April 12, 2000

Mr. James Knubel
Chief Nuclear Officer
Power Authority of the State of
New York
123 Main Street
White Plains, NY 10601

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT - PLANT-SPECIFIC SAFETY EVALUATION REPORT FOR UNRESOLVED SAFETY ISSUE (USI) A-46 PROGRAM IMPLEMENTATION AT FITZPATRICK NUCLEAR POWER PLANT (TAC NO. M69446)

Dear Mr. Knubel:

Enclosed is the U.S. Nuclear Regulatory Commission (NRC) staff's safety evaluation (SE) of your USI A-46 implementation program at the James A. FitzPatrick Nuclear Power Plant.

The USI A-46 program at FitzPatrick was established in response to Generic Letter (GL) 87-02 through a 10 CFR 50.54(f) letter. The NRC staff concludes that your USI A-46 implementation program has, in general, met the purpose and intent of the criteria in Generic Implementation Procedure (GIP)-2 and the staff's Supplemental Safety Evaluation Report (SSER) No. 2 for the resolution of USI A-46. The staff has determined that your corrective actions and completed physical modifications for resolution of outliers will result in safety enhancements that are, in certain aspects, beyond the original licensing basis, and as a result, provide sufficient basis to close the USI A-46 review at the facility. The staff also concludes that your implementation program to resolve USI A-46 at the facility has adequately addressed the purpose of the 10 CFR 50.54(f) request. Licensee activities related to the USI A-46 implementation are subject to NRC inspection.

This completes the staff action under TAC No. M69446. If you have questions related to this issue, please call me at 301-415-1441.

Sincerely,
/RA/
Guy S. Vissing, Senior Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure: As stated

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

OF USI A-46 PROGRAM IMPLEMENTATION AT

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

DOCKET NO. 50-333

1.0 BACKGROUND

On February 19, 1987, the NRC issued Generic Letter (GL) 87-02, "Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, Unresolved Safety Issue (USI) A-46." In the GL, the NRC staff set forth the process for resolution of USI A-46, and encouraged the affected nuclear power plant licensees to participate in a generic program to resolve the seismic verification issues associated with USI A-46. As a result, the Seismic Qualification Utility Group (SQUG) developed the "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment," Revision 2 (GIP-2, Reference 1).

On May 22, 1992, the NRC issued Supplement 1 to GL 87-02 including the staff's Supplemental Safety Evaluation Report No. 2 (SSER-2, Reference 2), pursuant to the provisions of 10 CFR 50.54(f), which required that all addressees provide either: (1) a commitment to use both the SQUG commitments and the implementation guidance described in GIP-2 as supplemented by the staff's SSER-2, or (2) an alternative method for responding to GL 87-02. The supplement also required that those addressees committing to implement GIP-2, provide an implementation schedule as well as detailed information including the procedures and criteria used to generate the in-structure response spectra (IRS) to be used for USI A-46.

By letter dated September 22, 1992, (Reference 3), the Power Authority of the State of New York (PASNY), the licensee, provided its response to Supplement 1 to GL 87-02 for the James A. FitzPatrick Nuclear Power Plant (JAFNPP). In that letter, PASNY committed to follow the SQUG commitments set forth in GIP-2, including the clarifications, interpretations, and exceptions identified in SSER-2. The staff issued its evaluation of the licensee's response by letter dated November 17, 1992, (Reference 4).

By letter dated November 15, 1995, (Reference 5), PASNY submitted a summary report containing the results of the USI A-46 program implementation at JAFNPP. By letter dated November 25, 1996, (Reference 6), PASNY provided its response to the staff's request for additional information (RAI), dated August 12, 1996, (Reference 7). On July 8, 1999, the staff had a telephone conference with PASNY to obtain clarification of information provided in Reference 5 and Reference 6. In a letter, dated October 8, 1999 (Reference 10), PASNY documented the information requested during the July 8, 1999, telephone conference. This report provides the staff's evaluation of the licensee's USI A-46 implementation program based on the staff's review of the summary report, supplemental information, clarification and documentation provided by the licensee in response to the staff's RAI.

2.0 DISCUSSION AND EVALUATION

PASNY's walkdown summary report (Reference 5) provides the licensee's implementation results of the USI A-46 program at JAFNPP. The report identifies a safe shutdown equipment list (SSEL) and contains a summary of the screening verification and walkdowns of mechanical and electrical equipment, as well as the relay evaluation.

The report also contains the evaluation of the seismic adequacy for tanks and heat exchangers, cable and conduit raceways, and outlier identification and resolution, including proposed schedules. By letter dated November 25, 1996, (Reference 6), the licensee provided an updated equipment modification schedule for resolving outliers. By letter dated December 4, 1998, (Reference 8), the licensee informed the staff that it has completed all outlier resolutions for JAFNPP.

2.1 Seismic Demand Determination

In Reference 5, the licensee stated that the USI A-46 equipment is located in the reactor and turbine buildings. The turbine building encompasses the control building, the electric bay, the diesel generator building, and the service water pump area. Reference 5 stated that the horizontal component of the design basis earthquake (DBE), now called the safe shutdown earthquake (SSE), has a peak ground acceleration of 0.15g. PASNY generated ground response spectra by normalizing the Housner response spectra to a peak ground acceleration of 0.15g. They used multi-degree-of-freedom lumped mass elastic dynamic models to perform dynamic analyses to generate in-structure response spectra (IRS). They broadened the peaks of the IRS by plus and minus 15% to account for uncertainties in the modeling.

The staff evaluated the seismic input motions and the method for developing the IRS and accepted them as documented in Reference 4. The staff determined that the licensee's IRS could be considered as "conservative design" spectra for the purpose of comparing seismic capacity to seismic demand for the USI A-46 program at JAFNPP.

2.2 Seismic Evaluation Personnel

PASNY engineering staff and staff members of two engineering consulting firms: Stevenson and Associates (S&A) of Woburn, Massachusetts and Engineering and Plant Management (EPM) of Framingham, Massachusetts made up the project teams. Dr. John D. Stevenson and Dr. Robert J. Budnitz provided independent reviews. The licensee provided the resumes of the seismic capability engineers (SCE) and the independent reviewers in Appendix A of Enclosure 2 of Reference 5.

The staff finds that the SCEs' qualifications satisfy the provisions of GIP-2. The staff also notes that the "Third Party" reviewers are recognized for their experience in the field of seismic evaluation of structures, systems and components.

2.3 Safe Shutdown Path

GL 87-02 specifies that the licensee should be able to bring the plant to, and maintain in a hot shutdown condition during the first 72 hours following an SSE. To meet this provision, in its submittal of November 15, 1995, the licensee addressed the following plant safety functions: reactor reactivity control, pressure control, inventory control, and decay heat removal. Primary and alternate safe shutdown success paths with their support systems and instrumentation were identified for each of these safety functions to ensure that the plant is capable of being brought to, and maintained in a hot shutdown condition for 72 hours following an SSE. Attachment B of Reference 5 provides the safe shutdown success paths. Attachment D of Reference 5 provides the SSEL. The licensee compiled the SSEL items according to the guidelines of Section 3 "Identification of Safe Shutdown Equipment," and Appendix A, "Procedure for Identification of Safe Shutdown Equipment" of GIP-2.

The reactor decay heat removal function is accomplished by relieving steam from the reactor via the safety/relief valves into the suppression pool. The reactor coolant system (RCS) inventory is controlled by injecting water into the RCS by the low pressure coolant injection (LPCI) mode of the residual heat removal (RHR) which takes suction from the suppression pool. During the early stages of the plant shutdown procedures, the decay heat removal is achieved by placing one train of the RHR in the suppression pool cooling (SPC) mode. During the SPC mode of RHR, the RHR system takes suction from and discharges to the suppression pool via the RHR heat exchangers. In the later stages of the plant shutdown procedures, decay heat removal is achieved by placing one train of RHR in the shutdown cooling (SDC) mode. During the SDC mode of RHR, the system takes suction from and discharges to the reactor water recirculation loop via the RHR heat exchangers. The RHR service water system provides the capability to transfer decay heat from the RHR system to Lake Ontario.

The licensee indicated that the JAFNPP operations personnel who have a comprehensive understanding of the plant layout and the function and operation of the equipment and systems in the plant have also reviewed the SSEL for compatibility with the approved plant normal and emergency operating procedures used for shutdown of the plant and associated operator training. They also reviewed the safe shutdown success paths and concluded that the plant operating procedures and operator training were adequate to establish and maintain the plant in a safe shutdown condition using the equipment identified in Attachment D of Reference 5.

We conclude that the approach to achieve and maintain safe shutdown for 72 hours during a seismic event is acceptable for the implementation of USI A-46 at JAFNPP as it meets the provisions of GIP-2.

2.4 Seismic Screening Verification and Walkdown Mechanical and Electrical Equipment

The seismic screening of components is documented on Screening Evaluation Work Sheets (SEWS) in accordance with the requirements of GIP-2. SEWS are sorted by the 20 classes of equipment covered in GIP-2 (Reference 1) and the "other" equipment class not covered in GIP-2. The results are further condensed and summarized on Screening Verification Data Sheets (SVDS), where the SSEL equipment items are sorted by equipment class and presented as Appendix B of the Seismic Evaluation Report which is in Reference 5.

2.4.1 Adequacy of Equipment Seismic Capacity Compared to Seismic Demand

GIP-2 provides five methods for comparing equipment seismic capacity to the seismic demand. Method A.1 compares the SQUG bounding spectrum (BS) to the SSE ground response spectrum (GRS). Method A.2 compares the generic equipment ruggedness spectrum (GERS) to 1.5 times 1.5 (2.25) times the GRS. Method B.1 compares 1.5 times the BS (reference spectrum) to the conservative design IRS or to the realistic median-centered IRS. Method B.2 compares the GERS to conservative design SSE IRS. Method B.3 compares the GERS to 1.5 times the median center IRS. Also, the seismic design of equipment may be compared to the seismic demand as represented by the IRS.

The criteria and limitations for use of Method A.1 are: the equipment should be mounted below about 40-feet above the effective plant grade, the equipment's natural frequency should be greater than 8 Hz, and the amplification factor between free-field GRS and the IRS will not be more than about 1.5. Method B may be used for equipment at any elevation and for equipment with any natural frequency.

During its review of Reference 5 the staff found, in Figures 3.1 and 3.2, plots of the envelope of the turbine building IRS at elevations 272 feet and 300 feet, and reactor building IRS for elevations 272 feet, 326 feet and 344 feet, respectively. The amplification factors, above 8 Hz, of some of these IRS for elevations where Method A.1 was used appear to be significantly above the 1.5 limit set by GIP-2. During a telephone conference on July 8, 1999, which was followed-up by a facsimile on July 12, 1999, the staff requested that PASNY provide a building specific justification for the use of Method A.1 at the locations where the amplification significantly exceeds the 1.5 limit above 8 Hz. PASNY replied to the request for information with Reference 10.

In Reference 10 the licensee states that the structures at JAFNPP in which Method A.1 was used are typical nuclear plant structures, either reinforced concrete frame and shear wall or heavily braced steel frame. These structures are the reactor building which houses the reactor pressure vessel, primary shield wall, drywell and suppression chamber; and the turbine building complex which includes the turbine building, administration building, radwaste building, screenwell pumphouse and emergency diesel generator building. The reactor building is an embedded, multistory reinforced concrete shear wall structure from the foundation (elevation 222 feet) up to the refueling floor (elevation 369 feet). It is founded at elevation 222 feet, with a sand backfill in the annular space between the exterior wall and the excavated rock up to elevation 365 feet, and common backfill up to the yard grade elevation 272 feet. The SSEL items in the reactor building are in the crescent areas below 272 feet and on the floor elevations 272, 300, 326, and 344 feet. All SSEL items inside the drywell are below elevation 300 feet. The licensee considered all equipment on or below elevation 300 feet to meet the within about 40 feet above effective grade criteria for the use of GIP-2 Method A.1. The licensee stated that the base of the turbine building complex varies, but it is typically founded on excavated rock at about elevation 245 feet, with structural backfill up to the top of the rock excavation at about elevation 265 feet, and common backfill up to the yard grade at elevation 272 feet. All the SSEL items in the turbine building are at elevation 310 feet or lower. The licensee considers all the SSEL items in the turbine building complex to meet the within about 40 feet above effective grade requirement for the use of GIP-2 Method A.1.
PASNY stated that the JAFNPP licensing basis IRS were used for the USI A-46 implementation and the reason these IRS exceed 1.5 times the GRS, is due to the conservatism associated with the analytical procedures used in developing the IRS and if more realistic median-centered response spectra were used, the calculated IRS at frequencies above 8 Hertz would not greatly

exceed 1.5 times the GRS. To demonstrate this, PASNY referenced information provided to the NRC in Reference 11 by Rochester Gas and Electric for the Ginna plant USI A-46 implementation.

Reference 11 presents information developed by SQUG to demonstrate the factors of conservatism between median centered and design IRS in nuclear power plants. The structures discussed are reinforced concrete shear wall structures. The licensee states that the results of Reference 11 are applicable to the JAFNPP structures. The ratios of the conservative design spectra to median-centered spectra for the five structures presented in Reference 11 are 2.53, 5.3, 3.3, 2.3, and 5.4. The mean of the ratios is 3.77. The NRC staff had previously used this mean value to estimate what the amplification factor would be in the R. E. Ginna Nuclear Power Plant structures if median-centered spectra were developed for locations in Ginna where Method A.1 was used.

PASNY used the procedure which the staff used for Ginna, to estimate building specific amplification factors for JAFNPP. The licensee estimated building specific amplification factors, expressed as the ratio of median-centered IRS to the GRS the JAFNPP buildings applying the 3.77 mean factor of conservatism to the amplifications for the conservative design spectra. This yielded estimates of the amplification factor (IRS/GRS) of about 1.5. The licensee postulated, that if there were median-centered IRS developed for the structures, the amplification factors for the IRS over the GRS, at frequencies above 8 Hertz, would be about 1.5 for the elevations where GIP-2 Method A.1 was used. Based on the above, the staff considers the use of Method A.1 acceptable at those locations to verify the adequacy of SSEL components for USI A-46.

The staff finds that the licensee has followed the GIP-2 procedures for comparing equipment seismic capacity to seismic demand, and the licensee's evaluation is adequate for the resolution of USI A-46 at JAFNPP.

2.4.2 Assessment of Equipment "Caveats"

In order to apply the experience-based approach and use the equipment seismic capacity defined in GIP-2, the plant-specific equipment must meet some restrictions or caveats described in GIP-2. The licensee indicated, in Reference 5, that the SCEs verified that the caveats listed in Appendix B of GIP-2 for each equipment class were met for JAFNPP. Caveats are the inclusion and exclusion rules, which represent specific characteristics and features particularly important for seismic adequacy of a specific class of equipment when the equipment seismic capacity is determined based on the experience-based data. The use of "meeting the intent of the caveats" is typically intended to demonstrate seismic adequacy of equipment that did not meet the specific wording in certain caveats, but is deemed seismically adequate based on the judgment of the SCE.

PASNY documented the applicable caveats and the results of their evaluations for conformance with the caveats in SEWS and SVDS (Appendix B of the Seismic Evaluation Report of Reference 5). In many cases, the licensee considered equipment which does not meet the GIP-2 caveats, as outliers which were documented in the Outlier Seismic Verification Sheet (OSVS) of the JAFNPP summary report for USI A-46 resolution. In some cases, if the licensee judged that an item of equipment meets the intent of the caveats, but that the specific wording of the caveat rule is not met, then the equipment item was considered to have met the caveat rule, in accordance with GIP-2. Equipment items that met the intent rather than the specific wording of the caveats are summarized in Table 3.1 of the Seismic Evaluation Report of Reference 5.

In its response of November 25, 1996, (Reference 6), to the staff's RAI, dated August 12, 1996, (Reference 7), the licensee provided supplemental information, for some equipment items, to demonstrate how the intent of certain caveats was met rather than the exact wording of the caveats. For instance, the licensee identified liquid nitrogen Tank A and Tank B relief valves 27RV-101A, and 27RV-101B, as meeting the intent but not the letter of the equipment class caveat. These valves are mounted on a pipe less than one inch in diameter. One inch is the lower bound pipe size supporting valves in the earthquake experience equipment class. In addition, these valves do not meet the cantilever length measurement in GIP-2 Figure B.7-1 because the figure does not provide a maximum length for valves mounted on pipes less that 1 inch in diameter. The concern is that valves with heavy operators on small lines may cause an over stressed condition in the adjacent piping. There is no concern if the valve, the operator, and the pipe are well-supported and anchored to the same support structures. In response to the staff's concern, the licensee stated that in all such instances, the valve, operator and pipe are well-supported and anchored to the same support structures. This is consistent with GIP-2 guidance and is, therefore, acceptable.

In Table 3.1, the Seismic Evaluation Report portion of Reference 5 indicates that the inboard and outboard main steam line isolation valves 29A AOV-80A, B, C, D and 29 AOV-86A, B, C, D are larger than the piston-driven AOVs in the experience database as shown in Figure B.7-2 in Appendix B of GIP-2. These valves do not meet the wording of the GIP-2 caveats because they exceed the weight/cantilever length limits of 750 lb./100 inch in GIP-2, Figure B.7-2. The staff requested that the licensee demonstrate the seismic adequacy of these AOVs. In response to the staff's concern, the licensee stated that it performed a 3g load evaluation which is documented in the SEWs for these valves. The results of that evaluation showed that the resulting stress and displacement are low. Based on the low stress and displacement, the seismic review team (SRT) judged the valves to be acceptable. The licensee also indicated that as shown on Table 16.2-7 of the JAFNPP UFSAR (Reference 9), these MSIVs are designed to withstand the effects of a design-basis earthquake. The staff concurs with the licensee's assessment.

The staff finds that the seismic adequacy determinations for equipment identified in Section 3.2 of the JAFNPP summary report conformed with the GIP-2 guidance on the caveats, and are acceptable in the instances where the intent rather than the wording of the caveats was met for the resolution of USI A-46 at JAFNPP.

2.4.3 Equipment Anchorage

GIP-2 specifies the following four steps in regard to equipment anchorage verification: (1) anchorage installation inspection, (2) anchorage capacity determination, (3) seismic demand determination, and (4) comparison between capacity and demand.

The licensee discussed the different types of equipment anchorages used at JAFNPP in Section 3.1.3 of Reference 5. They organized the discussion by anchorage type and described the type of equipment anchorage and how it was evaluated.

The licensee stated that it obtained anchorage details and equipment weights from plant drawings, and performed detailed anchorage calculations in accordance with the requirements of GIP-2 Section 4.4 and Appendix B. PASNY stated in Reference 5 that all horizontal and vertical pumps and the diesel generators are anchored with cast-in-place bolts. The licensee also stated that most of the floor-mounted electrical equipment, such as motor control centers, switchgear, transformers, and cabinets, are welded to sills. Sills are steel channels anchored to a reinforced concrete slab. PASNY stated that it verified the weld capacity between the cabinet and the sill and the anchorage capacity between the sill and the reinforced concrete slab. The staff reviewed the licensee's method for the evaluation of the anchorage capacity of the sills and found it conservative and, therefore, acceptable for the resolution of USI A-46 at JAFNPP.

PASNY also stated, in Reference 5, that equipment welded or bolted to building steel includes the motor control centers, instrument racks, air handling units on or near the elevation 242 feet platform in the reactor building crescents; the air handling equipment hung from the ceiling in the diesel generator areas and chiller room; and some of the distribution panels in the relay rooms. The licensee stated that the welding/bolting capacity evaluations were performed according to the requirements of GIP-2. PASNY also stated that equipment anchored with concrete expansion anchors includes most of the floor-mounted heating, ventilation and air conditioning (HVAC) equipment in the station battery area, in the control room HVAC area and in the electrical bay; the station battery racks; the LPCI battery racks and battery charger/inverters; a number of small electrical cabinets in the diesel generator area; the diesel generator air start receiver tanks; and a number of small wall-mounted equipment items, such as circuit breaker panels and single instruments. The licensee stated that expansion anchor bolt tightness checks were performed and the small wall mounted equipment was tug-tested by the SRT without a bolt tightness check. The licensee stated that the evaluation of concrete expansion anchor bolts was performed per the requirements of GIP-2, Section 4.2 and Appendix C. Since the concrete compressive strength was specified as 3,000 psi at 28 days for the JAFNPP plant, the licensee stated that it applied anchor strength reduction factors to the anchor strength calculations as required per GIP-2, Appendix B.

In summary, the licensee's screening approach for verifying the seismic adequacy of equipment anchorage is based on a combination of field inspections, analytical calculations and engineering judgment. During the field inspection process, the SRT noted attributes related to equipment characteristics, type of anchorage, size and location of anchorage, installation adequacy, embedment length, gaps, spacing, and edge distance. Expansion anchors were also checked for tightness. Detailed information on equipment anchorage evaluations performed at JAFNPP including field sketches, calculations, and bolt tightness check evaluations are included with the SEWS in Appendix G of the Seismic Evaluation Report of Reference 5. In Section 3.1.3, the licensee stated that equipment anchorage evaluation was performed per the requirements of GIP-2 II.4.2 and GIP-2 Appendix C. Those items of equipment that did not meet GIP-2 anchorage requirements were identified as outliers in Table 3.2 of the Seismic Evaluation Report of Reference 5. As the staff discusses in Section 2.9 of this safety evaluation, all such outliers have been resolved by the licensee as indicated in its letter dated December 4, 1998, (Reference 8).

The staff finds that the licensee has followed the GIP-2 procedures for verifying equipment anchorage adequacy. Therefore, the equipment anchorage evaluation is considered acceptable for the resolution of USI A-46 at JAFNPP.

2.4.4 Seismic Spatial Interaction Evaluation

The SRT seismic walkdowns included evaluation for potential seismic interaction concerns. The licensee stated that the evaluation was performed in accordance with the GIP-2 provisions in Section II.4.5 and Appendix D. The interactions of concern are: 1) proximity effects, 2) structural failure and falling, 3) flexibility of attached lines and cables, and 4) any other possible interactions. The SRT evaluated the possible seismic spatial interactions for all the SSEL components and documented them on the SEWS. Several seismic interaction concerns including some housekeeping issues were identified during the walkdown and were classified as outliers in Table 3.2 of the Seismic Evaluation Report of Reference 5. As the staff discusses, in Section 2.9 of this SER, all of these outliers have been resolved by the licensee as indicated in its letter dated December 4, 1998 (Reference 8).

It should be noted that the licensee identified masonry block walls as a possible interaction concern prior to conducting walkdowns. The licensee reviewed its NRC Bulletin 80-11 masonry block wall submittals and identified those walls which were seismically analyzed and qualified. During the walkdowns, the licensee checked off those walls which were qualified by the NRC Bulletin 80-11 program. Three masonry block walls were encountered which were not part of the NRC Bulletin 80-11 effort: the walls around the two SCRAM discharge tank cubicles on elevation 272 feet of the reactor building, and a small fire protection barrier next to a motor center also on elevation 272 feet of the reactor building. The tank cubicles' walls were installed after the NRC Bulletin 80-11 effort and were seismically designed and, therefore, acceptable. The fire protection barrier was evaluated by the SRT and found acceptable.

The staff finds the licensee's spatial interaction evaluation acceptable for the resolution of USI A-46 at JAFNPP as it meets the provisions of GIP-2.

2.5 Tanks and Heat Exchangers

A total of twelve types of tanks and heat exchangers were evaluated and the summary of the evaluations is documented on Table 4.1 of Reference 5. The tanks and heat exchangers are: the SCRAM discharge instrument air volume tanks, the RHR heat exchangers, the standby liquid control tank, the containment air dilution ambient heat exchangers, the containment air dilution ambient vaporizers, the containment air dilution liquid nitrogen tanks, the MSIV air accumulators, the condensate storage tanks, the MSRV air accumulators, the EDG air start receiver tanks, the EDG fuel oil storage tanks, and the EDG fuel oil day tanks. The detailed evaluations, including field notes, sketches, photographs, and calculations are documented in the SEWS. A brief description of the geometry and evaluation results of the tanks and heat exchangers are described in Table 4.1 of Reference 5. The evaluation results indicated that all tanks and heat exchangers meet the GIP-2 requirements, and there are no outliers.

The staff reviewed the licensee's evaluation results and found them adequate for the resolution of USI A-46 at JAFNPP because they meet the provisions of GIP-2.

2.6 Cable and Conduit Raceways

PASNY stated, in Reference 5, that the raceway review was performed as specified in GIP-2 Section 8. Raceway systems were walked down, checked against the inclusion rules and other seismic performance concerns as specified in Section 8.2 of the GIP-2, and examined for seismic spatial interactions with adjacent equipment and structures.

The SRT studied the plant layout drawings and walked down the plant to determine how cabling was routed to the areas of the plant containing the SSEL equipment. Reference 5 indicated that the SRT reviewed all cable and raceway systems in the areas of the plant where equipment on the SSEL is located, and cable and raceway systems in the cable spreading room and the cable tunnels. The walkdown of each plant area was documented on a plant area summary sheet.

Reference 5 states that ten representative worst-case raceway supports were selected and received a Limited Analytical Review (LAR) per GIP-2 Section 8.3. The results of the ten LARs were documented in Table 5.2 of Reference 5. Two outliers and their proposed resolutions were identified and are documented in Table 5.3 of Reference 5. One outlier was resolved analytically and the other was resolved by physical modification.

The licensee's evaluation of the cable and conduit raceways is adequate for the resolution of USI A-46 at JAFNPP because it meets the provisions of GIP-2.

2.7 Seismic Adequacy of Essential Relays

The purpose for the review of the essential relays is to determine if the plant's safe shutdown systems could be adversely affected by relay malfunction in the event of an SSE. The licensee stated that its relay evaluations were performed in accordance with the procedure outlined in GIP-2 and in EPRI NP-7148-SL. The licensee also stated that, the relays identified as having low ruggedness in Table 6.2 of EPRI NP-7148-SL, relays for which the demand exceeds capacity and relays for which the seismic capacity is unavailable were identified as outliers. PASNY classified as "chatter acceptable" relays for which chatter would not affect system performance and for which chatter would affect system performance, but for which operator actions would mitigate the relay chatter impact.

In Section 4 of the Relay Evaluation Report of Reference 5, the licensee stated that they identified a total of 1734 relays for all components on the relay review SSEL. As a result of its relay evaluations, they identified a total of 144 relays as outliers. The licensee listed the outlier relays in Attachment I, List of Outlier Relays, of Reference 5. Attachment I also includes OSVS forms for each outlier relay. As the staff states in Section 2.9, of this safety evaluation, all of the outliers have been resolved by the licensee as indicated in its letter dated December 4, 1998 (Reference 8). The staff finds the licensee's seismic relay evaluation to be acceptable for resolution of USI A-46 at JAFNPP as it meets the provisions of GIP-2.

2.8 Human Factors Aspect

GIP-2 described the use of operator action as a means of accomplishing those activities required to achieve safe shutdown. Section 3.2.7, "Operator Action Permitted," states, in part, that timely operator action is permitted as a means of achieving and maintaining a safe shutdown condition provided procedures are available and the operators are trained in their use. Additionally, Section 3.2.6, "Single Equipment Failure," states that manual operator action of equipment which is normally power operated is permitted as a backup operation provided that sufficient manpower, time, and procedures are available. Section 3.2.8, "Procedures," states, in part, that procedures should be in place for operating the selected equipment for safe shutdown and operators should be trained in their use. It is not necessary to develop new procedures specifically for compliance with the USI A-46 program.

In Section 3.7, "Operations Department Review of SSEL," of GIP-2, SQUG also described three methods for accomplishing the operations department reviews of the SSEL against the plant operating procedures. Licensees were to decide which method or combination of methods were to be used for their plant-specific reviews. These methods included:

1. a "desk-top" review of applicable normal and emergency operating procedures,
2. use of a simulator to model the expected transient,
3. performing a limited control room and local in-plant walk-down of actions required by plant procedures.

The staff's evaluation of the SQUG approach for the identification and evaluation of the SSEL, including the use of operator actions, was provided in Section 11.3 of the staff's SSER on GIP-2. The evaluation concluded that the SQUG approach was acceptable.

The staff's review focused on verifying that the licensee had used one or more of GIP-2 methods for conducting the operations department review of the SSEL, and had considered aspects of human performance in determining what operator actions could be used to achieve and maintain safe shutdown (e.g., resetting relays, manual operation of plant equipment).

The licensee provided information which outlined the use of both the "desk-top" review and simulator methods by the Operations Department to verify that existing normal, abnormal and emergency operating procedures were adequate to mitigate the postulated transient and that operators could place and maintain the plant in a safe shutdown condition. The staff verified that the licensee had considered its operator training programs and verified that its training was sufficient to ensure that those actions specified in the procedures could be accomplished by the operating crews. During development of the shutdown paths for this program, existing procedures were reviewed and found adequate to address the shutdown requirements. As a result of these reviews, the licensee enhanced the Abnormal Operating Procedure, “Earthquake,” by providing additional detail on the specific activities that may be required of the operators as they perform the plant cooldown. The procedural enhancements have been included in the operator training programs and have been exercised during dynamic simulator training sessions.

In addition, the staff requested verification that the licensee had adequately evaluated potential challenges to operators, such as lost or diminished lighting, harsh environmental conditions, potential for damaged equipment interfering with the operators tasks, and the potential for placing an operator in unfamiliar or inhospitable surroundings. The licensee provided information regarding their evaluations to substantiate that operator actions could be accomplished in a time frame required to mitigate the transient. Specifically, the licensee provided assurance that ample time existed for operators to take the required actions to safely shut down the plant, based on the review of specific manual operator actions which must be taken both in the control room and locally in the plant. As part of this review, the licensee developed a detailed description of each of the potential local operator actions which might be necessary based on a postulated seismic event. In addition, the licensee stated that they had previously evaluated operator actions associated with the Loss of Offsite Power transient as part of the Final Safety Analysis Report Chapter 14 accident scenario evaluations. These evaluations explicitly considered the potential for adverse environmental conditions such as loss of lighting and excessive heat and humidity. The licensee verified that existing procedures, availability of lighting equipment, and operator training were adequate to ensure the operators could perform the required actions credited in the submittal. The licensee stated that the areas of the plant where local operator actions were required were familiar to the operators and that no undue challenge to the operators would be expected. The licensee verified that all required actions were located in structures which had been seismically analyzed for the safe shutdown earthquake and as a result no major in-plant barriers would be expected in the areas or in the routes to where local operator actions would be required. The licensee performed seismic interaction reviews which eliminated any concerns with the plant components and structures located in the immediate vicinity of the components which had to be manipulated. Therefore, the potential for physical barriers resulting from equipment or structural earthquake damage which could inhibit operator ability to access plant equipment was considered, and eliminated as a potential barrier to successful operator performance.

The licensee has provided the staff with sufficient information to demonstrate conformance with the NRC-approved review methodology outlined in the GIP-2 and is, therefore, acceptable.

2.9 Outlier Identification and Resolutions

The licensee identified equipment and relay outliers resulting from the USI A-46 implementation effort in the summary report. A detailed description of each equipment outlier condition is in the attached OSVS (Appendix E of the Seismic Evaluation Report of Reference 5). A detailed description of each relay outlier condition is in Attachment 1 of the Relay Evaluation Report of Reference 5. The majority of the equipment outliers are related to seismic spatial interaction issues; while the relay outliers included the seismically sensitive relays and relays of unknown make or model or with unknown seismic capacities. The licensee provided outlier documentation including identification of the affected component, a description of the associated defects or inadequacies, and the proposed method of outlier resolution (e.g., modification, replacement, testing, or analysis) for the outliers. In Reference 5, the licensee stated that it will dispose of all outliers no later than startup from Refueling 13/Cycle 14 refueling outage. The licensee also stated that all outliers were reviewed to determine compliance with JAFNPP seismic licensing/design criteria. They found that all are in compliance and therefore, none were judged to present a significant impact on the health and safety of the public. In its submittal of December 4, 1998 (Reference 8), the licensee indicated that it has completed the outlier resolution for JAFNPP. PASNY dispositioned outliers by modification, replacement, testing, or analysis.

Based on our review, the staff determined that the licensee’s completed actions for resolution of outliers are acceptable for resolution of USI A-46 at JAFNPP because they meet the provisions of GIP-2.

3.0 SUMMARY OF STAFF FINDINGS

The staff's review of the licensee's USI A-46 implementation program, as provided for each area discussed above, did not identify any significant or programmatic deviation from the GIP-2 methodology regarding the walkdown and the seismic adequacy evaluations at JAFNPP.

4.0 CONCLUSION

In general, the licensee conducted the USI A-46 implementation in accordance with GIP-2. The licensee's submittal on the USI A-46 implementation indicated that all the safe shutdown equipment included in Reference 5 were examined during walkdowns to verify their seismic adequacy. Numerous equipment items containing relays were classified as outliers and were included in Appendix E, as well as Attachment I of Reference 5. The licensee's implementation program did not identify any instance where the operability of a particular system or component was questionable. In Reference 9, the licensee indicated that it has completed all of the outlier resolutions. As described in Section 3.0 of this evaluation, the staff's review did not identify any areas where the licensee's program deviated from GIP-2 or the staff's SSER No. 2 on SQUG/GIP-2 issued in 1992.

The staff concludes that the licensee's USI A-46 implementation program has, in general, met the purpose and intent of the criteria in GIP-2 and the staff's SSER No. 2 for the resolution of USI A-46. The staff has determined that the licensee's corrective actions and completed physical modifications for resolution of outliers will result in safety enhancements which, in certain aspects, are beyond the original licensing basis. As a result, the licensee's actions provide sufficient basis to close the USI A-46 review at the facility. The staff also concludes that the licensee's implementation program to resolve USI A-46 at the facility has adequately addressed the purpose of the 10 CFR 50.54(f) request. Licensee activities related to the USI A-46 implementation may be subject to NRC inspection.

Regarding future use of GIP-2 in licensing activities, the licensee may revise its licensing basis in accordance with the guidance in Section 1.2.3 of the staff's SSER No. 2 on SQUG/GIP-2, and the staff's letter to SQUG's Chairman, Mr. Neil Smith on June 19, 1998. Where plants have specific commitments in the licensing basis with respect to seismic qualification, these commitments should be carefully considered. The overall cumulative effect of the incorporation of the GIP-2 methodology, considered as a whole, should be assessed in making a determination under 10 CFR 50.59. An overall conclusion that no unreviewed safety question (USQ) is involved is acceptable so long as any changes in specific commitments in the licensing basis have been thoroughly evaluated in reaching the overall conclusion. If the overall cumulative assessment leads a licensee to conclude a USQ is involved, incorporation of the GIP-2 methodology into the licensing basis would require the licensee to seek an amendment under the provisions of 10 CFR 50.59.

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5.0 References

1. “Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Power Plant Equipment,” Revision 2, corrected February 14, 1992, Seismic Qualification Utility Group.

2. “Supplemental Safety Evaluation Report No. 2 on Seismic Qualification Utility Group’s Generic Implementation Procedure, Revision 2, corrected February 14, 1992” May 22,1992.

3. Letter, PASNY to NRC Document Control Desk, “Response to Supplement 1 to Generic Letter 87-02, SQUG Resolution of USI A-46,” dated September 22, 1992.

4. Letter, NRC to PASNY “Evaluation of the James A. FitzPatrick Nuclear Power Plant, 120-Day Response to Supplement No. 1 to Generic Letter 87-02,” dated November 17, 1992.

5. Letter, PASNY to NRC Document Control Desk, “Generic Letter 87-02, USI A-46 Walkdown Summary Report for James A. FitzPatrick Nuclear Power Plant,” dated November 15, 1995.

6. Letter, PASNY to NRC Document Control Desk, “Response to Request for Additional Information on the Resolution of Unresolved Safety Issue A-46 at James A. FitzPatrick Nuclear Power Plant,” dated November 25, 1996.

7. Letter, NRC to PASNY, “Request for Additional Information on the Resolution of Unresolved Safety Issue A-46, James A. FitzPatrick Nuclear Power Plant,” dated August 12, 1996.

8. Letter, PASNY to NRC Document Control Desk, “Inform that Planned Actions for Resolution of USI A-46 completed at James A. FitzPatrick Nuclear Power Plant,” dated December 4, 1998.

9. James A. FitzPatrick Nuclear Power Plant, Updated Final Safety Analysis Report, Section 16.2, “Nuclear Steam Supply System Component Structural Loading Criteria and Design,” Table 16.2-7.

10. Letter, PASNY to NRC Document Control Desk, “Response to Questions from a 7/12/99 NRC Facsimile to the Authority, Re: James A. FitzPatrick USI A-46 program,” dated October 8, 1999.

11. Letter, RG&E to NRC Document Control Desk, “Additional Information on Use of GIP Method A, R. E. Ginna Nuclear Power Plant,” Docket No. 50-244, dated May 25, 1999.