UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

OF USI A-46 PROGRAM IMPLEMENTATION AT

OYSTER CREEK NUCLEAR GENERATING STATION

DOCKET NO. 50-219

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 Title 10 of the Code of Federal Regulations (10 CFR) Part 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 14, 1992, (Reference 3), GPU Nuclear Corporation (GPUN or the licensee), provided its response to Supplement 1 to GL 87-02 for the Oyster Creek Nuclear Generating Station (OCNGS). In that letter, GPUN committed to follow the SQUG commitments set forth in GIP-2, including the clarifications, interpretations, and exceptions identified in SSER-2. On December 23, 1993 (Reference 4), GPUN submitted information concerning the method and criteria for developing in-structure response spectra (IRS) to be used for the resolution of USI A-46. The staff issued its evaluation of the licensee's response by letter dated February 23, 1995 (Reference 5).

By letter dated March 29, 1996, (Reference 6), GPUN submitted a summary report containing the results of the USI A-46 program implementation at OCNGS. By letter dated December 22, 1998, (Reference 7), GPUN provided its response to the staff's request for additional information (RAI), dated September 9, 1997, (Reference 8). By letter dated April 15, 1998 (Reference 9), the licensee also provided revised Appendices L (Seismic Evaluation Outlier Summary) and N (Modification Schedule). This report provides the staff's evaluation of the licensee's USI A-46 implementation program based on the staff's review of the

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summary report, supplemental information, clarification and documentation provided by the licensee in response to the staff's RAI.

2.0 DISCUSSION AND EVALUATION

GPUN's walkdown summary report (Reference 6) provides the licensee's implementation results of the USI A-46 program at OCNGS. 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. In Reference 9, the licensee provided an updated equipment modification schedule for resolving outliers.

2.1 Seismic Demand Determination (Ground Spectra and In-Structure Spectra)

In the evaluation of the licensee's 120-day response (Reference 10) to Supplement No. 1 to GL 87-02 (Reference 2), the staff accepted two options for the development of IRS for the resolution of USI A-46: (1) the licensee may use the ground response spectrum developed during the systematic evaluation program and apply it at the foundation level of the structure, or (2) it may use the site specific ground response spectra (SSRS) developed by the licensee and previously approved by the staff (Reference 11).

In a letter dated December 23, 1993 (Reference 4), the licensee indicated that it intends to use the SSRS (also termed as ground response spectrum (GRS)) as input for the development of IRS for use in the resolution of USI A-46. The staff approval of the approach is documented in Reference 5. In Section 4.1 of the USI A-46 evaluation report (Reference 6), the licensee confirmed that decision.

Three statistically independent artificial time histories, two horizontal and one vertical, were used to generate the Oyster Creek A-46 spectra. The response spectra of the artificial time histories at 5 percent damping envelop the SSE GRS in accordance with the provisions of Section 3.7.1 of the USNRC Standard Review Plan, Revision 2. The IRS at various elevations in the reactor building, turbine building, intake structure, and emergency diesel generator building were developed by time history analyses using the artificial time histories. The staff considers the input parameters and approach used in the development of conservative IRS acceptable for verifying the seismic adequacy of USI A-46 equipment as they meet the criteria of GIP-2.

2.2 Seismic Evaluation Personnel

GPUN engineering staff and staff members of EQE International and Gilbert Associates made up the project teams. Dr. John D. Stevenson of Stevenson and Associates provided an independent review. The licensee stated that all the seismic capability engineers (SCEs) have completed the SQUG training course on seismic adequacy verification of nuclear power plant equipment. The licensee provided the resumes of the SCEs in Appendix J of Reference 6.

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 licensees should be able to bring the plant to, and maintain it in a hot shutdown condition during the first 72 hours following a safe shutdown earthquake (SSE). To meet this provision, in its submittal of March 29, 1996, 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. Appendix C provides the SSEL.

The reactor decay heat removal function is accomplished by relieving steam from the reactor via the lifting of the five main steam electromatic relief valves (EMRVs) at their respective setpoints into the torus. These EMRVs perform dual functions. They also permit low pressure core spray injection into the reactor by depressurizing the reactor coolant system (RCS). The low pressure core spray system can be initiated manually or automatically. The RCS inventory is controlled by injecting water into the reactor by the low pressure core spray system when the reactor pressure is reduced to 285 psig. The torus water is then cooled by the containment spray system in the torus cooling mode. The containment spray system is then cooled by the emergency service water (ESW) system which rejects heat to the ultimate heat sink.

The plant operations department reviewed the equipment listed in Appendix C of Reference 6 against the plant operating procedures and operator training and concluded that the plant operating procedures and operator training were adequate to establish and maintain the plant in a safe shutdown condition following an SSE.

The staff concludes that the approach to achieve and maintain a safe shutdown for 72 hours following a seismic event is acceptable.

2.4 Seismic Screening Verification and Walkdown of 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 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 I of Reference 6.

2.4.1 Equipment Seismic Capacity Compared to Seismic Demand

Table 4-1 of GIP-2 states two methods for comparing equipment seismic capacity to the seismic demand on the equipment resulting from the postulated SSE. Method A is limited to equipment located within 40 feet of the effective grade, and having fundamental frequency of vibration greater than 8 Hz. In Method A, the capacity of the equipment is the bounding spectrum (BS) or the Generic Equipment Ruggedness Spectra (GERS), and the demand on the equipment is the GRS. However, Section 4.2.3 of GIP-2 indicates that the use of Method A is based on the condition that the amplification factor between the free-field GRS and the IRS will not be more than about 1.5.

Method B can be used for all conditions, where demand is expressed in terms of IRS and the capacity is expressed in terms of the Reference Spectrum which is 1.5 times BS or the GERS.

In response to the staff's request for additional information (Response 13, Reference 7), the licensee provided the IRS at various elevations in the East-West, North-South and vertical directions. The staff reviewed the IRS plots and found that at a few locations within 40 feet of the effective grade, the amplifications are greater than 1.5 times the GRS at frequencies higher than 8 Hertz, however, they do not exceed 2.0 times the GRS. Moreover, in response to question 14 (Reference 7), the licensee stated that GPUN had reviewed all cases where Method A was used (total 76 cases), and determined that Method B could be used interchangeably without impact on the conclusion reached. Based on the fact that IRS are conservatively developed and the ratio of the IRS to GRS are not more than a factor of 2 for elevations less than about 40 feet at frequencies above 8 Hertz, the staff finds the use of Method A acceptable for resolution of USI A-46 at OCNGS.

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 the restrictions or caveats described in GIP-2. The licensee indicated, in Reference 6, that the SCEs verified that the caveats listed in Appendix B of GIP-2 for each equipment class were met for OCNGS. 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.

GPUN documented the applicable caveats and the results of their evaluations for conformance with the caveats in SEWS and SVDS (Appendix I of the seismic evaluation report of Reference 6). In many cases, the licensee considered equipment which do not meet the GIP-2 caveats, as outliers which were documented in Appendix L, seismic evaluation outlier summary of the OCNGS summary report for USI A-46 resolution. In some cases, if the licensee judged that an item of equipment met the intent of the caveats, but that the specific wording of the caveat rule was 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 Appendix K of Reference 6.

In its response of December 22, 1998, (Reference 7), to the staff's RAI, dated September 9, 1997, (Reference 8), the licensee provided supplemental information, for some equipment items, to demonstrate how the intent of certain caveats were met rather than the exact wording of the caveats. For instance, the licensee identified containment spray heat exchanger pressure relief valves V-21-0021, and V-21-002, as meeting the intent but not the letter of the equipment class caveat. These valves are mounted on a pipe less than 1 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. In response to the staff's concern, the licensee stated that in all such instances, the piping system will not be overstressed or damaged due to the light weight of the valve (less than 5 lbs.). The staff concurs with the licensee's assessment.

In Appendix K of Reference 6, the licensee identified that, for scram discharge volume drain valves, V-15-0121 and V-15-0134, the distance from the center line of the pipe to the top of the operator, exceeds the distance given in Figures B.7-1 and B.7-2 of Appendix B of GIP-2. The staff requested that the licensee demonstrate the seismic adequacy of these valves. In response to the staff's concern, the licensee stated that it performed a 3g load evaluation for these valves. The results of that evaluation showed that the resulting yoke stresses and displacements are acceptable. Based on these results, the licensee judged the valves to be acceptable. The staff concurs with the licensee's assessment.

The staff finds that the seismic adequacy determinations for equipment identified in Section 4.3.4 of the OCNGS 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 resolution of USI A-46 at OCNGS.

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 verified equipment anchorage during the walkdown and documented the acceptablility of equipment on the SVDS in Appendix I of Reference 6. 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. Expansion anchors were checked for tightness. Section 4.4 of GIP-2 states that expansion anchors should not be used for anchoring vibratory equipment, such as pumps and compressors. GIP-2 furthermore states that if used, a large margin between the pullout loads and pullout capacities should be used. In response to the staff's question (Response 15, Reference 7), the licensee states that the only vibratory SSEL component found to be anchored with expansion anchors is the 125VDC MG Set B. Two of its anchors are cast in place, while the other two are shell anchors. The licensee's review of the SEWS package for this component indicated that the components would not have uplift during a seismic event, and the anchor bolts would not see a tensile load. The anchorage would, however, see a shear load of 248 lbs per bolt under a postulated seismic event. The shear capacity of the anchorage was calculated as 2380 lbs. This gives a minimum factor of safety of 9.5. The licensee furthermore stated that a tightness check on the shell anchors, during the SQUG walkdown, determined that the anchors were adequately tight. In Section 4.3.1 of Reference 6, the licensee stated expansion anchor bolt tightness checks were performed per the guidelines of GIP-2, Section II.4.4 and Appendix C. Detailed information on equipment anchorage evaluations performed at OCNGS including field sketches, calculations, and bolt tightness checks evaluations were included with the SEWs. Those items of equipment that did not meet GIP-2 anchorage requirements were identified as outliers in Appendix L of Reference 9. As discussed in Section 2.0 of this SER, the licensee indicated that all these outliers will be resolved per the modification schedule identified in Appendix N of Reference 9.

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 OCNGS.

2.4.4 Seismic Spatial Interaction Evaluation

The SRT seismic walkdowns included evaluation for potential seismic interaction concerns. 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 were identified during the walkdown and were classified as outliers in Appendix L of Reference 9. In Reference 9, the licensee indicated that it has resolved most of these outliers and will resolve the remaining outliers per the schedule identified in Appendix N of Reference 9.

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

2.5 Tanks and Heat Exchangers

The licensee identified 5 tanks and heat exchangers requiring seismic adequacy evaluations: one flat-bottom vertical (the diesel fuel oil storage) tank, and four large containment spray heat exchangers. In its response to staff question 16 (Reference 7), the licensee described the outliers associated with these items, and provided detailed calculations related to the seismic adequacy of the diesel fuel oil storage tank.

The licensee had identified two outliers associated with each of the four heat exchangers. The first outlier was the presence of chainfalls in the vicinity of the heat exchangers. As corrective actions, the chainfalls were restrained and supported to prevent interaction with the heat exchangers. Subsequent walkdowns by a team of SCEs verified that the corrective actions were adequate to resolve the outliers. The second outlier was associated with the fact that the heat exchangers are installed vertically instead of horizontally, and that the configuration of the attached piping could result in significant anchor loads due to pipe movement during a seismic event. To resolve the second outlier, the licensee performed an analysis of the heat exchangers taking into consideration flexibility of the component as well as all applicable loads from all the attached piping. Subsequently, during the design verification process, the licensee verified the adequacy of the original analysis.

In Attachment 17 of Reference 7, the licensee provided a copy of the SEWS package for the diesel fuel oil storage tank. A review of the calculations indicated that the flat-bottom vertical tank has a height to radius ratio of 2.15, an effective thickness to radius ratio of .003, and an impulsive mode fluid-structure frequency of 32 Hz. These parameters indicate that the tank will act as a rigid structure during the postulated SSE. The calculations, furthermore, showed that the overturning moment demand and the shell buckling stresses are significantly lower than the allowables. In response to question 16, the licensee indicated that during replacement of the tank in 1991, one of the anchors required repairs. The physical configuration of this repair utilized a threaded extension. The repair was designed to provide the bolt with the same anchorage capacity as the other tank anchor bolts.

Based on the process, parameters, and guidance documents stated in the licensee's summary report (Reference 6), and in the response to the staff's RAI (Reference 7), the staff finds the technique for verifying the adequacy of safe shutdown tanks and heat exchangers and the resolution of the associated outliers acceptable.

2.6 Cable and Conduit Raceways

The licensee performed the seismic verification walkdowns of cable tray and conduit supports in accordance with Section 8 of GIP-2. Walkdowns were performed prior to and during the 15th refueling outage in July, August, September and October 1994.

The licensee stated that it reviewed the raceway supports using the GIP-2 inclusion rules to determine if the as-installed raceway systems are within the envelope of the earthquake experience and shake table data bases. The licensee, also, screened the installations for other seismic performance concerns which could result in unacceptable damage. Raceways were also reviewed for potential seismic interactions with adjacent equipment and structures which could cause the raceway system to fail to perform its safe shutdown function. In addition, representative worst-case bounding samples of supports were selected, and limited analytical reviews (LAR) were performed as specified in GIP-2.

The licensee categorized the raceways supports at Oyster Creek in two distinct support systems:

1. Rigid supports for cable trays and conduits which were designed for seismic loads. These supports utilize wide flange, angle and tube steel as structural members, rigid base plates, cross or knee bracing and ½-inch diameter (minimum) Hilti kwikbolts or wedge anchors. Cable trays are bolted to their supports using clip angles. Cable tray spans are generally 8 feet or less and have very light cable loads. Conduit spans are generally within the guidelines of GIP-2.

2. Flexible supports for cable trays and conduits which utilize standard threaded rod, unistrut trapeze members, "prayer" type clamps for conduit, and standard friction type attachment clips for cable trays. Typically the supports are mounted to concrete surfaces with shell anchors. Some conduits are directly mounted to walls or ceilings with unistrut hardware and shell anchors.

The two systems are not integrated. They do not share common supports, cable trays, or conduits. Trays and conduits are either rigidly supported using the more recent seismic support system or are flexibly supported using the original flexible support system. The licensee's walkdown indicated that the two systems were not connected at any point in the plant.

During the licensee's (or its consultant's) walkdowns, the licensee observed that both types of cable tray systems were, in general, lightly loaded with cables. The flexible cable tray system was found to contain heavy cable loads in certain areas of the plant. Conduit supports also were found to be lightly loaded in most areas of the plant, with only isolated cases of supports which carried heavy loads of multiple conduits. The flexible support system was found to have many supports which carry both cable trays and conduits.

The licensee evaluated the raceways and their supports to determine if they meet the GIP-2 inclusion rules. Those raceway supports which did not meet the inclusion rules were documented as outliers. Cable tray and conduit spans were observed to be generally 6 to 8 feet or less. Cable trays were generally attached to their supports with standard friction type hardware. Channel nuts are the unistrut type with teeth stamped into the nuts. Cast iron inserts were not observed. Where friction type beam clamps were used, they were generally installed so that dead load was not resisted by the friction force. The licensee identified a few small diameter conduit supports which had the friction clamps oriented so that dead load was resisted by the friction force. They judged these cases acceptable, based on the small magnitude of the seismic loading (15 pounds or less) and field tug tests as defined by GIP-2. Rigid boot connection details were not observed in any application critical to the support of any raceway system in the scope of this effort.

Cable trays and conduit raceways were found acceptable for the other seismic performance concerns with the exception of a few outliers. The isolated outliers consisted of instances of corrosion, a cable routed near sharp metal edges, missing hardware, broken or not properly installed and suspect anchorage in masonry block walls. All the outliers were documented on OSVS forms for resolution.

The licensee stated that the seismic interaction review was found acceptable in most areas of the plant with the exception of isolated cases which were documented as outliers. Minor instances of proximity interactions between cable tray/conduit, flexible rod hung piping, HVAC ducts and other cable tray/conduit systems were observed and noted. These cases were determined to be acceptable because they were judged to be non-damaging and would not compromise cable function. Seismic interaction cases documented as outliers in various areas of the plant include:

- Unanchored or inadequately anchored equipment not on the SSEL which represents an interaction hazard to proximate or attached raceway and its support,

- Cable trays or conduit supports in the vicinity of masonry block walls with unknown seismic capacity, and

- One instance of a traveling crane which could potentially impact a conduit.

These cases are documented and their resolution method is identified in Appendix L of the summary report (Reference 6).

The licensee selected 20 supports for LAR as a result of the in-plant review walkdowns. Eleven supports passed the analytical review using the acceptance criteria of Section 8 of GIP-2. Two supports which failed the three times dead load vertical capacity criterion of GIP-2 were initially identified as outliers. However, these two supports passed the lateral load checks performed in accordance with Section 8.3A of GIP-2. The remaining seven supports were identified as outliers. These seven supports were unique in the plant or were worst case samples which, the licensee indicated to represent a very small number of additional supports in the plant. The licensee performed detailed analyses of these supports and determined that they were seismically adequate.

In response to the staff's request for additional information for SEWS related to the seven outliers (Response 17, Reference 7), the licensee provided a set of calculations related to the resolution of these outliers. The staff's review of the SEWS indicated that in resolving a number of outliers, the licensee had to reduce the cable tray loads to the actual number of cables existing in the cable trays. This is acceptable. However, the licensee needs to have a procedure that would assure that the trays will not be loaded with additional cables in the future.

Based on the review of the information provided in the summary report (Reference 6), and in response to the staff's RAI (Reference 7), the staff concludes that the licensee has appropriately verified the seismic adequacy of the cable tray raceway supports, utilizing the criteria and caveats provided in Section 8 of GIP-2, and hence the verification process is acceptable for resolution of USI A-46 at Oyster Creek.

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. In Section 3.5 of Reference 6, the licensee stated that the control circuits of all SSEL components were reviewed to screen out those which are nonvulnerable to chatter or whose chattering is acceptable during an SSE. In addition, those relays/contacts whose chattering could result in a system/component malfunction, but whose operator actions could restore or reset such circuits to their desired condition, were also screened out.

In Section 3.7 of Reference 6, the licensee stated that it identified a total of 772 relays for all components on the relay review SSEL. As a result of its relay evaluations, the licensee identified a total of 111 relays as outliers. The licensee listed the outlier relays in Appendix L of Reference 9. Appendix L provides a description of each relay outlier, and the planned method of resolving each outlier. The licensee stated that all outliers will be resolved by analysis or modification. The schedule for resolving all relay outliers is included in Appendix N of Reference 9. The staff finds the licensee's seismic relay evaluation to be acceptable for the resolution of USI A-46 at OCNGS as it meets the provisions of GIP-2.

2.8 Human Factors Aspects

GIP-2 describes 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. 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 the "desk-top"evaluation method 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 licensee determined that the systems and equipment selected for seismic review in the USI A-46 program are those for which normal, abnormal, and emergency operating procedures are available to bring the plant from a normal operating mode to a safe shutdown condition. The shutdown paths selected were reviewed by the OCNGS operations staff and who determined that the procedures would provide adequate guidance to the operators in response to a seismic event. The licensee provided assurance that ample time existed for operators to take the required actions to safely shut down the plant. This had been accomplished during validation of the pertinent plant operating procedures related to the licensees updated final safety evaluation report (UFSAR), Chapter 15, Accident Analysis for the Loss of Offsite Power (LOOP) transient which preceded the USI A-46 program review. The licensee stated that since these plant procedures had already been validated to ensure that adequate time and resources are available for operators to respond to the analyzed transients, it was not necessary to revalidate these procedures for the USI A-46 program.

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. The operations department verified that all actions necessary to safely shutdown the plant were included in existing normal, abnormal, and emergency operating procedures. The licensee verified that no additional operator actions, beyond those associated with the safe shutdown paths, must be performed to bring the plant from a normal operating mode to a safe shutdown condition.

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 to substantiate that potential challenges to the operator were explicitly reviewed during validation of the pertinent plant operating procedures related to the licensees UFSAR, Chapter 15, Accident Analysis for the Loss of Offsite Power (LOOP) transient which preceded the A-46 program review and as part of the A-46 validation effort. The review determined that there were four (4) newly required operator actions introduced as a result of the USI A-46 postulated seismic event. These four actions include: manually restarting the fans associated with the service water vault roof ventilators located in the turbine building, manually resetting the reverse current relay associated with the motor-generator set B in the A/B Battery room, manually resetting the compressor over-current relays associated with the control room system B HVAC supply fan located on the mechanical equipment building roof, and restarting the unit from within the control room. For each of the four manual actions, the licensee conducted an evaluation and verified that sufficiently hospitable ingress/egress paths to the equipment would be available and that sufficient time existed to permit the operators to access the equipment areas.

In addition, the licensee explicitly evaluated the potential for local failure of architectural features and the potential for adverse spacial interactions in the vicinity of safe shutdown equipment, where local operator action may be required, as part of the GIP-2 process. As a result of the review, a potential control room interaction source was identified associated with non restrained equipment (e.g., non-bolted cabinets, copiers, printers, file cabinets, storage locker, water cooler, a ladder, and the block walls in the East and South boundaries of the control room). The licensee stated that these issues have been evaluated and corrected by relocating or removing the hazard, or upgrading the anchorage of the equipment to preclude any interaction. 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 GIP-2 and is, therefore, acceptable for resolution of USI A-46 at OCNGS.

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 outlier condition is provided in Appendix L of Reference 9. Appendix L includes 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. The licensee also indicated that all outliers were reviewed to determine compliance with OCNGS seismic licensing/design criteria. As a result, 13 items were either repaired immediately or justified analytically for continued plant operation and modifications were completed during or subsequent to the walkdown. In its submittal of April 15, 1998 (Reference 9), the licensee indicated that it has completed a large number of outlier resolutions and will complete all the remaining outlier resolutions by the end of refueling outage18 R, which is currently scheduled to commence in September 2000.

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 OCNGS 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 OCNGS.

4.0 CONCLUSION

In general, the licensee conducted the USI A-46 implementation in accordance with GIP-2. The licensee's implementation program did not identify any instance where the operability of a particular system or component was questionable. The staff's review of the licensee's implementation program did not reveal any significant findings that would suggest inadequacy of the licensee's A-46 program in light of the GIP-2 guidelines. The staff concludes that the licensee's USI A-46 implementation program has, in general, met the purpose and the 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 already completed actions 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 (Reference 12). It should be noted that the primary consideration in the staff's determination to permit the licensee to incorporate GIP-2 in the licensing basis is the licensee's completion of all the identified outliers, in accordance with GIP-2 provisions. 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 unresolved 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 50.90.

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5.0 REFERENCES

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3. Letter, GPUN to NRC Document Control Desk, "Response to Supplement 1 to Generic Letter 87-02, SQUG Resolution of USI A-46," dated September 14, 1992

4. Letter from R. Keaton (GPUN) to NRC, "In-structure Response Spectra," December 1993

5. Letter, NRC to GPUN "Evaluation of the Oyster Creek Nuclear Generating Station, 120-Day Response to Supplement No. 1 to Generic Letter 87-02," dated February 23, 1995

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8. Letter, NRC to GPUN, "Request for Additional Information on the Resolution of Unresolved Safety Issue A-46, Oyster Creek Nuclear Generating Station," dated September 9, 1997

9. Letter, GPUN to NRC Document Control Desk, "Revised Appendices L and N, USI A-46 Seismic Evaluation Report," dated April 15, 1998

10. Letter , A. Dromerick (NRC) to J. Barton (GPUN), "Evaluation of OCNGS 120-day response to Supplement 1 to GL 87-02," dated November 1992

11. Letter, A. Dromerick (NRC) to J. Barton (GPUN), "Review and Evaluation of Site Specific Response Spectra - OCNGS," dated March 1992

12. Letter, B. W. Sheron (NRC) to Neil Smith (SQUG), dated June 19, 1998