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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Additional Information Supporting the Request for License Amendment Related to Onsite Spent Fuel Storage Expansion

Reference: Letter from Keith R. Jury (AmerGen Energy Company, LLC) to U. S. Nuclear Regulatory Commission, "Request for Technical Specification Change to Support Onsite Spent Fuel Storage Expansion," dated August 18, 2004

In the referenced letter, AmerGen Energy Company, LLC (AmerGen) requested a change to the Technical Specifications for Clinton Power Station (CPS), Unit 1, to reflect the addition of fuel storage capacity in the fuel cask storage pool and increased fuel storage capacity in the spent fuel pool. Specifically, the proposed expansion will increase the total storage space at CPS from 2,512 to 4,159 fuel assemblies. This extra capacity is expected to allow operation without loss of full core discharge capability until the 15th refueling outage (i.e., C1R15) in the year 2016.

On February 8, 2005, the NRC requested that AmerGen provide additional information to support review of the proposed license amendment in the referenced letter. This request was provided electronically from Kahtan N. Jabbour (U. S. NRC) to Timothy A. Byam (AmerGen). Attachment 1 to this letter provides the requested information.

The revised regulatory commitments from the referenced letter are provided in Attachment 2. Attachment 3 includes the affidavit supporting the request for withholding the proprietary report in Attachment 4 from public disclosure in accordance with the requirements of 10 CFR 2.390. Attachment 4 provides the proprietary report documenting evaluation of the proposed storage racks. Since this document is proprietary in its entirety, a non-proprietary version has not been provided.

AmerGen has reviewed the information supporting a finding of no significant hazards consideration that was previously provided to the NRC in Attachment 1 of the referenced letter.

APO1

The supplemental information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration.

If you have any questions concerning this letter, please contact Mr. Timothy A. Byam at (630) 657-2804.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 13th day of April 2005.

Respectfully,

Keith R. Jury

Keith R. Jury
Director – Licensing and Regulatory Affairs
AmerGen Energy Company, LLC

Attachments:

1. Additional Information Supporting the Request for License Amendment Related to Onsite Spent Fuel Storage Expansion
2. Commitments
3. Affidavit
4. Holtec International Report No. HI-2043215, "Sourcebook for Metamic Performance Assessment"

ATTACHMENT 1

Additional Information Supporting the Request for License Amendment
Related to Onsite Spent Fuel Storage Expansion

Request 1:
On page 10 of Attachment 1 to the submittal dated August 18, 2004, it is stated that loading the newly installed fuel racks in the fuel cask storage pool with fresh (24 hour cooling) could result in dose rates up to 26 rem per hour. However, restricting the first three rows of storage cells closest to the pool walls to storing only "cooled" fuel assemblies the dose rates can be reduced to 4.4 millirem per hour. Is this analysis bounding for both the Phase 1 and Phase 2 storage racks in the cask storage pool? Do these dose increases change the radiation zoning of the facility as described in the Updated Final Safety Analysis Report (UFSAR)? If so, please provide revised radiation zoning maps for the affected areas, and a detailed description of the administrative controls that will be used to ensure that fuel storage will not result in high radiation areas adjacent to the cask storage pool. Include the measures that will ensure that only cooled fuel is stored in the outer three rows, the minimum cooling time for this fuel, and the requirements for radiation surveys in the adjacent areas, post-fuel movement.

Response 1:
The dose rates for the fuel cask storage pool were developed for the bounding configurations being considered for Phase 1 and 2 and were developed based on worst-case fuel parameters (i.e., fuel resulting in the highest source terms). The 3-foot thick walls on the West and South side of the fuel cask storage pool provide less shielding than the other, 6-foot thick walls, thus, representing more of a concern for possible dose increases resulting from the storage configuration change.

Administrative controls will be instituted to restrict storage of only fuel cooled at least 10 years in the three peripheral rows and columns of the fuel cask storage pool racks. These controls will be implemented through requirements and restrictions in the fuel handling and movement procedures. The revisions to the procedure will ensure that the fuel and associated source terms will result in dose levels beneath the thresholds of the existing radiation zone designations. Therefore, radiation zone designation changes are not expected to be required. Routine area surveys conducted by Radiation Protection (RP) personnel following fuel movement into the fuel cask storage pool will confirm dose rates stay within the zone designations. Area surveys at CPS are conducted on a periodicity determined by RP Supervision and movement of fuel into the fuel cask storage pool will trigger a survey to ensure the area dose rates are known and understood. Appropriate actions will be taken if dose surveys indicate abnormal or unexpected dose levels.

In the original amendment request (Reference 1), AmerGen Energy Company, LLC (AmerGen) committed to "provide procedural guidance to administratively control storage of recently discharged fuel assemblies (i.e., fuel that has occupied part of a critical reactor core within the previous 24 hours) in the three rows of storage cells adjacent to the fuel cask storage pool walls." To provide more clarification this commitment has been revised to specify the fuel be cooled at least 10 years. Attachment 2 provides the revised commitment summary from Reference 1.

Request 2:
Discuss the precautions, such as use of TV monitoring, tethers, etc., that will be used to ensure that the divers will maintain a safe distance from any high radiation sources in the spent fuel pool (SFP). Please describe how you plan to monitor the doses received by the divers during the re-racking operation (e.g., use of dosimetry, alarming dosimeters, remote readout radiation detectors). The NRC staff finds the information, methods and guidance (pertinent to diving) in Regulatory Guide 8.38, "Control of Access to High and Very High Radiation Areas in Nuclear Power Plants," June 1993, acceptable for controlling diving operations.

Response 2:
All diving activities that are required to support the various steps in the reracking process will be controlled in accordance with Exelon procedure RP-AA-461, "Radiological Controls for Contaminated Water Diving Operations." This procedure complies with the guidance provided in Regulatory Guide (RG) 8.38. Specifically, the diver will be visually monitored (e.g., by direct line of sight, glass bottom viewing port, or by camera) at all times during the course of the dive. Additionally, the diver will have direct audio communications with topside controls. Loss of either of these monitoring tools will be cause for immediate cessation of dive operations, and the diver will relocate to the pool surface at a safe location as designated by Radiation Protection (RP) or will be removed completely from the pool.

The diver will be confined to a safe dive area, which will be clearly delineated to him in the pre-dive brief as well as physically marked in the pool. Special precautions such as physical barriers or tethers shall be used to prevent a diver from coming into close proximity to highly radioactive materials.

With respect to dose monitoring, the diver will be equipped with a hand held probe. The diver will use this hand held monitor to check locations that he is about to enter. This hand held device gives him direct real-time dose rate information. Additionally, the diver will move around, as instructed by RP, remote probes that will give the topside RP personnel a direct readout of the dose fields in a dive area prior to the diver physically entering the area. Finally, the diver will be monitored by a remote dose telemetry system so that the topside RP personnel can know exactly what dose the diver's body and extremities are receiving. With the multiple sources of monitoring, the topside RP personnel will have real time dose information to direct the diver's movements, ensuring the diver remains in a safe and approved work area.

Request 3:
Please describe the radiation surveys that will be performed (from the pool rim or by divers in the pool) to map dose rates in the SFP, or to check for contamination of material, equipment or divers upon removal from the pool.

Response 3:
Radiation surveys shall be completed for all evolutions involved with the reracking operation. Initial surveys shall be performed by RP personnel from the fuel handling platform or similar location using underwater dose rate instruments. The dose rates will be documented on a survey map clearly delineating the components and dose rates. In addition, the diver will also

complete radiological surveys when they enter the water and when they move to new locations in the pool. This will be monitored and documented by RP personnel. All items that are to be removed from the pool shall be surveyed from the surface prior to removing them from the pool. Additional surveys and rinsing will be done as the item breaks the water surface. Additionally, as applicable, smears shall be taken on items to determine contamination levels. Appropriate measures and controls shall be implemented to minimize the potential for spread of contamination. All dose rate and contamination controls are governed by Clinton Power Station (CPS) procedures.

Request 4:
Describe the intended disposal of the fuel racks removed from the pool.

Response 4:
For the spent fuel racks that are being removed from the CPS spent fuel pool (SFP) for disposal, the racks will be removed from the pool, allowed to "drip dry", and then placed in a large plastic shipping bag. The bag serves as the mechanism for contamination control during rack handling and movement from the point of removal from the SFP to the point of lid installation on its shipping container. Once the racks are placed in the shipping containers, they will be transported to a vendor that specializes in volume reduction and packaging of contaminated spent fuel racks. This vendor will cut the racks into smaller pieces that will support a better compaction of materials in their burial containers. It is estimated that the total material waste after the racks are processed will be approximately 20% of their original volume. Upon completion of the processing and packaging, the burial containers will be shipped to one of two burial facilities, Barnwell in South Carolina, or Envirocare in Utah, for burial.

Request 5:
With respect to Section 6.2, "Overview of Rack Structural Analysis Methodology" of Attachment 5, please discuss key engineering analysis methodology improvements applicable to the Clinton Power Station's (CPS) Technical Specification change request, including additional test based verification work on Whole Pool Multi-Rack (WPMR) analysis methodology, beyond those reported in related references of Section 6.13, Attachment 5.

Response 5:
The Holtec International, Inc. (Holtec) proprietary software code, DYNARACK, was used for all of the single rack and WPMR evaluations. The current version of DYNARACK uses the same algorithm solvers and fluid coupling formulations as the versions used to support previous reracking projects submitted under numerous dockets since about 1988. There has been no recent key engineering analysis methodology improvements required or performed for the DYNARACK solver. The DYNARACK computer software validation manual (Reference 2) provides a detailed description of the experimental testing performed in 1987 by Dr. Burton Paul. The DYNARACK software validation manual was provided in response to NRC Requests for Additional Information (RAI) to support the 1997 reracking license amendment submittal for Waterford Unit 3 (Reference 3). Detailed discussions about the experimental data that supports

the DYNARACK fluid coupling solution method were provided in the Waterford Unit 3 RAI responses.

The Waterford Unit 3 RAIs also requested comparison with experimental work performed by Scavuzzo, et al. The results of this comparison were provided to the NRC in Reference 4. Holtec determined that the solver used by Scavuzzo was substantively the same algorithm as that used in DYNARACK, and comparisons performed with DYNARACK found good correlation. These comparisons were documented in the DYNARACK computer software validation manual and were submitted to the NRC as part of the correspondence associated with the Waterford Unit 3 reracking license amendment (Reference 4).

Request 6:
Please provide a summary discussion of past CPS' operating and maintenance experience with respect to its spent fuel racks and pool structures including unexpected deformations and damages of racks, fuel assemblies, pool liner and aging related degradation of SFP structural concrete and liner elements.

Response 6:
Since installation, there have been no adverse operating or maintenance issues associated with the CPS spent fuel racks. There have been no unexpected deformations or damage of the racks and there have been no instances of damage to the racks or to fuel bundles as a result of the use of the racks. As part of the initial installation of the spent fuel racks, drag testing was used to identify individual unusable rack locations (i.e., cells). None of these cells identified as unusable have been used. CPS has experienced fuel channel bow as a result of normal exposure in the core. Fuel assemblies with bowed channels have been stored in the SFP racks without incident.

The CPS spent fuel pool liner is intact with no history of leakage. Leak detection is provided by welded channels located behind the liner welds that route any leakage to flow sensors. A level instrument on the fuel pool surge tanks also monitors pool water volume. Since surge tank volume is small compared to the volume of the pools, surge tank level instrumentation is very sensitive to changes in pool volume.

The issue of gamma heating of the SFP structural concrete has been evaluated as part of the reracking project. There has been no observed age related degradation of the SFP structure.

Request 7:
Please provide a plan view of CPS' SFP and fuel cask storage pool with indication of areas to be covered by the fuel building crane and the low profile temporary crane operations, respectively, with a description of applicable administrative controls to be imposed on operations. Also, as applicable, please provide a discussion of design considerations for temporary platforms which may be used to support the CPS' spent fuel re-racking operation including a description of how they will be supported and connected to the pool and duration of using the platforms.

Response 7:
Figure 1 provides a schematic showing the travel limit restrictions of the overhead crane with respect to the SFP. New and existing racks that are on the West (i.e., left) side of the line indicated on the figure can be removed or installed with the existing building overhead crane. A temporary crane will be constructed and installed on the fuel handling platform rails to gain access to the affected racks. The temporary crane will be configured such that it may also be used to handle all of the racks in the pool. Though the overhead crane remains an option for handling the accessible existing and new racks, it will be considered a back-up system to the newly reconfigured full height temporary crane. The design of the temporary crane includes personnel platforms supported by the end trucks of the crane. These platforms will move along with the crane and will only be in place while the temporary crane is in place on the fuel handling platform rails.

In order to minimize carrying heavy loads over the spent fuel at excessive heights, the rack change out sequence was prearranged to minimize this possibility. New racks to be installed in the SFP will be lowered to a point approximately 6 inches above the pool floor as soon as the suspended rack clears the SFP wall and appurtenances that project from the wall. Once the rack is at a minimal height above the pool floor, the rest of its required travel will be done at this minimal height. With regard to existing racks, they will be lifted from the SFP floor no more than approximately 6 inches and will travel at this height until reaching the point of egress from the pool. At this point, the rack will be lifted to the surface.

Project specific procedures will be in place to govern the rack movement activities described above. Existing plant procedures will continue to be used to operate the Fuel Building overhead crane.

A safe load path deviation will be prepared for the project and evaluated by site engineering. The safe load path deviation will include both the overhead crane and the temporary crane movements. The Plant Operations Review Committee will approve the deviation. Crane travel stops preventing movement over the spent fuel pool will be removed for work moving equipment in the pool and controls will be in place to prevent unauthorized use of the crane. Barriers will be used to ensure the safe load path deviation is adhered to and no heavy loads travel over fuel.

Request 8:
Section 4.0 of Attachment 1 states that the new rack modules will be separated from each other by a gap of approximately 1.0 inch, and along the pool walls, a nominal gap of 2.5 inches will be provided. Please discuss the basis for selecting these gaps and clarify if the gaps between the racks and between the racks and the pool wall will be measured at the base plates or at a higher elevation. If the gaps measured at the top and bottom of the fuel rack are different, indicate how the gap values to be used in a WPMR analysis model are determined.

Response 8:
All rack periphery gaps were obtained from an attempt to maximize the number of storage locations that can safely be placed within the pools. The gaps between racks and the pool walls were not specifically selected, but are the result of designing the number of cells and associated cell-to-cell pitch to provide gaps that are too small to inadvertently insert an assembly into during fuel shuffle and large enough to limit potential rack impacts to acceptable levels. The 1.0 inch gap between adjacent storage racks was selected as a nominally small value that experience has shown allows placement of adjacent empty racks without damage. The gap between racks will be ensured by ½" base plate extensions beyond the perimeter of the rack storage cell boundary. These base plate gaps will also be maintained at the top by ensuring that the racks are leveled during installation. The installation procedures require that the pedestal extensions be adjusted prior to the rack being inserted into the pool to account for pool floor and bearing pad elevation irregularities. Additional minor adjustments can also be performed subsequent to placement of the rack to ensure that the racks are level and that the sides are vertical.

Upon installation, the rack to rack and rack to wall gaps, as applicable, are measured using long handled measuring tools prior to removal of the lifting rig from the rack. If gaps are not within the design parameters, the rack will be lifted and relocated. This process will be repeated as necessary until design parameters are met. If there are any issues that prevent the design gaps from being obtained, appropriate mechanisms are put in place so that evaluation and disposition by the rack designer can be initiated to address any in-field measurements that are not in compliance with the design. Based on the disposition, further action will be taken as directed by the rack designer.

The installation practice is to install the racks with the base plates butted together to the extent possible. Fabrication tolerances and straightness of the side of the base plate will obviously preclude rack base plates on adjacent racks from being in contact over their entire width. However, the DYNARACK model considers that these base plates are in initial contact at the onset of the dynamic simulations. This practically ensures that the base plates will produce in-plane impact loads during the dynamic simulation. The tops of the racks are modeled with the nominal gaps. This difference in gaps between the top and bottom of the rack is accomplished in the DYNARACK model by adjusting the length of the rack periphery springs (K_g) indicated in Figure 6.5.3 of Attachment 5 to Reference 1.

Request 9:
Section 6.5.1.1.f states that sloshing is found to be negligible at the top of the rack and is, therefore, neglected in the WPMR analysis. Briefly discuss the basis for your assertion with specific consideration of the CPS' safe shutdown earthquake (SSE) motion magnitude. Also, clarify that in a CPS' WPMR analysis, if a randomly selected friction coefficient at a given instant is applied to all racks identically. If a random friction coefficient is selected for each rack at each instance, would the results be appreciably changed?

Response 9:
"Sloshing" is defined as the dynamic behavior and associated load of the water produced by wave-like motion at the surface of the SFP. Technical Information Document (TID) 7024, "Nuclear Reactors and Earthquakes," (Reference 5) Chapter 6, is commonly used to evaluate the dynamic response of the water within the SFP. Figure 6.2(a) of Reference 5 depicts the two masses of water that the total bulk is considered to be split into, as described in the text. The upper portion of the water is the sloshing portion and is denoted in the figure as "water in motion," which produces convective forces and the lower portion of the water, denoted as "constrained water" produces impulsive forces. The latter bulk of water has an associated mass (identified as weight W_0) and is effectively a rigid body that moves along with the tank (refer to Figure 6.1 and the first paragraph of Section 6.4 of Reference 5). The horizontal force produced by this mass of water when accelerated by the earthquake acts at a height of h_0 from the bottom of the tank. This parameter is determined in the table given at the end of Section 6.3 of Reference 5 to be equal to 3/8 times the height of the fluid. This height is not dependent upon the magnitude of the earthquake. For the SFP, the water depth is approximately 40 feet and the height h_0 would be 15 feet (i.e., 180 inches) from the bottom. Since the impulsive force acts at approximately the centroid of the rigid mass of water, the top of this bulk of water is above this point. The racks are approximately 176 inches tall, which is lower than the height h_0. So, the racks are in the rigid body at the bottom of the pool and the sloshing portion of the water will be above this elevation.

The coefficients of friction (COF) considered pertain to the interface between the bottom of the pedestal and the top of the bearing pad. The values chosen for the random case differ for each individual pedestal, but once the values are chosen at the beginning of the simulation, they are kept as the same value throughout the simulation. The program also has the ability to change the COF value for each pedestal at every time step in a random manner. However, the option for the random COF cases is not used, since the results would not be reproducible. In other words, the design inputs must be documented as set values (i.e., not completely random) so that subsequent evaluations can produce the same results during any future re-evaluation or confirmatory review. The 0.2, 0.8, and random COF values are documented in the output produced by a preprocessor that develops the pedestal parameters to be used in the input file of DYNARACK. As stated in Section 6.2.1 of Attachment 5 to Reference 1, the COF values for the random case simulations are selected in a Gaussian distribution with a mean of 0.5 and lower and upper limits of 0.2 and 0.8. Therefore, most of the values are close to the 0.5 value and, as stated above, once the random values are selected for each pedestal, they remain the same throughout the simulation. Therefore, the results for different randomly selected COF value sets would not appreciably change the results. The dynamic evaluations performed for CPS include six WPMR and 162 single rack simulations. This is one of the largest number of simulations ever performed for any reracking project by Holtec. A review of the results from the individual simulations indicates that the results do not vary by great amounts for similar conditions. The selection of 0.2, 0.8, and random COF for the pedestals gives a high confidence that the results are representative of the output that would be obtained for any set of COF values in the range between 0.2 and 0.8.

Request 10:
As applicable, describe the leak detection methods used in the CPS fuel pool structure. How leaks, if any, are monitored? Also, discuss the CPS specific quality assurance and inspection programs to be implemented in order to preclude installation of any irregular or distorted rack structure, and how CPS confirms that the actual installed fuel rack gap configurations are consistent with those gaps assumed in the WPMR analyses.

Response 10:
Interconnected drainage paths are provided behind the liner welds. These paths are designed to:

a. Prevent the uncontrolled loss of contaminated pool water to other relatively cleaner locations within the containment or fuel building,
b. Prevent pressure buildup behind the liner plate, and
c. Provide liner leak detection and measurement.

These drainage paths are formed by welding channels behind the liner weld joints and are designed to permit free gravity drainage to the fuel building equipment drain system. The leakage is monitored by flow switches and is annunciated in the main control room in the event of excessive leakage.

The rack installer, Holtec, will provide receipt inspection and pre-installation drag testing procedures that will be used to thoroughly inspect each rack for fit, form, and function. If shipping damage is discovered or a storage cell location exceeds the maximum allowable drag force, tooling will be available to expand and repair the cell in question as necessary.

Upon installation, the rack to rack and rack to wall gaps are measured as described in the response to Request 8 above.

Request 11:
Referring to Section 6.7 of Attachment 5 (page 6-22), two racks and a fuel transfer cask are modeled in the phase 1 case for the WPMR analysis. Please discuss the potential significance of the impact on the WPMR analysis results due to the non-rectangular shape of the fuel transfer cask which may not have been accounted for in past development of the WPMR analysis method.

Response 11:
Although spent fuel casks are depicted in Figures 1.1.1 and 1.1.3 of Attachment 5 to Reference 1, the intention was to indicate that the rack size and layout configuration was chosen to allow insertion of a cask alongside these empty racks. The DYNARACK models prepared for Phases 1 and 2 do not include casks. CPS does not intend to place a cask into the fuel cask storage pool simultaneous with fuel being stored within these racks. Fuel cask loading and movement procedures will contain controls, as committed to in Reference 1, to require that all fuel be removed from the fuel cask storage pool prior to placing any cask within this pool. The models,

which were specifically developed to address seismic behavior of racks loaded with fuel, do not include a cask. Therefore, the models need not address any non-rectangular shaped casks.

Request 12:
Section 6.8, "Time History Simulation Results," discusses key analysis results with specific quantities for rack displacements, pedestal vertical forces, pedestal friction forces, rack impact loads, impacts external and internal to the rack, etc. Considering that the WPMR analysis methodology is based on many engineering assumptions in its theoretical development, provide a summary discussion of the potential variabilities of the specific analysis results quoted in the section and the bases for concluding that these variabilities are adequately accounted for in the design of rack structural elements.

Response 12:
The WPMR analysis for spent fuel rack analysis has been developed and improved by Holtec over a period of many years and is used for determination of global displacements of spent fuel racks, as well as rack-to-rack and rack-to-floor reaction forces. Over the years, the methodology has been continually improved to minimize the effect of engineering variabilities. Section 6.5 of Attachment 5 to Reference 1, provides a brief description of the theoretical concepts and conservative assumptions used in the development of the WPMR model. The building block for the simulation is the structural model of a single spent fuel rack. Each rack is modeled as a beam-like structure having twelve degrees of freedom. The formulation is set up so that classical beam theory (including shear deformation) static solutions are reproduced when the rack model is subject to end loadings. Therefore, to the extent that the "beam properties" of the spent fuel rack are modeled accurately, the predicted results are consistent with the accuracy of beam theory applied to any structure. The spent fuel rack is a rugged, nearly rigid honeycomb structure whose beam properties (i.e., area and moments of inertia) can be developed with minimal assumptions. In terms of its global response, it can be characterized as a "nearly rigid" structure.

Therefore, the results that are obtained from any simulation will differ from the results obtained by considering the racks as rigid, with known mass and inertia properties, only to the extent of the "improvements" included in the characterization of the beam-like deformations. From the above, it can be concluded that the results for the behavior of spent fuel racks in a dry pool would have minimal variability, as they would be founded in the well-known precepts of multi-body rigid body dynamics. Any variabilities would, in that case, come only from the numerical solution procedure and the step size of integration. Based on numerous convergence studies that have been performed over the years, there is confidence that the results obtained reflect the reality of the scenarios under study.

Having stated the above with respect to WPMR performance in a dry pool, it is noted that the scenarios of interest involve racks under water. Therefore, it has been recognized that the responses obtained are very dependent upon the approach used to simulate the hydrodynamic coupling between racks and SFP walls, and between individual fuel assemblies and rack cell walls. The basis of the simulation of fluid coupling effects is a classical analytical solution of a moving fluid-filled cylinder that contains a smaller moving solid cylinder; coupling between the bodies is provided by the fluid-filled annulus (see Reference 6.5.3 to Attachment 5 of Reference 1). Holtec has extended this solution to the case of rectangular bodies and then further extended the solution to cover multiple rectangular bodies. This was to ensure that the formulation could be supported by either existing or new experimental results.

Holtec demonstrated that the methodology gave results in full agreement with the experimental results performed at Carnegie Mellon University. This comparison was submitted in Reference 4, as mentioned in the response to Request 5 above. Holtec also performed its set of experiments involving multiple rectangular bodies submerged in a fluid and subject to dynamic motion. This data was also submitted in Reference 4 and was contained in Reference 6.5.5 to Attachment 5 of Reference 1. The agreement of Holtec's fluid coupling methodology with all of the available experimental work provided the necessary confidence to utilize it in all of its spent fuel rerack projects and that it would provide results suitable to make engineering assessments of the viability of a proposed rerack scheme.

Notwithstanding the discussion above, analytical approaches cannot exactly predict what will happen to an assemblage of real structures submerged in a seismically excited SFP. Therefore, to the extent possible, all engineering assumptions are made in a manner that ensures that the results will overpredict displacement, forces, etc., and therefore, will produce conservative estimates of safety factors. In addition, to minimize the effects of variability, safety factors that are near the limit (e.g., 0.98 is less than 1.0) are not used in analyses as a matter of policy. While acceptable, the use of such safety factors creates the potential that any variability runs the risk of having a non-acceptable result. Generally, only results that have at least a 15% margin to the design basis limit are acceptable.

Based on the theoretical development, experimental verification, and numerous independent reviews of Holtec's methodology, there is confidence that the analysis results are within what would be accepted as good engineering accuracy, and any variation is likely to be conservative (i.e., overpredictions). To further ensure that variabilities in the results would not inadvertently lead to an adverse conclusion, arrays result in structural margins that are well below the design limit so that any variability would not alter the ultimate conclusions regarding safety.

Request 13:

Section 6.8.4.2, "Impact Internal to the Rack," states, "The cell wall integrity under the 815 lbf impact load has been evaluated and shown to remain intact with no permanent damage." Please discuss the type of evaluation implemented with emphasis on the applicability of the Lawrence Livermore National Laboratory study to CPS' new spent fuel racks/fuel assemblies subjected to CPS' SSE motions and the basis for the conclusion drawn. Also discuss the factors that may appreciably affect the 815 lbf impact load referred to in the section and the means used to amply account for the variability of the impact load.

Response 13:

The impacts between the fuel assembly and the rack cell wall are evaluated for affects on cell wall integrity and fuel integrity. The fuel integrity evaluation uses the Lawrence Livermore National Laboratories (LLNL) report discussed in Section 6.8.4.2 of Attachment 5 to Reference

1. The method develops equivalent maximum accelerations for the five individual fuel masses considered in the DYNARACK model by using the maximum predicted impact load of 815 pounds force (lbf). The equivalent acceleration is then compared to the acceleration reported by the LLNL report that the fuel assembly is capable of withstanding.

The cell wall integrity evaluation determines the limit load on an equivalent beam strip (the width of a single cell), which is subject to impact loads taken to occur at the two corners of a fuel assembly grid. The collapse load of the panel is then examined as a bending collapse. Based on classical mechanics limit analysis, the deflected shape of the cell wall is taken as a beam with four plastic hinges, one at each end, and one at each of the load application points.

The 815 lbf impact load is the maximum value of any fuel-to-cell wall impact from the many impact sites in the total array of simulations. The load occurs in one of the existing racks that is being reused in the new storage configuration. This load is considered to be conservative, since it is predicted based on modeling the fuel assemblies in each rack with five masses. However, a more accurate representation of the fuel assembly impact points would be at the actual fuel grid locations, which number more than five. Therefore, the actual impact loads would be expected to be less, since the individual masses associated with each impact site would be lower than those modeled. The factor of safety of the cell wall to withstand the impact load is determined to be more than 3.0. The factor of safety for the maximum fuel-to-cell wall impact in one of the new racks (a load of 626 lbf) is determined to be 3.3.

Request 14:
Section 7.5 of Attachment 5 discusses specific analysis results for shallow and deep drop events with displacement and strain quantities. Please provide a discussion of applicable test based experiential results that serve as a basis for verifying your drop events analyses. Also, from an engineering design perspective, discuss the meaningfulness of quoting a liner strain value with four decimal figures considering the many engineering assumptions that were made in the analysis of the CPS spent fuel racks.

Response 14:
Holtec has not performed any specific tests or experiments simulating a fuel assembly drop onto a spent fuel rack. However, the computer code LS-DYNA, which is a commercial code developed by Livermore Software Technology Corporation, was validated under Holtec's 10 CFR 50, Appendix B, Quality Assurance program through comparisons with documented test cases. Moreover, LS-DYNA has been widely used for many years in the automobile and aerospace industries to simulate dynamic impact problems, and numerous examples exist in published literature demonstrating the program's accuracy when compared with actual test results.

As for the liner strain, the reported value of 0.0863 is beyond the precision of the input data and incongruous with the modeling assumptions. The liner strain should be reported as 0.09, which remains well below the failure strain limit of 0.38.

Request 15:
Figure 7.5.4,' "Deep" Drop Scenario 2: Maximum Effective Strain - Concrete,' shows that the concrete slab of Clinton spent fuel pool is projected to experience very limited local damage as shown by the predicted cracks and the effective strain distribution in the figure. Discuss the variability of the strain distributions shown and how the variability is adequately accounted for in the Clinton plant's assessment of its spent fuel pool integrity under the postulated deep drop events (Section 7.5.2), considering that the computed strain values are very sensitive to the specific material constitutive laws assumed for the concrete in the WPMR analysis.

Response 15:
The results provided in Figure 7.5.4 of Attachment 5 to Reference 1 are determined using the computer code LS-DYNA and are entirely independent of the WPMR analysis.

The assessment of the SFP integrity under the postulated deep drop events accounts for the variability (i.e., uncertainty) of the strain distributions by using a well-established concrete material model and the minimum concrete compressive strength. To be more specific, the CPS SFP floor is modeled in LS-DYNA using the Winfrith concrete model, which is part of LS-DYNA's built-in material library. This material model has been validated by the United Kingdom Atomic Energy Authority (AEA) against a wide range of impact and blast tests (References 7 and 8). In addition, this same model has been reviewed and accepted by the NRC in support of the recent Private Fuel Storage Atomic Safety and Licensing Board hearings regarding the effects of aircraft impact on the HI-STORM 100 spent fuel storage cask (Docket No. 72-22).

The concrete compressive strength is input based on the CPS minimum design value of 3,500 pounds force per square inch. In reality, the compressive strength is likely to be much higher as concrete continues to harden with age. The use of the Winfrith concrete model together with the minimum concrete compressive strength ensures that the LS-DYNA results are conservative. Notwithstanding the conservative explanation, a slight increase in the concrete damage would not be detrimental to the SFP integrity as the maximum calculated strain in the liner (i.e., 0.09) is less than the failure strain (i.e., 0.38) by a factor of 4.

Request 16:
With respect to Sections 7.3, 7.4 and 7.5 of Attachment 5, briefly discuss key assumptions and engineering modeling approaches utilized in obtaining the results summarized in Section 7.5, and confirm if the engineering reliability associated with these reported analytical results was reasonably verified and documented via some experimental work.

Response 16:
The LS-DYNA models used for the drop analyses are developed with some conservative simplifications; the emphasis of each model is placed on the local impact region that could be damaged by the dropped object.

For the shallow drop case, only the upper portion of the rack cells near the impacted cell wall is modeled for numerical efficiency and conservatism. The rack is represented by 10 local cells extending 48 inches in the vertical direction; the rest of the rack is assumed structurally safe and absorbs no impact energy in order to maximize the damage in the modeled portion of the rack. Accordingly, displacement constraints are imposed on the bottom nodes of the modeled cells and on the boundary nodes laterally connected to the rest of the rack. For conservatism and simplicity, the stored fuel assembly is modeled by two rigid end fittings connected with a beam that has an equivalent mass and cross sectional area of all fuel rods in a fuel assembly. The fuel rod yield stress is set to be the buckling stress of the rod. The fuel rod failure strain of the stored fuel assembly is assumed to be 2% to minimize the resistance of the stored fuel assemblies in a drop event. The dropped fuel assembly is modeled the same way as the stored fuel assembly, except that the top fitting includes the weight of the handling tool and the fuel rod material is assumed to be elastic-perfectly plastic so that the entire dropped mass can be maintained during the drop accident.

Similarly, only the lower portion of the rack cells near the impact region is considered in the finite element model for deep drop, scenario 1; the rest of the rack is considered structurally safe. The model spans about 65 inches in the vertical direction. Displacement constraints are imposed on the boundary cell wall nodes that are sufficiently far from the dropped fuel assembly. Since the impact is assumed to occur inside an interior cell at the rack center for predicting the maximum base plate deflection, the model takes advantage of the symmetry of the problem by considering only a quarter of the affected structural members with appropriate symmetric boundary conditions imposed. The fuel assembly is conservatively assumed to be rigid and represented by a quarter of the fuel assembly end-fitting with 1/4 total dropped mass. This deep drop model is conservative since the impact energy absorption is limited to the modeled portion of rack.

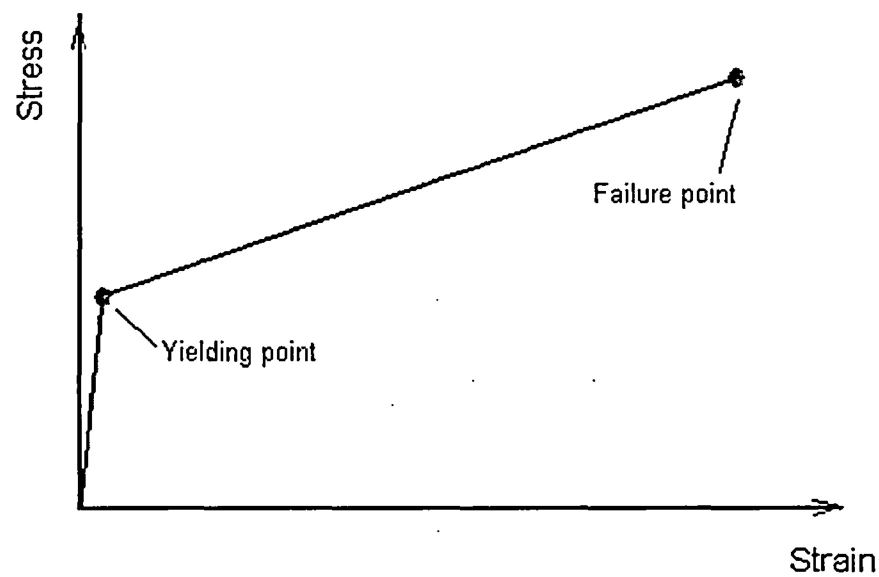
The model for deep drop, scenario 2, emphasizes the structural responses of the rack pedestal, the bearing pad, the SFP pool liner and the underlying concrete slab. Since the impact takes place directly above a rack support pedestal, the rack cells are assumed to be safe in this scenario and are not modeled for numerical efficiency. Therefore, the rack is represented only by a pedestal cylinder and the mating female block, as well as a portion of the rack base plate with mass density adjusted to match 1/4 of the total weight of the smallest empty rack. The model also includes the bearing pad, the stainless steel liner, and the concrete slab resting on subgrade. The concrete slab model is fixed at the bottom surface and restrained from moving in the horizontal directions at the periphery to simulate the confining effect by surrounding concrete. Finally, the fuel assembly is represented by a rigid fuel assembly end fitting modeled with the full dropped weight.

The following key assumptions are also employed in the various drop analyses.

i. The initial trajectory and the long axis of the fuel assembly prior to impacting the SFP rack are assumed to be vertical. This is conservative since the kinetic energy of dropped fuel will be focused on the minimum impact area. This assumption is also reasonable because it is consistent with the configuration of the fuel assembly while it is being moved.

ii. The orientation of the fuel assembly is constrained to remain vertical throughout the simulation after the initial impact. This is also conservative, since it maintains the impact site focused on the initial target area and keeps the centroid of the fuel assembly missile (and its travel alignment) directly above the impact zone.

iii. The stainless steels used to manufacture the spent fuel rack are considered as bi-linear elasto-plastic materials as shown in the following sketch. The material characteristics (i.e., the first yielding stress, the ultimate tensile stress, the failure strain and the elastic modulus) are obtained from Section II, Part D, of the American Society of Mechanical Engineers Code for a bounding SFP operating temperature of 150°F. The 304L type stainless steel failure strain is conservatively set at 0.38.



iv. The fuel assembly is assumed to hit a periphery cell wall at the rack corner in the shallow drop event. This is a conservative assumption, since the corner cell wall has less support from adjacent cells than an interior cell and therefore is more vulnerable in a shallow drop accident. Furthermore, the dropped fuel assembly can only achieve first contact with the top of the rack at this location because of the orientation of the fuel assembly handle that sticks out above the top of the rack. Other impact sites would require the falling fuel assembly to impact the stored fuel assembly handle first. These other impact scenarios would tend to reduce the damage to the rack and, therefore, are not considered here, since the goal is to maximize penetration depth.

v. The finite element analyses conservatively neglect impact damping and water resistance effects (i.e., buoyancy, drag, etc.) during the impact process.

No comparisons have been made between the results reported in Section 7.5 of Attachment 5 to Reference 1 and any experimental work, as AmerGen and Holtec are not aware of any available drop test data for assemblies or other missiles onto spent fuel racks. A general validation of the computer code LS-DYNA has been performed as stated in the response to Request 14.

Request 17:
Please provide additional information to demonstrate that the increased mass in the CPS' spent fuel pool racks due to the expansion of the spent fuel storage capacity will not affect appreciably the CPS' UFSAR defined seismic response of the reactor building.

Response 17:
CPS utilizes a Mark III style containment and the separate buildings are identified as the Containment, Auxiliary Building, and Fuel Building. The new racks will be installed in the Fuel Building. There will be no affect on the seismic response of the building because the increase in mass represented by the fuel assemblies and racks is not significant with respect to the masses considered in the model prepared for the building in the design basis evaluation that produced the building dynamic behavior and response. Actually, the increased mass is even less than would be implied by the entire weight of the additional fuel assemblies and racks to be stored, since that weight would be partially offset by the displaced volume of water that was already considered in the original model.

Request 18:
In its safety evaluation (ML031681432) of the topical report supporting the use of Metamic™ in SFPs, dated June 17, 2003 and referenced in your report, the staff conditioned the use of this material on the implementation of a coupon sampling program to ensure consistent material performance with that described in the topical report. Metamic™ is a new material to be used in the SFP environment. Please describe the Metamic™ coupon surveillance program to monitor Metamic™ degradation. This program should monitor the physical and chemical properties of Metamic™ over time and include a discussion of the following:

I. Size and types of coupons to be used; i.e., similar in fabrication and layout as the proposed insert including welds and proximity to stainless steel.
II. The technique for measuring the initial B_4C content of the coupons.
III. Simulation of scratches in the coupons.
IV. Frequency of coupon sampling and its justification.
V. Tests to be performed on the coupons (e.g., weight and dimension measurement - length, width and thickness), and B_4C content.

In addition, please discuss the impact on the analyses should the coupons reveal a change in material performance from that assumed in the analyses.

Response 18:
AmerGen will not implement a coupon surveillance program as it is not necessary and, for the very high cost involved, would produce no significant additional information. At the time the

referenced NRC safety evaluation (ML031681432) was written, there was significantly less information available on Metamic™. Since that time, Holtec has performed numerous qualification tests on Metamic™ of the type (i.e., 25% boron carbide in aluminum 6061) that is proposed for use in the CPS racks. This additional test information has independently confirmed the Electric Power Research Institute (EPRI) test results (Reference 9) and demonstrated that Metamic™ is qualified for use in wet storage applications.

None of the tests revealed any change in material performance that would alter or affect the assumptions in the criticality analyses. Specifically, the qualification program confirmed in accelerated testing the following.

- The corrosion of Metamic™ reflects the behavior of aluminum for which there is extensive information in the literature. Boron carbide is a completely inert material leaving aluminum as the only material that might show any corrosion.
- Testing demonstrated a very high level of uniformity of the boron-10 in the manufactured panels of Metamic™ of the type proposed for the CPS racks.
- Qualification testing confirmed the absence of any effects due to gamma radiation at the levels expected for the racks.
- Manufacturing tolerances in the manufacture of Metamic™ panels were established.
- Metamic™ panels for the CPS racks do not require any welding and show no interaction with stainless steel (i.e., no galvanic corrosion consistent with the behavior of aluminum or the aluminum-based absorbers).
- Surface passivation of the aluminum in water was confirmed to inherently produce a tightly adhering, hard protective layer of $Al_2O_3 \bullet 3H_2O$ that precludes significant corrosion of the aluminum. Any scratches are quickly "healed."
- Techniques for cleaning Metamic™ have been developed that remove the nucleation points for pitting corrosion of Metamic™. The efficacy of this cleaning process has been verified in the corrosion test program.
- Neutron attenuation measurements have been used to measure the boron-10 content and to confirm, in accelerated testing, that no loss of boron occurs in water simulating the SFP environment.

This qualification program has demonstrated that a coupon surveillance program would not produce any further information. Therefore, AmerGen does not intend to implement a Metamic™ coupon surveillance program at CPS.

Request 19:

In the Holtec Report (HI-2022871) that supports the use of Metamic^{TM} in the SFP, the physical and chemical properties of Metamic^{TM} as well as the test results supporting the use of Metamic^{TM} in SFP applications are described. The staff notes the type of coupons tested and discussed in that report are 15 weight percent (wt%) or 31 wt% B_4C, mill-finished or anodized. Please discuss the following:

I. *Identify which type of Metamic^{TM} poison inserts (15 or 30 wt% B_4C) will be used in the SFP and whether these are mill-finished or anodized. If the anodized inserts are to be used, discuss the anodizing process used for these inserts and its effectiveness in reforming the protective oxide layer in the event the surface should be scratched. In addition, discuss the process used to ensure that the protective oxide layer will be formed adequately during installation.*

II. *The topical report concludes that corrosion on both mill-finished and anodized Metamic^{TM} coupons is due to inadequate cleaning of the surface. Discuss the cleaning technique to be used on the inserts to ensure sufficient removal of surface contaminants prior to installation, its acceptability and its expected effectiveness in controlling impurities.*

Response 19:

Holtec report HI-2022871 (Reference 6) was provided to the NRC in August 2002, and summarized the information available on Metamic^{TM} at that time. This early report summarized the results of an extensive investigation by EPRI leading to their conclusion that "Metamic appears to be a good candidate for both wet and dry fuel storage applications."

Since Reference 6 was issued, Holtec has conducted a large number of qualification and acceptance tests that include Metamic^{TM} with 25% boron carbide content comparable to that proposed for the CPS spent fuel storage racks. A copy of Holtec Report HI-2043215 is provided as Attachment 4 to this letter and includes significant new information on the testing and performance of Metamic^{TM}. These studies corroborate the EPRI study and provide significant additional data. In addition to corrosion tests, the Holtec investigative program, as documented in Attachment 4, confirmed the very high level of boron-10 uniformity in the panels and established tolerances related to the Metamic^{TM} manufacturing process. It may be noted that boron carbide is a completely inert material and any corrosion that might occur would affect only the aluminum. Thus, any corrosion measurements in the literature for aluminum would also apply for Metamic^{TM}. It may also be noted that Metamic^{TM} is a monolithic material of very nearly full theoretical density, which precludes the possibility of swelling or blistering, as has been observed in materials with laminated structures.

Further responses to the specific questions in the RAI are discussed below.

I. The Metamic^{TM} proposed for CPS (and included in the Holtec test program) will contain 25% boron carbide and will be mill-finished. Anodizing has been found to be completely unnecessary. Surface passivation (i.e., formation of the protective coating of $Al_2O_3 \bullet 3H_2O$) is an inherent property of aluminum in contact with water. Any scratches that might occur are quickly "healed" as confirmed in the Holtec program, which demonstrated that scratches had no effect on the corrosion resistance of the Metamic™ or the boron-10 content.

II. The EPRI test program identified surface impurities (i.e., inadequate cleaning) as the cause of the pitting corrosion observed on some test coupons. Holtec identified these surface impurities as arising in the extrusion process where the very hard boron carbide gouged minute particles of steel from the extrusion die. Holtec therefore established the requirement that the extruded Metamic™ piece be high-pressure glass beaded to remove the surface layer of the Metamic™, along with surface impurities. As an additional precaution, the final hot-rolled sheets of Metamic™ are wiped with a nitric acid solution to remove any traces of ferric impurities that might be on the surface. The accelerated corrosion tests (i.e., 90 day exposure to demineralized water at ~200°F) confirmed the efficacy of the cleaning process.

As described in Section 8.1 of Attachment 4, a special test was performed in which Metamic™ coupons were intentionally exposed to a chloride solution in order to produce pitting. Neutron attenuation measurements before and after the exposure showed no reduction in boron-10 areal density; thereby, confirming that any pitting corrosion that might occur does not measurably reduce the neutron absorption capability of Metamic™ absorber panels.

References:

1. Letter from Keith R. Jury (AmerGen Energy Company, LLC) to U. S. Nuclear Regulatory Commission, "Request for Technical Specification Change to Support Onsite Spent Fuel Storage Expansion," dated August 18, 2004

2. Holtec International Report No. HI-91700, "DYNARACK Validation Manual," dated November 12, 1991

3. Letter from C. M. Dugger (Entergy Operations, Inc.) to U. S. NRC, "Request for Additional Information (RAI) Regarding Technical Specification Change Request NPF-38-193," dated October 23, 1997

4. Letter from C. M. Dugger (Entergy Operations, Inc.) to the U. S. NRC, "Request for Additional Information (RAI) and Errata Pages Regarding Technical Specification Change Request NPF-38-193," dated January 29, 1998

5. TID-7024, "Nuclear Reactor and Earthquakes," dated August 1963

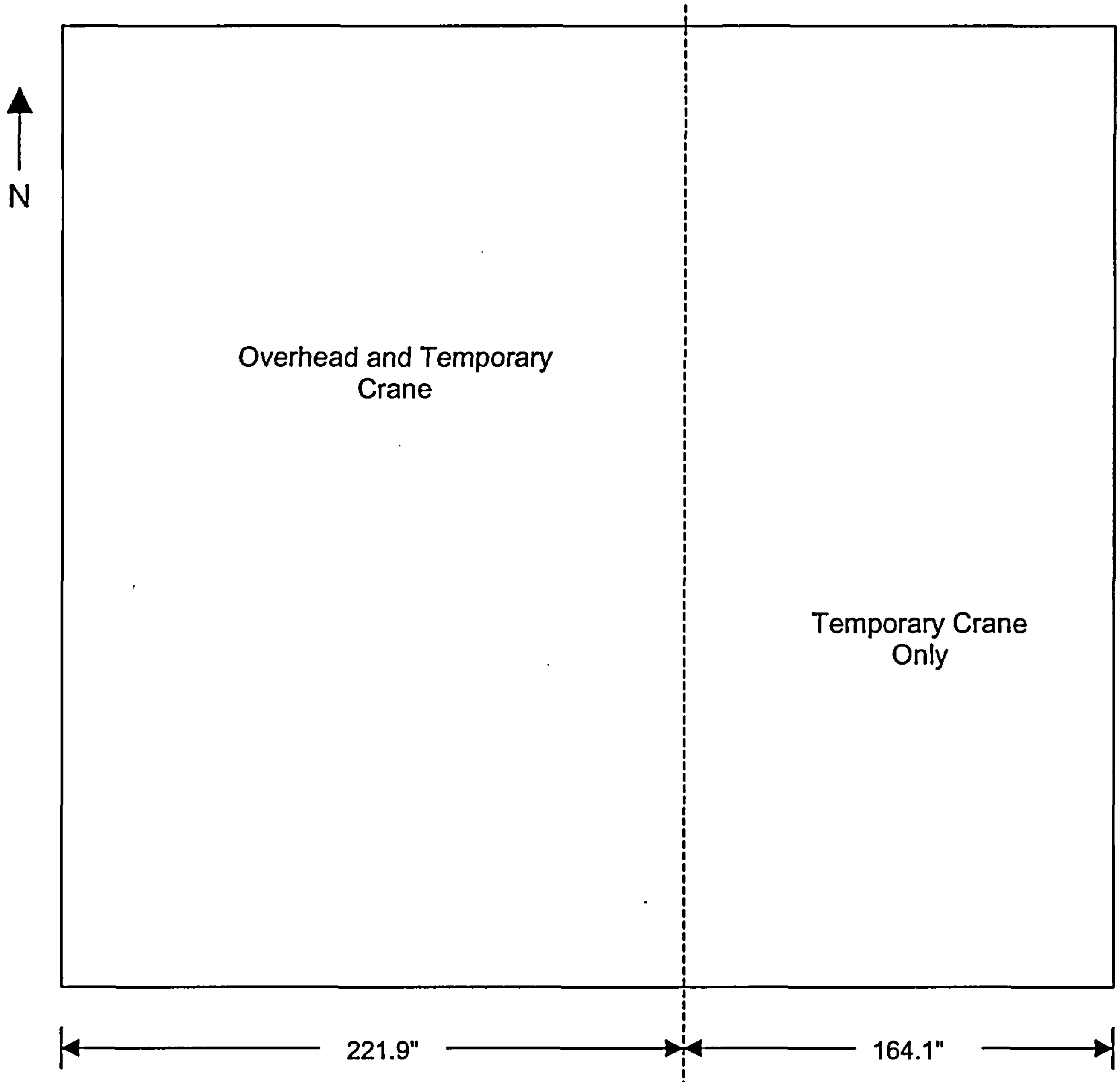
6. Holtec International Report HI-2022871, "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Holtec International Report HI-2022871 Regarding Use of Metamic in Fuel Pool Applications," dated June 2003

7. Broadhouse and Nielson, "Modelling Reinforced Concrete Structures in DYNA3D," Safety and Engineering Science Division WINFRITH United Kingdom Atomic Energy Authority, dated October 1987

8. B. J. Broadhouse, Report SPD/D(95)363, "The Winfrith Concrete Model in LS-DYNA3D," Structural Performance Department AEA Technology, dated February 1995

9. EPRI Report 1003137, "Qualification of METAMIC® for Spent Fuel Storage Application," Final Report dated October 2001

FIGURE 1



CLINTON SPENT FUEL POOL

The temporary crane will have access to install racks in the cask and spent fuel pools. The Clinton overhead crane will have access to install racks in the cask pit and a majority of the spent fuel pool as shown above.

ATTACHMENT 2
Commitments

LIST OF COMMITMENTS

The following table identifies those actions committed to by AmerGen Energy Company, LLC (AmerGen), in this document. Any other statements in this submittal are provided for information purposes and are not to be considered commitments.

COMMITMENT	Due Date/Event
(1) Provide procedural guidance to administratively control storage of only fuel cooled at least 10 years in the three peripheral rows and columns of the fuel cask storage pool racks.	Upon implementation of the License Amendment
(2) Provide administrative controls to ensure that fuel will be removed from storage racks located within the cask storage pool prior to any fuel cask being moved in this area.	Upon implementation of the License Amendment

ATTACHMENT 3

Affidavit

AFFIDAVIT PURSUANT TO 10CFR2.390

I, Scott H. Pellet, being duly sworn, depose and state as follows:

(1) I am the Project Manager for Holtec International and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in the document entitled "Sourcebook for Metamic Performance Assessment," Holtec Report HI-2043215, revision 1. This document is proprietary in its entirety.

(3) In making this application for withholding of proprietary information of which it is the owner, Holtec International relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4) and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10CFR Part 9.17(a)(4), 2.390(a)(4), and 2.390(b)(1) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information", and some portions also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by Holtec's competitors without license from Holtec International constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.

c. Information which reveals cost or price information, production, capacities, budget levels, or commercial strategies of Holtec International, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future Holtec International customer-funded development plans and programs of potential commercial value to Holtec International;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs 4.a, 4.b, 4.d, and 4.e, above.

(5) The information sought to be withheld is being submitted to the NRC in confidence. The information (including that compiled from many sources) is of a sort customarily held in confidence by Holtec International, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by Holtec International. No public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within Holtec International is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his designee), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside Holtec International are limited to regulatory bodies, customers, and

potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information classified as proprietary was developed and compiled by Holtec International at a significant cost to Holtec International. This information is classified as proprietary because it contains detailed historical data and analytical results not available elsewhere. This information would provide other parties, including competitors, with information from Holtec International's technical database and the results of evaluations performed using codes developed by Holtec International. Release of this information would improve a competitor's position without the competitor having to expend similar resources for the development of the database. A substantial effort has been expended by Holtec International to develop this information.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to Holtec International's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of Holtec International's comprehensive spent fuel storage technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology, and includes development of the expertise to determine and apply the appropriate evaluation process.

The research, development, engineering, and analytical costs comprise a substantial investment of time and money by Holtec International.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

Holtec International's competitive advantage will be lost if its competitors are able to use the results of the Holtec International experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to Holtec International would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive Holtec International of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

STATE OF NEW JERSEY)

) ss:

COUNTY OF BURLINGTON)

Scott H. Pellet, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at Marlton, New Jersey, this 7th day of April, 2005.

Scott H. Pellet

Mr. Scott H. Pellet
Holtec International

Subscribed and sworn before me this 7th day of April, 2005.

Maria C. Pepe

MARIA C. PEPE
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 25, 2005