

# CATEGORY 1

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SUBJECT: Forwards response to NRC RAI re verification of seismic adequacy of mechanical & electrical equipment for NMP, Unit 1. Encl documents unresolved questions & responses & provides info that is supplemental to verbal responses.

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August 31, 1998  
NMP1L 1354

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
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RE: Nine Mile Point Unit 1  
Docket No. 50-220  
DPR-63

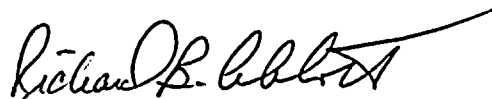
*Subject: Responses to Staff Questions Regarding Verification of Seismic Adequacy of Mechanical and Electrical Equipment (Unresolved Safety Issue A-46)*

Gentlemen:

Attached are responses to the NRC staff's recent requests for further information regarding verification of seismic adequacy of mechanical and electrical equipment (Unresolved Safety Issue A-46) for Nine Mile Point Unit 1 (NMP1). These requests were made during a telephone discussion between the staff and Niagara Mohawk Power Corporation (NMPC) on July 30, 1998. They relate to information in previous NMPC submittals dated March 11, 1996 (NMP1L 1044), and July 31, 1997 (NMP1L 1238), concerning Unresolved Safety Issue A-46. //

Verbal responses to staff questions were provided during the telephone discussion. This submittal documents the unresolved questions and responses and provides information that is supplemental to the verbal responses. For convenience, each question has been paraphrased in an explanatory manner and is followed by NMPC's response. 1025

Very truly yours,



Richard B. Abbott  
Vice President - Nuclear Engineering

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RBA/KLL/kap

Attachment

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Page 2

xc: Mr. H. J. Miller, NRC Regional Administrator  
Mr. S. S. Bajwa, Director, Project Directorate I-1, NRR  
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## ATTACHMENT

### Request for Information #1

*The staff asked if the status of unresolved outliers of the Summary Report can be updated at this time. NMPC Engineering indicated that since the submittal of the Summary Report, quite a few unresolved outliers have been resolved. The "anchorage of equipment outliers" are an exception but these will be resolved by the next Nine Mile Point Unit 1 (NMP1) refueling outage (RFO15), which is expected to begin in April 1999. NMPC will provide a letter showing the current resolution status of all outliers. The staff wanted the letter to indicate how many outliers were found, how many were resolved by analysis, how many were resolved by modification, and what the status/schedule for any modifications is.*

### Required Response #1

Generic Implementation Procedure (GIP), prepared by the Seismic Qualification Utility Group (SQUG), Part I, Section 2.2.8, requires that a plant specific Summary Report be submitted to the NRC. The NMP1 Summary Report was sent to the NRC by letter dated March 11, 1996. The equipment evaluation report, Attachment 1 of this letter, is now contained in Nuclear Engineering Report (NER), "NMP1 USI A-46 Seismic Evaluation Report," NER-1S-012. The relay evaluation report, Attachment 2 of this letter, is now contained in "NMP1 USI A-46 Relay Evaluation Report," NER-1S-013.

The plant components to achieve safe shut down, using the GIP, for a seismic event are contained in the Safe Shutdown Equipment List (SSEL) of the above reports. The equipment and relays contained in the SSEL were evaluated using the GIP Screening Evaluation Work Sheet (SEWS). The equipment and relays that did not meet the SEWS caveats were declared as outliers. As such, the GIP, Section 5, was followed to identify, document, and resolve outliers.

### EQUIPMENT OUTLIERS

A. NMP1 report NER-1S-012, Table 5-3, reports the equipment outlier description and resolution summary table. There were 114 outliers reported. Fifty-seven were resolved by further evaluation and analysis. Forty-seven were resolved by completing plant modifications. The following ten components require a plant modification to resolve the associated outlier issue. The design for these modifications was issued to the plant, and implementation is scheduled to be completed by the conclusion of RFO15 (1999). Modifications have been scheduled to modify the base anchorage for the following:

1. Power Board, ID number 1671
2. Power Board, ID number 16A
3. Power Board, ID number 16B





4. Power Board, ID number 17A
  5. Power Board, ID number 17B
  6. Power Board, ID number 11
  7. Power Board, ID number 12
  8. Power Board, ID number 102
  9. Power Board, ID number 103
  10. Control Room Chiller, ID number 210.1-119
- B. NMP1 report, NER-1S-012, Table 7-1, tabulates the Raceway Outlier Description and Resolution Summary. There were four outliers reported. Two were resolved by further evaluation and analysis. One was resolved by performing a plant modification. This modification is complete. The CB-TB-261 outlier requires engineering to issue a plant modification package. The modification for this outlier has been scheduled for completion by the conclusion of RFO15.
- C. The NMP1 report, NER-1S-012, Table 8-1, tabulates the Unresolved Outlier Summary required per the GIP. This table reports the outliers that are required to be resolved. Tables 5-3 and 7-1 of the report address the status of these equipment outliers. The outliers were reviewed against the NMP1 design basis requirements, and Deviation/Event Reports (DERs) were generated to address deficiencies. Operability determinations were completed if required. No safety/operability concerns exist for the identified outliers.

### RELAY OUTLIERS

The NMP1 report, NER-1S-013, Table 2-2, tabulates the Action Plan to address relay outliers. The essential relay outliers are classified as follows:

#### ESSENTIAL RELAY OUTLIERS

Number where seismic demand exceeds capacity (GERS)	19
Number with capacity data unavailable (CDU)	28
Number with low seismic ruggedness (LR)	<u>10</u>
TOTAL	57

Seismic shake table testing was performed at an independent laboratory to determine relay chatter for the CDU and GERS classified relays. One CDU relay passed the seismic qualification test without experiencing relay chatter. The other relays in these two categories experienced relay chatter. To determine if relay chatter is acceptable, further circuit evaluation for these relays is currently under review. Preliminary review indicates that the chatter is acceptable and no operability concerns exist. A final evaluation report will be completed by the conclusion of RFO15.



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Two of the ten LR relays were replaced in 1996. The eight remaining LR relays are scheduled to be replaced by the completion of RFO15.

### Request for Information #2

*The staff wanted the status (similar to above) of all outliers in Table 6-1 of the Summary Report. Additionally, the staff wanted the NMPC letter to include those open items resulting from third party comments which had not been totally resolved. The staff referred to NMPC's RAI response letter dated July 31, 1997, in which in response to Questions 3a and 3b, NMPC had stated that seismic frame analyses would be done.*

### Required Response #2

- A. The NMP1 report, NER-1S-012, Table 6-1, tabulates the Tank and Heat Exchanger Outlier Description and Resolution Summary. There were 17 outliers reported. Sixteen were resolved by further evaluation and analysis. One was resolved by performing a plant modification. This modification is complete. The outliers reported in Table 6-1 are resolved.
- B. Section 10 of NER-1S-012 documents the closure of some of the observations identified by Dr. Kennedy (Peer Reviewer). The response below summarizes the status of the observations that were not closed at the time the Summary Report was submitted to the NRC staff.
- The screening of cable trays was performed in accordance with the GIP. The theory that fire lines and structural members will provide support to raceways was not used at NMP1 to evaluate cable tray systems. This observation is closed.
  - The beam clamps used at NMP1 and evaluated in the cable tray evaluations were found to be adequate for the applied loads. This observation is closed.
  - The speed nuts securing the doors for the DG 102 and 103 control panels were modified to assure proper door closure. This observation is closed.
  - The plant modification to anchor each cubicle in power boards 102 and 103 is scheduled for completion at the conclusion of RFO15.
  - Rubber pads were attached to the door frames of power boards 102 and 103 to prevent the doors from rattling. This observation is closed.
  - The plant modification to control room chiller 210.1-120 is complete. The plant modification to control room chiller 210.1-119 is scheduled to be completed by the conclusion of RFO15.
  - The evaluation of the relays in Fire Panel 1 is being performed. The scheduled completion date is by the conclusion of RFO15.



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- The control room ceiling metal diffusers were tied to the metal grid members to prevent dislodging during an earthquake. This observation is closed.
  - The control room cabinets were modified to connect the cabinets together. This observation is closed.
  - The base anchorage for the auxiliary control room cabinets was modified. This observation is closed.
  - The plant modification to install a pad between the seismic brace and power boards 161 A & B, 171 A & B and 167 has been issued. The scheduled completion date for the installation is by the conclusion of RFO15.
  - A plant modification has been issued to weld each cubicle for power board 16 & 17. The scheduled completion date is by the conclusion of RFO15.
- C. NMPC's response to Questions 3a and 3b of the Request for Additional Information (RAI) letter, dated July 31, 1997, stated that a seismic frame analysis will be performed for power boards VB12 and 1671. The seismic frame analysis has been completed and is documented in an NMP1 approved calculation (S0.0SQUGMCC01) for these power boards. This calculation concluded that the frame is structurally adequate and a structural modification is not required for power boards VB12 and 1671.

### Request for Information #3

*The staff indicated that they did not agree with the response to RAI Question 4 in NMPC's response letter of July 31, 1997. They drew attention to an NRC to SQUG letter dated December 2, 1997, and commented that per that letter, SQUG did not apply the "Rule of the Box" correctly for the emergency diesel generators. The staff requested NMPC to revise its previous response by addressing the NRC comment.*

### Required Response #3

The Emergency Diesel Generators (EDG), EDG 102 & EDG 103, were evaluated using the "rule of the box" per Section 3.3.3 of the SQUG GIP. The diesel engine control panel and the fuel oil transfer pump were not evaluated separately.

In accordance with the "rule of the box" provisions, the diesel engine control panel and the fuel oil transfer pump were originally evaluated as part of the diesel generator overall unit. They were found to be adequate per a GIP SEWS evaluation. The NMP1 Seismic Review Team (SRT) did review the NRC letter to SQUG dated December 2, 1997, and concluded that the "rule of the box" was appropriately applied in this case. However, to alleviate concerns that the NRC may have regarding the use of the "rule of the box" provisions, the NMP1 SRT walked down the panel and pump again on August 11, 1998, and completed the SEWS



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separately for each item. Based on the individual review of these components, the SRT concluded that these components are seismically adequate per the SEWS evaluation.

#### Request for Information #4

*The staff questioned NMPC's application of anchorage allowable values in the Summary Report, Table 5-3, based on test results from the Savannah River (SR) facility, to NMP1. They asked for justification why SR allowable values were used instead of performing plant specific testing at NMP1. NMPC Engineering explained that the application of SR data to NMP1 was considered conservative. The allowable values based on test results are approximately 40% to 45% less than those specified by the manufacturer. The staff stated that the NMPC letter should include an evaluation of the attributes identified in Appendix C of GIP (aggregate size, compression strength etc.) and include justification for using SR allowable values at NMP1.*

#### Required Response #4

Plant specific testing on existing leaded expansion anchors installed at NMP1 was not done because abandoned in-place anchors of this type could not be found. The use of leaded expansion anchors at NMP1 is minimal; however, because of the plant vintage, some leaded anchors were utilized as noted in the NMP1 report NER-1S-012. The NMP1 SRT reviewed the anchorage adequacy per the GIP, Section 4.4 and documented the results in the SEWS for the equipment anchored with leaded anchors. In each instance, the SRT properly declared this anchor type an outlier as this anchor type was not included as part of Appendix C of the GIP. Also documented in the SEWS was the anchor spacing, presence of concrete cracking, concrete free-edge distance, and condition. No outliers were declared for these caveats. Concrete strength is not a concern as the basic failure mode for this type of anchor at the SR site has been slippage of the bolt from the lead shells.

Westinghouse Savannah River Corporation (WSRC) is also following the provisions of the GIP in their reassessment of the Savannah River Plant Reactors. Because the GIP does not address leaded expansion anchors, WSRC performed their own series of tests following, to the extent possible, the methodology of Appendix C and EPRI Report NP-5228, "Seismic Verification of Nuclear Plant Equipment Anchorage." To that end, they tested 141 abandoned anchorages ranging in size from 3/8" to 1" in diameter. At NMP1, these anchors range in size from 3/8" to 3/4" in diameter. The test setup used a hydraulic ram to test the anchor installations in load increments until failure. In all, 105 tension tests and 36 shear tests were performed. The WSRC Report RTR 2661 documents the lead shell expansion anchor tests and criteria for the SR site. The type of leaded expansion anchor tested at WSRC and the anchor used to anchor various equipment at NMP1 are the 2-unit Ring Wedge Cinch anchors for sizes 3/8" to 3/4" in diameter and the 3-unit Ring Wedge Cinch anchors for sizes 3/4" to 1" in diameter. These anchors were purchased from the same manufacturer as those supplied to SR. Therefore, since the same number of anchor units were used and the anchors were purchased from the same manufacturer, the embedment lengths are the same at both sites.

As previously indicated in the July 31, 1997 RAI response, accessible leaded expansion anchors at NMP1 were checked for tightness following the GIP. The torque values of GIP,



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Appendix C, Table C.2-3, were used to ensure their installation adequacy. The WSRC site also used the GIP, Appendix C, Table C.2-3 torque values.

These data, including an extreme value analysis performed by WSRC, were reviewed by the SRT and by the A-46 Peer Reviewer, Dr. Robert P. Kennedy. It was concluded that the recommended working loads in the report were directly suitable for use at NMP1 in that the WSRC testing program was thorough, complete, and probably conservative for similar anchor types. The RTR 2661 report is documented in Attachment C of NMP1 calculation S0.0SQUGANCHOR, which was submitted to the NRC on July 31, 1997. NMP1 utilized the values designated as "allowable load" given in Attachment C, Table 1, of the RTR 2661 report.

During the July 30, 1998 telecon with the NRC staff, NMPC indicated a 40% to 45% reduction in allowable values. A detailed review of the allowable tension and shear values identified in WSRC report RTR-2661 was performed. This report indicates a load reduction in the range of 14% to 57% (Table 2 of RTR-2661) for allowable tension. There is no reduction in allowable shear because the mean measured shear loads at failure were 50% to 74% greater than the failure loads indicated in the WSRC standards. A safety factor of four was used in determining both the allowable tension and shear values.

Accessible type 1, 2-unit cinch anchors used to anchor SSEL equipment at NMP1 passed the bolt tightness check per GIP, Appendix C.

Two type 2, 3-unit cinch anchors did not pass the tightness check. This type of anchor was used only on the 10 EDG Air Start tanks attached to a reinforced concrete wall. Further evaluation showed the remaining anchors that passed the tightness check were adequate to support the seismic loads from the air start tanks.

In conclusion, the testing performed at WSRC for leaded expansion anchors meets, and exceeds, the provisions and requirements of Appendix C of the GIP and is deemed directly applicable to the anchorages of this type found at the NMP1 plant.

#### Request for Information #5

*With respect to Question 2 of the July 31, 1997 RAI response, the staff commented that NMPC's previous response was adequate. However, they asked the following additional questions: Do you have in-structure response spectra in your licensing basis? Are these in-structure response spectra greater than 1.5 times the ground response spectra?*

#### Required Response #5

The use of an "In-Structure Floor Response Spectra (ISFRS)" was not employed in the original design or licensing of NMP1. Subsequent to the original design, for the purpose of evaluating SQUG USI A-46 SSEL components, floor response spectra were developed at various elevations of the NMP1 Reactor and Turbine Buildings.

The in-structure floor response spectra at or above the effective grade (elevation 243 feet) are greater than 1.5 times the ground response spectra.

