concerning Nuclear Services Closed Cooling Water Flow Rate Measurement During Group A Tests In Accordance with 10 CFR 50.55a(a)(3)(i)

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1. ASME Code Component(s) Affected

NS-P-1A, Nuclear Services Closed Cooling Water (NSCCW) Pump 1A (Centrifugal / Group A / Class 3)
NS-P-1B, Nuclear Services Closed Cooling Water Pump 1B (Centrifugal / Group A / Class 3)
NS-P-1C, Nuclear Services Closed Cooling Water Pump 1C (Centrifugal / Group A / Class 3)

Component/System Function

The NSCCW system includes four 33.33-percent capacity nuclear services coolers, and three 50-percent capacity NSCCW pumps. This system, along with the intermediate cooling system, satisfies the cooling requirements of all nuclear-oriented services other than decay heat and reactor building emergency cooling. In the event of a loss-of-coolant accident, 100-percent redundancy of all nuclear services equipment may be obtained by isolating nonessential items so that flow requirements are reduced to approximately half that of normal operation.

2. Applicable Code Edition and Addenda

ASME OM Code-2004 Edition, with Addenda through OMb-2006

3. Applicable Code Requirement(s)

ISTB-5121(b) - "Group A Test Procedure" - "The resistance of the system shall be varied until the flow rate equals the reference point… …Alternatively, the flow rate shall be varied until the differential pressure equals the reference point..."

4. Reason for Request

Pursuant to 10 CFR 50.55a(a)(3)(i), TMI, Unit 1 requests approval of this alternative to the requirement of ASME OM Code ISTB-5121(b). Due to system design and plant operating requirements, it is not practical to reduce the number of pumps in service to one to allow for single-pump testing during power operation. Also, individual pump flow rates cannot be measured during the Group A test. The flow instrumentation for this system is located in the common discharge header for all three of the subject pumps. The piping configuration does not contain, nor would the system design permit the installation of accurate individual pump flow measuring devices due to the turbulence caused by the

valving and elbow configuration on the discharge of the pumps. There were no provisions originally designed in the system to measure individual pump flow rate.

To comply with the ISTB requirement for measuring individual pump flow rates on a quarterly basis, a modification of the system would be required.

5. Proposed Alternative and Basis for Use

Individual suction and discharge pressure gauges are installed at each pump allowing for measurement of differential pressure for inservice testing. A flow instrument is installed in the common discharge header.

The proposed test would test (as approved previously in PR-02 for the fourth interval) NSCCW pumps in pump pairs. As stated previously, individual pump flow cannot be measured during quarterly operations since individual flow instrumentation does not exist. Also, two (2) pumps are normally required to be in service to provide adequate cooling for system components. The NSCCW pumps are centrifugal pumps (not vertical line shaft). The current quarterly inservice procedure tests all combinations of paired-pumps (A-B, B-C, A-C). During these tests, pump dP (differential pressure) is set, and combined pump flow rate is measured.

Individual pump flow rates will be calculated and compared against individual pump flow rate reference values. Corrective actions will be taken in accordance with ISTB-6200, "Corrective Action," in the event that these criteria are not met. The pumps will continue to be tested individually in accordance with ISTB-5123, "Comprehensive Test Procedure," during refueling outages.

Additionally, vibration data on the pump will be recorded and compared to the reference values. Any deviation from the reference value will be compared to the Code acceptance criteria. The current testing methodology of testing paired-combinations of pumps near two-pump design flow rate provides an adequate basis for identifying and evaluating degraded pump performance. Therefore, this testing method provides reasonable assurance of pump operational readiness.

The following is a summary of proposed alternative testing:

a. TMI, Unit 1 will continue to perform quarterly testing using a modified Group A test procedure as described above. With two paired-pumps in service, the required Group A test parameters will be measured except for individual pump flow rate. Individual pump flow rates will be calculated and compared against calculated individual pump flow rate reference values. During this test, the differential pressure for each pump will be throttled to the reference value.

b. Vibration measurements will be recorded and compared to their reference values. Deviations from the reference value will be compared with the ranges specified in Table ISTB-5121-1 for Group A tests. Corrective actions will be taken in accordance with ISTB-6200.

c. During testing of the subject pumps (quarterly and refueling), TMI, Unit 1 will perform full spectrum vibration analysis, which is above Code required vibration testing.

d. The pumps will continue to be tested individually in accordance with ISTB-5123, "Comprehensive Test Procedure," during refueling outages.

Using the provisions of this relief request as an alternative to the specific requirements of ISTB-5121(b) will provide reasonable assurance of pump operational readiness. Therefore, pursuant to CFR 50.55a(a)(3)(i), TMI, Unit 1 requests approval of this alternative to the specific ISTB requirements identified in this request.

6. Duration of Proposed Alternative

The proposed alternative identified will be utilized during the fifth IST interval which is scheduled to begin October 15, 2013 and conclude on October 14, 2023.

7. Precedents

A similar Relief Request (P5) was approved for TMI, Unit 1 for the third 10-year interval as documented in the U.S. Nuclear Regulatory Commission's Safety Evaluation Report dated July 2, 2004 (ML041670196).

A similar Relief Request (PR-02) was approved for TMI, Unit 1 for the fourth 10-year interval as documented in the U.S. Nuclear Regulatory Commission's Safety Evaluation Report dated July 7, 2005 (ML051530406).