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10 CFR 50.90

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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: Request for Technical Specification Change to Support Onsite Spent Fuel Storage Expansion

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," AmerGen Energy Company (AmerGen), LLC hereby requests an amendment to Appendix A, Technical Specifications (TS), of Facility Operating License No. NPF-62 for Clinton Power Station (CPS), Unit 1. The proposed change revises TS 4.3, "Fuel Storage," to reflect the addition of fuel storage capacity in the fuel cask storage pool and increased fuel storage capacity in the spent fuel pool.

Current projections, based on expected future spent fuel discharges, indicate that loss of full core discharge capability will occur during the scheduled February 2006 refueling outage (C1R10), when an anticipated 312 fuel assemblies are permanently discharged and new fuel is loaded into the spent fuel pool for Operating Cycle 11. The proposed expansion will increase the total storage space 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. The supporting analyses have been confirmed to be bounding for all spent fuel pool loading configurations.

This request is subdivided as follows:

1. Attachment 1 gives a description and safety analysis of the proposed change.
2. Attachment 2 includes the marked-up TS pages for the proposed change.
3. Attachment 3 summarizes the formal licensee commitments pending NRC approval of the proposed amendment.
4. Attachment 4 includes the affidavit supporting the request for withholding the proprietary information in Attachment 5 from public disclosure.

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5. Attachment 5 provides the proprietary version of the report documenting evaluation of the proposed storage racks.
6. Attachment 6 provides the non-proprietary version of the evaluation report included in Attachment 5.

AmerGen is requesting approval of this change by June 30, 2005. Approval by this date will allow sufficient time to install the new fuel storage racks and reconfigure the spent fuel pool to ensure that CPS maintains full core discharge capability during C1R10. Once approved, the amendment will be implemented within 30 days.

This proposed change has been reviewed by the CPS Plant Operations Review Committee and approved by the Nuclear Safety Review Board in accordance with the requirements of the Quality Assurance Program.

AmerGen is notifying the State of Illinois of this application for amendment by transmitting a copy of this letter and its attachments to the designated State Official.

Should you have any questions related to this information, 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 18th day of August 2004.

Respectfully,

Keith R. Jury

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

Attachments:
1. Evaluation of Proposed Changes
2. Markup of Proposed Technical Specification Page Changes
3. Commitments
4. Affidavit
5. Holtec International Report No. HI-2033124, "Spent Fuel Storage Expansion at Clinton Power Station," (Proprietary Version)
6. Holtec International Report No. HI-2033124, "Spent Fuel Storage Expansion at Clinton Power Station," (Non-Proprietary Version)

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Clinton Power Station
Illinois Emergency Management Agency – Division of Nuclear Safety

Subject: Request for Technical Specification Change to Support Onsite Spent Fuel Storage Expansion

1.0 DESCRIPTION

This is a request from AmerGen Energy Company (AmerGen), LLC to amend Appendix A, Technical Specifications (TS), of Facility Operating License No. NPF-62 for Clinton Power Station (CPS). The proposed change revises TS 4.3, "Fuel Storage," to reflect the addition of fuel storage capacity in the fuel cask storage pool and increased fuel storage capacity in the spent fuel pool.

Current projections, based on expected future spent fuel discharges, indicate that loss of full core discharge capability will occur during the scheduled February 2006 refueling outage (C1R10), when an anticipated 312 fuel assemblies are permanently discharged and new fuel is loaded into the spent fuel pool for Operating Cycle 11. The proposed expansion will increase the total storage space 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.

2.0 PROPOSED CHANGES

2.1 The proposed change revises the TS 4.3.1.1.c wording to read as follows.

> "For the fuel storage racks supplied by Nuclear Energy Services (NES), a nominal fuel assembly center to center spacing of 6.4375 inches in the high density storage racks in the spent fuel storage pool or fuel cask storage pool. For the fuel storage racks supplied by Holtec International, a nominal fuel assembly center to center spacing of 6.243 inches in the high density storage racks in the spent fuel storage pool or fuel cask storage pool."

2.2 The proposed change revises the TS 4.3.3.1 wording to read as follows.

> "The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 3796 fuel assemblies. The fuel cask storage pool is designed and shall be maintained with a storage capacity limited to no more than 363 fuel assemblies."

In summary, AmerGen proposes to modify CPS TS to support reconfiguration of the spent fuel pool and fuel cask storage pool to ensure that full core discharge capability beyond the next scheduled refueling outage in February 2006 (C1R10) is maintained. Specifically, the changes revise TS 4.3.1.1.c to identify the spacing between fuel assemblies in the fuel storage racks used in the spent fuel storage pool and the fuel cask storage pool. In addition, TS 4.3.3.1 is being revised to reflect the new storage capacities of the two pools.

3.0 BACKGROUND

The CPS spent fuel pool currently contains 22 high-density storage racks with a capacity of 2,512 Boiling Water Reactor (BWR) fuel assemblies. Current projections, based on expected future spent fuel discharges, indicate that loss of full core discharge capability is projected to occur during C1R10, when an anticipated 312 fuel assemblies are permanently discharged and new fuel is loaded into the spent fuel pool for the subsequent fuel cycle, Operating Cycle 11.

AmerGen has evaluated spent fuel storage alternatives that have been licensed by the NRC and which are currently feasible for use at CPS. The evaluation concluded that storage capacity expansion is currently the most cost-effective alternative. To maintain prudent storage reserve, AmerGen intends to expand spent fuel storage capacity in two phases. Phase 1 consists of installing two new 15 by 12 cell racks in the fuel cask storage pool by third quarter 2005. This modification will increase the licensed fuel storage capacity from the current 2,512 storage cells to 2,872 storage cells and will ensure that full core discharge capability is maintained following C1R10. The fuel cask storage pool configuration following Phase 1 is shown in Figure 1.1.1 in Attachment 5. During Phase 2, which is scheduled to take place following C1R10, the two new racks that were installed in Phase 1, plus an additional 14 new racks, will be placed in the spent fuel pool. As part of Phase 2, 12 of the existing racks in the spent fuel pool will be removed; three of these existing racks will be placed in the fuel cask storage pool. This expansion will increase the storage capacity to 4,159 assemblies, which is expected to maintain the CPS capability to accommodate a full core discharge until C1R15 in the year 2016. The final, Phase 2, configurations of the spent fuel pool and fuel cask storage pool are shown in Figures 1.1.2 and 1.1.3 of Attachment 5, respectively.

The new racks will contain Metamic as the active neutron absorbing poison. The neutron absorbers have been sized to sufficiently shadow the active fuel height of all fuel assembly designs. The new racks will have a closer assembly-to-assembly spacing to allow for higher density storage and thus, more fuel storage capability.

To accommodate the proposed increase in capacity, the CPS TS will be revised as described above in Section 2.0.

4.0 TECHNICAL ANALYSIS

As stated previously, the planned expansion of the fuel storage capacity at CPS will be implemented in two phases. Following the second phase, 12 existing storage racks in the spent fuel pool will be replaced with 16 new racks and three of the racks removed from the spent fuel pool will be placed into the fuel cask storage pool. The new storage racks are similar to the existing racks in that they will be free standing and self-supporting. The new rack modules will be separated from each other by a gap of approximately 1.0 inch. Along the pool walls, a nominal gap will also be provided. This gap will be a minimum of 2.5 inches.

With the expanded capacity, the spent fuel pool cooling system will be required to remove an increased heat load while maintaining the pool water temperature below the design limit. The maximum heat load typically develops from the residual heat in the pool after the last full core discharge fills the racks to capacity.

The spent fuel pool thermal performance, criticality, and seismic response have been reanalyzed considering the increased storage capacity and fuel burnup. The results of these analyses have shown that the pool storage systems remain adequate. The design and analyses performed were completed to demonstrate that the new storage racks meet all the governing requirements of the applicable codes and standards, including the NRC guidance provided in Reference 1. In addition, the supporting analyses have been confirmed to be bounding for all spent fuel pool loading configurations. Attachment 5 provides the design basis, analysis methodology, and evaluation results for the proposed storage racks at CPS to support the licensing process.

Mechanical Design Evaluation

The new fuel rack designs have been evaluated with respect to the mechanical and material qualifications, neutron poison, fuel handling qualifications, fuel interfaces, and accident considerations. The details of this evaluation are provided in Attachment 5.

The principal construction materials for the new racks will be American Society for Testing and Materials (ASTM) Standards A240 Type 304L stainless steel, for plate stock, and A564-630 precipitation hardened stainless steel, for the adjustable support spindles. The rack designs, material selection and fabrication process will comply with the applicable ASTM Standards A240, A276, A479, A564 and others, for service in the nuclear environment. The governing quality assurance requirements for fabrication of the racks are compatible with the quality assurance and quality control requirements of 10CFR50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

For primary nuclear criticality control in the new racks, a fixed neutron absorber will be integrated within the rack structure. As described in Section 3 of Attachment 5, to determine the physical stability and performance characteristics, Metamic was subjected to an extensive array of tests by the Electric Power Research Institute that evaluated the functional performance of the material at elevated temperatures and radiation levels. The results of the tests indicate that Metamic maintains its physical and neutron properties with little variation in its properties from the unirradiated state. As a result, Metamic has been endorsed for dry and wet storage applications on a generic basis. In addition, the NRC has approved Metamic for use in both wet storage and dry storage applications.

The installation of the new fuel storage rack modules will preserve space for thermal expansion and seismic movement. The support legs on the new racks will allow for remote leveling and alignment of the rack modules to accommodate variations in the floor surface. A thick bearing pad will be interposed between the new rack pedestals and the floor to distribute the dead load over a wider support area.

The rack structural performance with respect to the impact and tensile loads, as well as the subcritical configuration, has been analyzed. The analysis included an accidental drop of a fuel assembly during movement to a storage location. It has been demonstrated that these accidents will not invalidate the mechanical design and material selection criteria for safe storage of spent fuel in a coolable and subcritical configuration. The fuel was shown to remain subcritical following the analyzed event.

Criticality Considerations

The new spent fuel storage racks are designed to maintain the required subcriticality margin when fully loaded with enriched fuel at a temperature corresponding to the highest reactivity. For reactivity control in the racks, neutron absorber panels will be used. The panels have been sized to sufficiently shadow the active fuel height of all assembly designs stored in the pool. The panels will be held in place and protected against damage by a stainless steel jacket which will be stitch welded to the cell walls. The panels will be mounted on the exterior or on the interior of the cells in an alternating pattern (see Figures 2.6.3 and 2.6.4 of Attachment 5).

A criticality study was performed, as documented in Section 4.0 of Attachment 5, supporting the criticality safety of the new spent fuel storage racks at CPS. The new racks are designed to assure that the neutron multiplication factor (k_{eff}) is equal to or less than 0.95 with the racks fully loaded with fuel of the highest anticipated reactivity and pool (i.e., spent fuel pool or fuel cask storage pool) flooded with unborated water at a temperature corresponding to the highest reactivity. The maximum calculated reactivity includes a margin for uncertainty in reactivity calculations and in mechanical tolerances, statistically combined, giving assurance the true k_{eff} will be less than 0.95 with a 95% probability at a 95% confidence level. Reactivity effects of abnormal and accident conditions are also evaluated to assure that under credible abnormal or accident conditions, the reactivity will be maintained less than 0.95. The accidents and malfunctions evaluated included the impact of a dropped fuel assembly on top of a fuel rack; impact on criticality of water temperature and density effects; and impact on criticality of eccentric positioning of fuel assemblies within the rack.

Thermal Hydraulics and Pool Cooling

A comprehensive thermal-hydraulic evaluation of the spent fuel pool and fuel cask storage pool under the expanded storage configuration has been completed to analyze their thermal performance (see Section 5.0 of Attachment 5). Evaluations performed for the spent fuel pool cooling system conservatively considers background heat from 13 previous cycles discharging one half the core (i.e., 312 assemblies) every 18 months and the decay heat from a normal or full core discharge after a 24-month cycle. The quantity of fuel assemblies (i.e., 4,680) from this discharge history is beyond the 4,159 designed available storage locations. The calculation of the long-term decay heat for thermal analysis of the pool was performed using the industry standard ORIGEN2 isotope depletion and generation computer code developed by the Oak Ridge National Laboratory, as incorporated into Holtec's proprietary computer codes DECOR and BULKTEM. The time-variant decay heat generated by the most recent outage discharge was assumed to take place after the shortest period of cooling time allowed by the TS and with the highest rate of fuel transfer from the vessel to the pool to maximize the heat addition.

Discharge scenarios were considered for both partial and full core discharges to the spent fuel pool and the fuel cask storage pool coupled with only one cooling train operable. Bulk pool maximum temperatures of 140°F and 150°F were chosen for normal and abnormal conditions, respectively, as the acceptable pool water temperature based on cooling system performance parameters and the pool structure evaluation. A component cooling water temperature of 105°F at the inlet of the spent fuel pool heat exchangers was considered for both scenarios.

The local water temperature determinations were performed assuming that the spent fuel pool is at its peak bulk temperature. The worst location was identified as the cell with the hottest assembly and the most restrictive convective flow. A conservative value for the axial peaking power factor was used. The local analysis was extended to include the effects of a partially blocked exit flow, postulated from an accidentally dropped assembly on top of the rack. The heat transfer model conservatively accounted for an additional resistance from the fouling of the heat transfer surface in the heat exchangers and performance loss due to plugged tubes.

The calculated maximum local water temperature was determined to be 164.1°F in the hottest channel and coincides in time with the highest pool bulk temperature. The maximum fuel cladding temperature was calculated to be 212.4°F. These results conservatively assume a dropped fuel assembly blocking the exit of the cell. The local boiling point at the top of the fuel, based on the minimum water level in the pool as required by the TS, will be approximately 238.7°F which indicates that the channel will remain in subcooled flow, thus minimizing the potential for fuel damage.

<u>Heavy Load Considerations for the Proposed Rack Installations</u>

The Fuel Building crane will be used for installing the new racks and removing the existing racks. The Fuel Building crane is designed as Seismic Category I equipment. The capacity of the main hoist is 125 tons, however, the hoist has been derated to a single failure capacity equivalent to 62 tons to comply with NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants, Resolution of Generic Technical Activity A-6." The Fuel Building crane is designed for spent fuel cask handling operations. More specifically, it is used to place casks within the fuel cask storage pool for removal of spent fuel from the plant. Cask drop accidents have been evaluated previously, as discussed within Section 15.7.5 of the CPS Updated Safety Analysis Report (USAR). The cask drop evaluations will remain valid and will not be compromised by placement of racks within the fuel cask storage pool. All fuel will be removed from the fuel cask storage pool racks before placement of any cask in this vicinity.

The Fuel Building crane will also be used to lift new and existing spent fuel racks between the truck bay and the operating deck to enable rack access and egress from the building. However, physical travel limits of the Fuel Building crane preclude use of the main hook over the east end of the spent fuel pool. Therefore, the Fuel Building crane cannot be used to install and remove all of the racks within the spent fuel pool during Phase 2 of the project. To overcome this constraint, a low profile temporary crane will be required to install and remove the racks along the east wall. The Fuel Building crane will be used to lower racks into the pool, place racks within the range of accessibility for the temporary crane, and to remove racks from the spent fuel pool. The temporary crane will be used to lift racks from the pool floor and move the racks horizontally with a limited lift height above the pool floor. The Fuel Building crane will be used to assemble the temporary crane on the operating deck.

The temporary low profile crane will have a sufficient rated lifting capacity to lift each of the new and old racks, including any additional lifting hardware (i.e., rack lift rig, hoist block, and rigging). Safe handling of heavy loads by the Fuel Building crane and temporary crane will be ensured by following the defense-in-depth approach guidelines of NUREG-0612. All phases of rack installation activities will be conducted in accordance with written procedures.

Safe load paths will be defined for moving the new racks into the Fuel Building. The racks will be lifted by the main hook of the Fuel Building crane and enter the Fuel Building operating deck through the opening designed for ingress and egress of spent fuel casks. The racks will enter the building at a location adjacent to the area of placement and will not be carried over any portions of the existing storage racks containing active fuel assemblies. A staging area will be set up on the operating deck as a laydown area for racks. The staging area location also will not require any heavy load to be lifted over the pools or any safety-related equipment.

The Fuel Building crane is single failure proof with sufficient capacity to handle all lifts during the reracking process. The heaviest load will be well below the 62 ton rating of the Fuel Building crane main hoist. The temporary hoist to be used to maintain the main hoist hook in a dry condition and lift racks into the pool will be selected to provide an adequate load capacity and comply with NUREG-0612.

Remotely engaging lift rigs, meeting all requirements of NUREG-0612, will be used to lift the rack modules. The rack lift rigs consist of four independently loaded traction rods in a lift configuration. The individual lift rods have a safety factor of greater than 10. If one of the rods breaks, the load will still be supported by at least two rods, which will have a safety factor of more than 5 against ultimate strength. Therefore, the lift rigs comply with the duality feature called for in Section 5.1.6 (3) of NUREG-0612.

The rack installation ensures maximum emphasis on mitigating the potential load drop accidents by implementing measures to eliminate shortcomings in all aspects of the operation. As described in Section 3.0 of Attachment 5, these measures address the major causes of load handling accidents including operator errors, rigging failure, lack of adequate inspection, and inadequate procedures.

Table 3.5.1 of Attachment 5 provides a summary of the CPS spent fuel storage expansion compliance with the requirements delineated in NUREG-0612.

Seismic and Structural Evaluation

A complete reevaluation of the mechanical and civil structures, to address the structural issues resulting from the expansion of the pool storage capacity, has been performed. The analysis considered the loads from seismic, thermal, and mechanical forces to determine the margin of safety in the structural integrity of the fuel racks, the spent fuel pool, fuel cask storage pool, and their liners. The loads, load combinations, and acceptance criteria were based on the American Society of Mechanical Engineers (ASME) Section III, Subsection NF, and on NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," (SRP) Section 3.8.4, Appendix D, "Technical Position on Spent Fuel Pool Racks."

The final configuration of the pool will consist of free standing and self-supporting style rack storage modules. The seismic analysis was performed using both whole pool multi-rack analysis and single rack analysis. These analyses were based on the simulation of the safe shutdown earthquake (SSE) and the operating basis earthquake (OBE) in accordance with SRP Section 3.7.1, "Seismic Design Parameters," requirements. Separate models were developed for the analysis of the whole pool configuration and individual racks. The rack modules in the whole pool configuration were analyzed as completely full. The single rack analyses considered various rack loadings (i.e., full and several eccentric loading configurations), coefficients of friction at the base of the pedestals, motion in-phase and out-of-phase with adjacent racks, and the highest aspect ratio (i.e., height to width) and largest racks. Parametric studies were performed for these various rack attributes, primarily to study rack behavior under the plant-specific dynamic conditions, to assess the possibility of rack overturning and determine the largest possible top-of-rack displacement. A total of six whole pool multi-rack and 162 single rack simulations were performed.

The results indicate that the maximum seismic displacements do not pose any threat of impact between the top of the racks and the pool walls. The resultant member and weld stresses in the racks are all below the allowable stresses, with a safety factor of at least 1.2 when conservatively comparing stresses for SSE conditions against allowable stresses for normal conditions. This minimum calculated safety factor is associated with the pedestal support female thread shear stress. The minimum safety factor for the cell membrane material and associated welding is 1.22, resulting from the maximum top-of-rack impact load occurring during a seismic event. The racks will remain functional during and after a SSE.

The rack analysis also provided pedestal to bearing pad impact loads resulting from lift-off and subsequent resettling during dynamic events. The pool floor stresses were evaluated for these impact loads and determined to remain within the allowable limits even when considering the worst-case pedestal location with respect to leak chases.

In addition to the seismic evaluations, the storage racks were also analyzed for all postulated accident conditions. A fuel handling accident involving a fuel assembly dropped from the fuel handling platform highest possible lift point would not compromise the integrity of the rack neutron absorber or the ability of the racks to maintain a subcritical storage configuration. Permanent deformation of the rack would be limited to the top region only. This is acceptable since the rack cross-sectional geometry at the active fuel height is not altered. Thus, the functionality of the rack would not be affected by any postulated accident conditions.

The spent fuel pool and cask storage pool are cast-in-place, steel lined, and reinforced concrete tank structures that provide space for storage of spent fuel assemblies. Appropriate portions of the pool structures and supporting portions of the Fuel Building have been analyzed using a three-dimensional finite element model with static equivalent loads applied to envelope the rack and hydrodynamic loads. The individual loads and load combinations used were in accordance with SRP Section 3.8.4 and based on the "ultimate strength" design method. The following primary loads were considered.

- Dead weight of the concrete structure, fully loaded racks, and the water
- Rack seismic loads developed from the whole pool multi-rack simulations
- Pool structure self-weight excitation with g-values equal to the magnitudes of the maximum floor accelerations at the pool floor slab elevation
- Hydrostatic pressure force lateral to the walls
- Hydrodynamic coupling forces applied to the lower portion of the wall and water slosh pressures on top portion of the wall
- Bounding thermal loads, including gamma radiation heating, producing the largest temperature gradient across the thickness of the wall and the slab

In addition to the loads described above, the pool structure and liner were also analyzed for mechanical loads under accident conditions. Analyses were also performed on liner fatigue considering both temperature and seismic cycles. The result of the analyses performed on the spent fuel pool and fuel cask storage pool indicate that under all postulated loadings the structural components, floor slabs, pool walls, and liner will be subjected to stresses or strains within acceptable limits.

Radiological Considerations

Radiological consequences of accidents in the Fuel Building or Containment are not affected by this change. There are no changes to the fuel burnup or hold time of assemblies. Therefore, their source terms remain unchanged. The procedures and equipment used to move fuel remain unchanged and therefore, the drop height of a fuel assembly and the resulting fuel damage will not be changed. A rack drop involving radiological consequences is precluded, since all rack movement during the removal and installation phase will follow safe load paths that prevent heavy loads from being transported over the stored spent fuel. Thus, there are no credible radiological consequences from this accident.

There has been no history of steady long-term increases of radiological conditions in the spent fuel pool resulting from the radionuclides within the fuel as more spent fuel is added to the pool. The radiological conditions within the building are typically dominated by the most recent batch of the spent fuel from a full core discharge. The radioactive inventory of the older fuel that will increase with the expanded storage capacity will be insignificant compared to that of the recent offload.

Since the new storage racks will be located in closer proximity to the spent fuel pool walls, an increase in the adjacent radiological doses is expected. Radiological analyses have shown however, that the dose levels adjacent to all pool areas will remain within acceptable levels. In the event the racks in the fuel cask storage pool were filled with recently discharged fuel assemblies (i.e., fuel that has occupied part of a critical reactor core within the previous 24 hours), the dose rate at the outer surface of the pool walls could be as high as 26 rem/hour. If the three rows of storage cells closest to the fuel cask storage pool walls were restricted to fuel assemblies other than those cooled only 24 hours, the dose rate through the pool walls is reduced to 4.4 millirem/hour. Therefore, acceptable radiation dose levels will be ensured by procedural controls that preclude storage of recently discharged fuel assemblies adjacent to the fuel cask storage pool walls.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

AmerGen Energy Company (AmerGen), LLC is requesting a revision to the Facility Operating License No. NPF-62 for Clinton Power Station (CPS), Unit 1. The proposed change revises Technical Specification (TS) 4.3, "Fuel Storage," to reflect the addition of fuel storage capacity in the fuel cask storage pool and increased fuel storage capacity in the spent fuel pool.

Current projections, based on expected future spent fuel discharges, indicate that loss of full core discharge capability will occur during the scheduled February 2006 refueling outage (C1R10), when an anticipated 312 fuel assemblies are permanently discharged and new fuel is loaded into the spent fuel pool for Operating Cycle 11. The proposed expansion will increase the total storage space 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.

AmerGen has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below.

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed change involves revising CPS TS 4.3, "Fuel Storage," to reflect the increased storage capacity of the spent fuel pool due to the installation of higher density storage racks and the addition of fuel storage capacity in the fuel cask storage pool.

The method of handling fuel is not significantly changed since the same equipment and procedures will be used. During spent fuel rack removal and installation, all work in the spent fuel pool and cask storage pool area will be controlled and performed in strict accordance with specific written guidance. Any movement of fuel assemblies required to be performed to support the modification (e.g., removal and installation of racks) will be performed in the same manner as during normal refueling operations. Shipping cask movements will not be performed during the modification period. There is no change to the methods or equipment to be used in moving fuel casks. Expanding the spent fuel storage capacity does not have a significant impact on the frequency of occurrence for any accident previously evaluated. Therefore, this change will not significantly increase the probability of occurrence of any event previously analyzed.

The consequences of the dropped spent fuel assembly in the spent fuel pool have been evaluated for the proposed change. The results show that the postulated drop of a spent fuel assembly striking the top of the spent fuel storage racks will not distort the racks sufficiently to impair their functionality. The minimum subcriticality margin (i.e., neutron multiplication factor (k_{eff}) less than or equal to 0.95) will be maintained. The structural damage to the Fuel Building, spent fuel pool liner, and any fuel assembly resulting from a dropped fuel assembly striking the pool floor or another assembly located in the racks is primarily dependent on the mass of the falling object and drop height. Since these two parameters are not changed by the proposed modification, the postulated structural damage to these items remains unchanged. The radiological dose at the exclusion area boundary will not be increased since no changes are being made to in-core hold time or burnup as a result of the proposed amendment.

The consequences of a loss of spent fuel pool cooling were evaluated and found to not involve a significant increase as a result of the proposed changes. The concern with this event is a reduction of spent fuel pool water inventory from bulk pool boiling resulting in uncovering fuel assemblies. This situation could lead to fuel failure and subsequent significant increase in offsite dose. Loss of spent fuel pool cooling at CPS is mitigated by ensuring that a sufficient time lapse exists between the loss of forced cooling and uncovering fuel. This period of time is compared against a reasonable period to reestablish cooling or supply an alternative water source. Evaluation of this event includes determination of the time to boil. This time period is much less than the onset of any significant increase in offsite dose, since once boiling begins it would have to continue unchecked until the pool surface was lowered to the point of exposing active fuel. The time to boil represents the onset of loss of pool water inventory and is commonly used as a gage for establishing the comparison of consequences before and after a reracking project. The heatup rate in the spent fuel pool is a nearly linear function of the fuel decay heat load. The fuel decay heat load will increase subsequent to the proposed changes because of the increase in the number of assemblies. The thermal-hydraulic analysis determined that the minimum time to boil is more than three hours subsequent to complete loss of forced cooling and a minimum of 24 hours between loss of forced cooling and a drop of water level to within 10 feet of the top of the racks. In the unlikely event that all pool cooling is lost, sufficient time will still be available subsequent to the proposed changes for the operators to provide alternate means of cooling before the water shielding above the top of the racks falls below 10 feet. The supporting analyses have been confirmed to be bounding for all spent fuel pool loading configurations.

The consequences of a design basis seismic event are not increased. The consequences of this event were evaluated on the basis of subsequent fuel damage or compromise of the fuel storage or building configurations leading to radiological or criticality concerns. The new racks have been analyzed in their new configuration and were found to be safe during seismic motion. Fuel has been determined to remain intact and the storage racks maintain the fuel and fixed poison configurations subsequent to a seismic event. The structural capability of the pool and liner will not be exceeded under the appropriate combinations of dead weight, thermal, and seismic loads. The Fuel Building structure will remain intact during a seismic event and will continue to adequately support and protect the spent fuel storage racks, storage array, and pool moderator/coolant.

A fuel cask drop accident was previously evaluated as described in the CPS Updated Safety Analysis Report (USAR) Section 15.7.5. Administrative controls will be implemented 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. The presence of any empty racks in this area will not adversely affect the previously evaluated cask drop scenarios, since any impacted empty racks will tend to absorb the kinetic energy of the dropped cask and thus reduce the impact load and corresponding damage. The thin walled rack cell material poses significantly less threat to puncturing the cask than impact to the floor of the pool area. Thus, the results of the previously evaluated cask drop accident remain unchanged.

Therefore, the proposed change does not result in a significant increase in the consequences of a previously evaluated accident.

In summary, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed change involves revising CPS TS 4.3, "Fuel Storage," to reflect the increased storage capacity of the spent fuel pool as a result of the installation of higher density storage racks and addition of fuel storage capacity in the fuel cask storage pool. Due to the proposed changes, an accidental drop of a rack module during construction activity in the pool was considered as the only event that might represent a new or different kind of accident.

A construction accident of a rack dropping onto stored spent fuel or the pool floor liner is not a postulated event due to the defense-in-depth approach to be taken. A new temporary crane, hoist, and rack lifting rig will be introduced to remove the existing racks and install the new racks. These temporary lift items have been designed to meet the requirements of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants, Resolution of Generic Technical Activity A-6," and ANSI N14.6, "Standard for Special Lifting Devices for Shipping Containers Weighing 10000 Pounds or More for Nuclear Materials." A rack drop event is considered to be a "heavy load drop" over the pools. Racks will not be allowed to be lifted or to travel over any racks containing new or spent fuel assemblies, thus a rack drop onto fuel is precluded. A rack drop to the pool liner is also precluded since all of the lifting components, except for the temporary crane, either provide redundancy in load path or are designed with safety margins greater than a factor of ten (10). The Fuel Building Crane will be used to lower racks into the pool and place racks within the range of accessibility and to remove racks from the spent fuel pool. The temporary crane will be used to lift racks from the pool floor and move the racks horizontally with a limited lift height above the pool floor. All movements of heavy loads over the pool will comply with the applicable administrative controls and guidelines (i.e. plant procedures, NUREG-0612, etc.). A rack drop would not alter the storage configuration or moderator/coolant presence. Therefore, the rack drop does not represent a new or different kind of accident.

The proposed change does not alter the operating requirements of the plant or of the equipment credited in the mitigation of the design basis accidents. The proposed change does not affect any of the important parameters required to ensure safe fuel storage. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No.

The function of the spent fuel pool and fuel cask storage pool is to store the fuel assemblies in a subcritical and coolable configuration through all environmental and abnormal loadings, such as an earthquake or fuel assembly drop. The new rack design must meet all applicable requirements for safe storage and be functionally compatible with the spent fuel pool and fuel cask storage pool.

The mechanical, material, and structural designs of the new racks have been reviewed in accordance with the applicable provisions of the NRC Guidance entitled, "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications," provided as an enclosure to Generic Letter 78-11. The rack materials used are compatible with the spent fuel assemblies and the spent fuel pool environment. The fixed neutron absorber (i.e., Metamic) has been demonstrated to be acceptable for dry and wet storage applications on a generic basis. In addition, the NRC has approved Metamic for use in both wet storage and dry storage applications. The design of the new racks preserves the proper margin of safety during abnormal loads such as a dropped assembly and tensile loads from a stuck assembly. It has been shown that such loads will not invalidate the mechanical design and material selection to safely store fuel in a coolable and subcritical configuration.

The methodology used in the criticality analysis of the expanded spent fuel pool meets the appropriate NRC guidelines and the ANSI standards. The margin of safety for subcriticality is maintained by having k_{eff} equal to or less than 0.95 under all normal storage, fuel handling, and accident conditions, including uncertainties.

The criterion of having k_{eff} equal to or less than 0.95 during storage or fuel movement is the same as that used previously to establish criticality safety evaluation acceptance. Therefore, the accepted margin of safety remains the same.

The thermal-hydraulic and cooling evaluation of the spent fuel pool demonstrated that the pool could be maintained below the specified thermal limits under the conditions of the maximum heat load and during all credible accident sequences and seismic events. The spent fuel pool temperature will not exceed 150°F during the worst single failure of a cooling pump. The maximum local water temperature in the hot channel will remain below the boiling point. The fuel will not undergo any significant heat up after an accidental drop of a fuel assembly on top of the rack blocking the flow path. A loss of cooling to the pool will allow sufficient time (i.e., 24 hours) for the operators to intervene and line up alternate cooling paths and the means of inventory make-up before the water shielding above the top of the racks falls below 10 feet. The thermal limits specified for the evaluations performed to support the proposed change are the same as those that were used in the previous evaluations.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Conclusion

Based on the above, AmerGen concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92, paragraph (c), and, accordingly, a finding of no significant hazards consideration is justified.

5.2 Applicable Regulatory Requirements/Criteria

The proposed change has been evaluated to determine whether applicable regulations and requirements continue to be met. AmerGen has determined that the proposed change does not require any exemptions or relief from regulatory requirements, other than the Technical Specifications, and does not affect conformance with 10 CFR 50 Appendix A, "General Design Criteria for Nuclear Power Plants," differently than described in the Clinton Power Station (CPS) Updated Safety Analysis Report (USAR). Applicable regulatory requirements will continue to be met, adequate defense-in-depth will be maintained, and sufficient safety margins will be maintained. The report provided in Attachment 5 documents the design and analyses performed to demonstrate that the new racks meet all governing requirements of the applicable codes and standards.

Criterion 61, "Fuel Storage and Handling and Radioactivity Control," of 10 CFR 50 Appendix A, requires that the fuel storage and handling systems shall be designed to assure adequate safety under normal and postulated accident conditions. Expansion of the spent fuel storage capability does not impact compliance with this Criterion. These systems will continue to provide suitable shielding, cooling, containment, confinement and filtering systems, and protection against significant reduction in fuel storage coolant inventory under accident conditions. Additionally, Criterion 62, "Prevention of Criticality in Fuel Storage and Handling," requires prevention of criticality in fuel storage and handling by physical systems or processes, preferably by the use of geometrically safe configurations. The proposed changes do not impact the capability of the existing storage racks to comply with this Criterion and the new storage racks have been designed to comply with this Criterion.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

The proposed amendment is similar to the amendments approved for Hatch (Reference 2), J. A. FitzPatrick (Reference 3), and Byron and Braidwood (Reference 4).

6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, "Standards for Protection Against Radiation," or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22, "Criterion for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review.", Paragraph (c)(9). Therefore, pursuant to 10 CFR 51.22, Paragraph (b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

1. U. S. NRC guidance, "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications," Enclosure 1 to Generic Letter 78-11 dated April 14, 1978, as modified by amendment dated January 18, 1979.
2. Letter from U. S. NRC to Mr. H. L. Sumner, Jr. (Southern Nuclear Operating Company, Inc.), "Edwin I. Hatch Nuclear Plant, Units 1 and 2 RE: Issuance of Amendments (TAC Nos. MA5196 and MA5197)" dated March 23, 2000
3. Letter from U. S. NRC to Mr. James Knubel (Power Authority of the State of New York), "James A. FitzPatrick Nuclear Power Plant – Issuance of Amendment RE: Increased Spent Fuel Pool Capacity (TAC No. M99824)," dated November 10, 1999
4. Letter from U. S. NRC to Mr. O. D. Kingsley (Commonwealth Edison Company), "Byron and Braidwood – Issuance of Amendments on Spent Fuel Storage Racks (TAC Nos. MA5150, MA5149, MA5070, and MA5071)," dated March 1, 2000

ATTACHMENT 2
Markup of Proposed Technical Specification Page Changes

Revised TS Page

4.0-2

4.0 DESIGN FEATURES (continued)

4.3 Fuel Storage

4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. $k_{eff} \leq 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1.2 of the USAR;

b. A nominal fuel assembly center to center storage spacing of 7 inches within rows and 12.25 inches between rows in the low density storage racks in the upper containment pool; and

REPLACE WITH ATTACHED CHANGE

c. A nominal fuel assembly center to center storage spacing of 6.4375 inches in the high density storage racks in the spent fuel storage pool.

4.3.1.2 The new fuel storage racks are designed and shall be maintained with:

a. $k_{eff} \leq 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1.1 of the USAR; and

b. A nominal fuel assembly center to center storage spacing of 7 inches within rows and 12.25 inches between rows in the new fuel storage racks.

4.3.2 Drainage

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 754 ft 0 inches.

4.3.3 Capacity

REPLACE WITH ATTACHED CHANGE

4.3.3.1 The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 2522 fuel assemblies.

4.3.3.2 No more than 160 fuel assemblies may be stored in the upper containment pool.

4.3.1 Criticality

c. For the fuel storage racks supplied by Nuclear Energy Services (NES), a nominal fuel assembly spacing of 6.4375 inches in the high density storage racks in the spent fuel pool or fuel cask storage pool. For the fuel storage racks supplied by Holtec International, a nominal fuel assembly spacing of 6.243 inches in the high density storage racks in the spent fuel pool or fuel cask storage pool.

4.3.3.1 The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 3796 fuel assemblies. The fuel cask storage pool is designed and shall be maintained with a storage capacity limited to no more than 363 fuel assemblies.

ATTACHMENT 3
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 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.	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 4

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 "Spent Fuel Storage Expansion at Clinton Power Station," Holtec Report HI-2033124, revision 2. The proprietary material in this document is delineated by proprietary designation (i.e., shaded text) on pages 3-1 through 3-4, 3-10, 4-6, 4-13, 4-14, 4-20, 4-24, 4-28, 5-9 through 5-11, 6-32, 6-38, and 7-3 through 7-5 and in Figures 5.5.1, 5.5.2, and 5.5.3.

(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.

AFFIDAVIT PURSUANT TO 10CFR2.390

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 20th day of July, 2004.

Scott H. Pellet

Mr. Scott H. Pellet
Holtec International

Subscribed and sworn before me this 20th day of July, 2004.

Maria C Pepe

NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 25, 2005