



## Cask Report – The Month in Review

### ***NRC proposes to amend licensing, inspection and annual fees rule***

The US NRC said in a March 2, 2009 press release that it is proposing to amend its regulations for the licensing, inspection and annual fees it charges applicants and licensees for fiscal year 2009. By law, the NRC must recover 90% of its budget authority, less the amounts appropriated from the Nuclear Waste Fund for high-level radioactive waste activities, and from general funds for waste-incident-to-reprocessing and generic homeland security activities. Based on the FY 2009 Energy and Water Development Appropriations Bill, the NRC's required fee recovery amount for the FY 2009 budget would be approximately \$870.6 million. After accounting for billing adjustments, the total amount to be billed as fees would be approximately \$864.8 million. This is about \$104.1 million more than in FY 2008. The increase is due primarily to an increase in reactor license renewals and new uranium enrichment and recovery licensing activities. For operating power reactors, including spent fuel storage/reactor decommissioning annual fee, the proposed FY 2009 annual fee is \$4,735,000, and for spent fuel storage/reactor decommissioning the proposed FY 2009 annual fee is \$127,000.

The NRC estimates that the FY 2009 annual fees will be paid by 104 nuclear power plant licensees, four non-power reactors, 19 spent fuel storage/reactor-in-decommissioning facilities, 11 fuel cycle facilities, 7 uranium recovery facilities, and approximately 3,800 material licensees.

The NRC published the proposed rule in the March 2 *Federal Register*. The comment period expires April 1, 2009. Because the fees must be collected by September 30, 2009, requests for extensions of the comment period will not be granted.

### ***NRC seeks comments on petition for rulemaking***

The NRC has received and is requesting public comments on a November 24, 2008 petition for rulemaking submitted by the C-10 Research and Education Foundation, Inc., which requested that the NRC amend the regulations that govern licensing requirements for the independent storage of spent fuel, high-level radioactive waste, and reactor-related greater-than-class-C waste. The petitioner wants the NRC to amend

10 CFR Part 72 to require licensees to strictly adhere to the American Society of Mechanical Engineers (ASME) code requirements for design and use of spent fuel storage casks. The group also wants 10 CFR 72.42 to be amended to clarify requirements for "renewal" and "reapproval" of Certificates of Compliance (CoCs) of spent fuel storage casks, and to address license requirements for multiple cask designs under different expiration dates at the same ISFSI. The group is also concerned that NRC requirements allow 20-year CoCs for spent fuel storage casks to be "arbitrarily extended up to 60 years without adequate evaluation for protection of public health and safety," and states that the NRC does not require control systems for dry cask storage systems. Other concerns include the granting of exemptions from design and construction requirements; the long-term degradation of casks, and the lack of specific requirements for protection of ISFSIs from terrorist attacks or environmental elements.

A November 24 press release from the C-10 Foundation states that "Without a national repository, states will inherit the responsibility to contain the radiation and shield the public from exposure indefinitely." In an email, however, a C-10 spokeswoman clarified that the group is also opposed to the DOE's plan to construct a national repository at Yucca Mountain.

Comments are due by May 18, 2009.

The C-10 Foundation is a "watchdog" group based in Newburyport, Massachusetts, 10 miles from the Seabrook Nuclear

### **Milestones Reached Last Month**

- **Holtec International:** (1) Submitted supplemental RAI responses for HI-STORM 100U application on February 6; (2) Received review schedule for resubmitted HI-STAR 180 application; (3) The NRC renewed CoC 9261 for the HI-STAR 100 package on February 13, 2009.
- **NAC International:** (1) MAGNASTOR Certificate of Compliance took effect February 4, 2009.
- **Transnuclear, Inc.:** (1) Received second RAI for TN-40 transport application on January 29; (2) Received draft documents for the NUHOMS Amendment 10 application on February 12, and returned the documents with comments on February 20; (3) Received Part 71 approval for TN-RAM Revision 9 on February 23.

Plant. The website states that the group's vision is "a clean, safe, sustainable, non-nuclear energy future." The petitioners also include Beyond Nuclear, Alliance for Nuclear Accountability, Friends of the Earth, Physicians for Social Responsibility, Public Citizen, and others.

## Holtec International

**HI-STORM 100 Amendment 6** – This amendment adds instrument tube tie rods to the approved contents of the MPC-24 and MPC-32 canisters. The NRC delivered the documents approving this amendment to the rulemaking branch on January 30.

**HI-STORM 100U** – The NRC is finalizing the draft Certificate of Compliance (CoC), Safety Evaluation Report (SER), and Environmental Report for the underground storage design of the HI-STORM 100 system. This amendment is now designated as Amendment 7.

**HI-STAR 180 review schedule issued** -- Holtec International's January 17, 2009 resubmittal of the HI-STAR 180 transportation package appears to contain the necessary information for the US NRC to begin a technical review, according to a February 13, 2009 letter to Holtec from Pierre Saverot, Project Manager in the Division of Spent Fuel Storage and Transportation (SFST). The schedule allows for the staff to issue a possible request for additional information (RAI) in June 2009. If an RAI is not needed, the CoC could be issued at approximately that time, but if an RAI is necessary, the CoC is scheduled to be issued by mid-August 2009. Holtec officials met in January and February to discuss the application with SFST staff, and requested an expedited review of the application (as short as six months) to prevent disruption of Nordostschweizerische Kraftwerke AG's (NOK's) fuel management plans. Holtec won a contract in mid-2006 to provide 14 HI-STAR 180 systems to NOK to store Beznau spent fuel at the ZWIBEZ storage facility. NOK needs the casks after 2010, and will submit its request to the Swiss regulatory authority to license the system for storage.

SFST staff said, however, that the review will be a complex review because it involves multiple technical disciplines. Staff has expressed concerns about the application, specifically, that (1) the proposed alternative to burnup measurement had not been fully discussed prior to the application submittal, and (2) that the proposed loading conditions appear not to be symmetric.

The HI-STAR 180 basket material will be made with Metamic HT, which is a new material that will be used for the first time in the US to provide structural integrity of a spent fuel transportation cask; hence the SFST staff is particularly focused on the use of this material and the qualification program for it. At the January meeting, staff questioned the adequacy of testing and the test process when results are not what were

## Industry Calendar

- March 1-5, 2009  
**WM2009**  
WM Symposia  
<http://www.wmsym.org/>  
Phoenix Convention Center, Phoenix, AZ, USA
- March 10-12, 2009  
**USNRC Regulatory Information Conference**  
USNRC  
<http://www.nrc.gov>  
Bethesda North Hotel and Convention Center  
Bethesda, MD, USA
- April 21-23, 2009  
**World Nuclear Fuel Cycle**  
World Nuclear Association/Nuclear Energy Institute  
<http://www.nei.org/newsandevents/>  
Sheraton on the Park, Sydney, Australia
- May 12-14, 2009  
**Dry Storage Information Forum**  
Nuclear Energy Institute  
<http://www.nei.org/newsandevents/>  
Hyatt Regency Coconut Point, Bonita Springs, FL, USA
- June 11, 2009  
**NWTRB Spring Board Meeting**  
Nuclear Waste Technical Review Board  
<http://www.nwtrb.gov>  
Marriott Spring Hill Suites, Las Vegas, NV, USA
- July 1-2, 2009  
**Nuclear Decommissioning and Waste Management**  
Nuclear Waste Technical Review Board  
<http://www.nwtrb.gov>  
Marriott Spring Hill Suites, Las Vegas, NV, USA

Details are available at:

<http://www.uxc.com/c/data-industry/uxc-calendar.aspx>

expected. In particular, staff questioned the number of samples that have been tested, and the size of the specimens. At the February meeting, Holtec stated that the population of test coupons is slated to continue to increase, and that the company plans to conduct additional confirmatory tests, particularly on irradiated coupons (that require significant cool-off time) to bolster the database on Metamic HT. Creep testing of Metamic HT coupons continues, with over 18,000 hours of testing so far, and Holtec said the data "easily supports the safety analysis of the HI-STAR 180 as shown in the Safety Analysis Report." The NRC requested 10,000 hours of testing to comply with industry standard, so Holtec's creep testing will have been performed to twice the industry standard test duration. Results for the 20,000 hours are expected to be produced in time for the Safety Evaluation Report. For the time being, the CoC will contain a reminder to the NRC staff concerning Metamic HT qualifications as follows: "The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17 for the stan-

standard 5-year license life, after which the initial certificate renewal request will require an updated evaluation (e.g. test data) of Metamic-HT basket material sufficient to ensure the package continues to meet the applicable safety standards.”

The HI-STAR 180 allows both uniform and regionalized fuel loadings. Under uniform loading, every basket cell location is assumed to be loaded with fuel emitting heat at the maximum permissible level, while under regionalized loading, the fuel decay heat is defined in the SAR. Staff questioned the loading patterns, and expressed concern that the CoC limitations might not be covered by the analyses or that the calculations might not be bounding. Staff said it “needs to be convinced that there are limits on loading and that the loading patterns given in the CoC add up to less than 32 kW.”

Holtec also clarified that with regard to the potential for fresh fuel misloading, the proposed CoC contains the requirement of visual inspection to ensure no fresh assemblies are loaded. Holtec conducted studies with the lower bound of one misloaded assembly, and the upper bound of all fresh fuel assemblies loaded into the cask. All 42 possible misloading conditions for a single fresh assembly have been analyzed now, and the maximum k-effective for all of them is 0.9601.

For under-burned assemblies, Holtec noted that the burnup requirement for burnup credit is between 22 and 35 GWd/MTU, depending on the configuration, while the expected maximum assembly burnup of assemblies loaded into the cask is 66 GWd/MTU; thus, the number of assemblies in the spent fuel pool that are at or below the minimum required value would be small. An administrative control could be proposed requiring that all assemblies below the required burnup have to be accounted for in the spent fuel pool before and after a cask is loaded. Holtec noted that during a cask loading, a misloading event would be inconsequential since PWR spent fuel pools require a substantial amount of soluble boron. The number of assemblies to be verified could be further reduced by a burnup versus enrichment loading curve instead of a fixed burnup value. Based on these administrative controls, the misloading of an under-burned assembly should be considered non-credible.

The staff also has issues with the gap analysis, which affects both the HI-STAR 180 and the HI-STAR 60, and told Holtec that it “needs to consider any gap that has the potential to impart a significant secondary impact to the package.”

The HI-STAR 180 is designed to store fuel with burnups up to 60,000 MWd/MTU for UO<sub>2</sub> spent fuel and up to 61,500 MWd/MTU for mixed-oxide spent fuel, with a heat load up to 32 kW. The high capacity dual purpose casks will have two basket sizes – a 37 assembly basket and a 32 assembly basket – with no multi-purpose canister. The system is being licensed first for transport in the US, and is being licensed for storage in Switzerland.

**HI-STAR 100 CoC renewed** – The NRC notified Holtec on February 13 that the company’s January 23, 2009 application to renew Certificate of Compliance (CoC) 9261 for the HI-STAR 100 has been renewed for an additional five year period. Holtec did not request any changes to the package design, or to the operating procedures, acceptance tests and maintenance program of the package.

**HI-STAR 60** – According to a February 19 conversation record between Holtec and the SFST, the staff advised Holtec that “there are many unintentional welding conflicts throughout most package applications along with some general level of confusion on welding issues.” The memo said that the staff will issue a short guidance document (either a Regulatory Issue Summary or an Interim Staff Guidance document) with example language referencing welding codes in a way that will be acceptable to both staff and applicants.

**José Cabrera loads HI-STORMS** – Holtec said in a February 24 company newsletter to clients that Spain’s José Cabrera Nuclear Power Plant has become the first European utility to deploy the multi-purpose canister (MPC) technology to transfer spent nuclear fuel to an on-site dry storage facility. When the project is completed, the storage facility will contain 16 upright HI-STORM overpacks. Twelve HI-STORMS will be used to store the reactor’s 377 spent fuel assemblies in MPC-32 canisters. Four more HI-STORMS will be used to store greater-than-class-C (GTCC) waste. The defueling of Spain’s oldest nuclear plant is expected to be completed in August 2009, which will clear the way for de-watering and de-sludging of the fuel pool and plant demolition. The José Cabrera plant, also known as Zorita, was permanently shut down in April 2005 after 38 years of operation.

The dry storage project is sponsored by Spain’s radioactive waste and decommissioning agency, ENRESA, which is managing the site loading project along with the plant owner, Union Fenosa Generacion. The Holtec Manufacturing Division in Pittsburgh executed a manufacturing technology transfer program with ENSA, which manufactured most of the MPCs that will store the Cabrera fuel. The contract also includes a specially-designed HI-TRAC transfer cask, handling and operational equipment, and a HI-STAR transport cask.

ENRESA also selected Holtec’s HI-STORM 100 technology for the Ascó plant.

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### **Transnuclear, Inc.**

**NUHOMS Amendment 10** – On February 12, 2009, Transnuclear, Inc. (TN) received a proposed CoC, including the proposed technical specifications, and a preliminary safety SER for Amendment 10 to the NUHOMS dry storage system. Amendment 10 adds two new transportable, high burnup dry shielded canisters (DSCs) – the 61BTH and the 32PTH1 to the approved contents of the NUHOMS system. The amend-

ment will also allow storage of Westinghouse 15 x 15 partial length shield assemblies in the NUHOMS 24PTH DSC, and control components in the NUHOMS 32PT DSC. It also adds an alternate high-seismic option of the horizontal storage module for storing the 32PTH1 DSC, and it reformats the technical specifications. TN submitted this amendment to the NRC for approval on January 12, 2007.

TN submitted comments on the draft documents on February 20, 2009.

**NUHOMS Amendment 11** – TN is awaiting approval for Amendment 11, which converts the NUHOMS Technical Specifications to the standard format specified in NUREG-1745, and adds the lightweight transfer cask, the OS-197L to the approved contents.

**NUHOMS Amendment 12** – TN is performing the necessary analyses to submit Amendment 12 to the NUHOMS system later this year. This amendment will add two higher-capacity, higher-heat load NUHOMS canisters to store both PWR and BWR spent fuel, and will add a vertical overpack, the TN-NOVA.

**MP197 Transportation package modifications** – On February 5, representatives from Transnuclear, Inc. met with the NRC's Spent Fuel Storage and Transportation (SFST) staff to discuss a proposed revision to the NUHOMS-MP197 transportation package (CoC 9302). According to the published minutes of the meeting that SFST project manager Chris Staab prepared, the proposed changes are complex and include:

- Authorizing 11 DSCs as payloads, including failed fuel;
- Using burnup credit, including limited use of the proprietary French fission product data, to develop code-to-code correction factors based on benchmarking TN codes with other French codes;
- Incorporating high burnup fuel into a new inner canister.

Staab said that TN indicated the proposed revision would be submitted to staff in late March 2009. The application will provide an impact limiter analysis that uses LS-DYNA to benchmark from 1/3 scale drop tests performed for the MP197 to the new cask – the MP197HB. Two of the 11 new DSCs would contain failed fuel can options, and three DSCs are not currently contained in accepted storage analyses. TN proposed using already performed calculations for many aspects of the application contained in accepted storage analyses, and will rely on similarity as a basis for licensing. The currently approved heat load for the MP197 is 18.3 kW; the application will propose up to 26 kW. Staab said that TN will rely on accepted thermal analyses for storage for similar payloads, and will demonstrate that transportation thermal analyses will be bounded by accepted storage analysis, and again will rely on similarity as a basis for licensing.

TN is seeking a CoC revision 18 months after the NRC receives the application. Staff encouraged TN to factor the complexities of the amendment into their proposed schedule. Staff also encouraged TN to consider submitting this as a new application instead of as an amendment since there are changes in every discipline and overpack, and since it contains new canisters and contents.

Staff encouraged TN to provide clear descriptions of each type of damaged fuel and to clarify basket design changes. Staab noted that TN's presentation slides incorrectly stated that basket designs will remain the same as those approved for storage, but the new basket designs will contain cavity changes.

As currently licensed, the NUHOMS MP197 transport package allows the NUHOMS 61BT canister as payload, with a maximum heat load of 15.86 kW per canister, and fuel assembly burnup of no more than 45 GWd/MTU.

**TN-RAM Rev 9 approved** – The NRC has approved Revision 9 to TN's October 19, 2007 application to revise the TN-RAM transportation package to include the "-96" designation, and to approve for use an alternate lid design incorporating a separate shield plug and an alternate trunnion construction detail. The TN-RAM is designed for the transport of Type B quantities of radioactive material, primarily in the form of irradiated components, within secondary containers. The cask is constructed primarily of stainless steel with about six inches of lead shielding. The gross weight of the package is approximately 80,000 pounds, including the maximum content weight of 9,500 pounds.

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### **NAC International**

NAC International's MAGNASTOR spent fuel storage system took effect February 4, 2009 – details were included in the February 3 issue of *StoreFUEL*. NAC will submit an application for MAGNATRAN, which is the transport system for the MAGNASTOR canisters, later this year.

NAC was scheduled to meet March 3, with SFST staff to discuss the January 21 application to amend the NAC-MPC spent fuel storage system to add Dairyland Power Cooperative's (DPC) LaCrosse Boiling Water Reactor (LACBWR) fuel to the NAC-MPC CoC. However, the meeting was cancelled and has not been rescheduled. NAC and DPC hope to have the amendment approved by November 2009 so dry storage operations could begin at LaCrosse before October 2010. The NAC-MPC system will have the capacity to store 68 fuel assemblies, and each cask can store up to 32 damaged fuel cans. DPC plans to load all of its spent fuel into five NAC-MPC systems. *StoreFUEL* November 4, 2008 has additional details.

NAC will file a Part 71 CoC amendment request in the 4<sup>th</sup> quarter of 2009 for the NAC-STC transport cask.

**NAC-LWT** – NAC met with the SFST on Thursday, February 26 to discuss a request to revise the TRIGA (Training, Research, Isotopes, General Atomic research reactor) fuel authorization contents for the NAC-LWT cask. NAC also met with the staff again on Monday, March 2 to discuss the contents of the NAC-LWT amendment request to ship up to 25 tritium-producing burnable absorber rods (TPBARs) in a 5 x 5 insert located within the PWR/BWR transport canister, and to provide an additional 5 x 5 insert design that accommodates a 1.10-inch diameter water rod.

**Special Report – Spotlight on TriVis, Inc.**

Birmingham, Alabama-based TriVis, Inc. has grown by 50 percent each year since the company was launched in 1999 to provide ISFSI support and “pool-to-pad” services for nuclear power plants. Even in the midst of a slumping economy, TriVis expects to maintain its current staffing and revenue level in 2009, and fully expects 2010 to be another year of growth as several plants in the United States will require the services TriVis provides. TriVis – which refers to the “triple vision” of storage, transport and disposal – was originally established to provide loading services. The company now dubs itself “The complete solution provider”



since it has branched out into engineering, professional staffing services, inspection services (including ASME program development and implementation as well as non-destructive testing activities), civil/technical communications, and, after the 2002 purchase of Power Substations Incorporated, TriVis even supplies high-voltage equipment design and delivery of substations.

TriVis supports spent fuel loading campaigns at numerous sites in the US, including documentation preparation, canister welding, NDE services, providing and/or supervising loading crews, and operations consulting. In fact, the company has

**Views of TriVis Training Facility**

Source: UxC



### TriVis Dry Cask Loading Status

| Year | DCS System        | Plant Site                  | Number of Canisters | I – Initial<br>O – Ongoing | Total Campaign Occupational Exposure | Shortest Loading Duration    |
|------|-------------------|-----------------------------|---------------------|----------------------------|--------------------------------------|------------------------------|
| 2002 | HI-STORM          | Fitzpatrick <sup>(1)</sup>  | 3                   | I                          | 2.414 REM                            | 9 days 6 hr                  |
| 2002 | NUHOMS            | Duane Arnold <sup>(1)</sup> | 10                  | I                          | 6.361 REM                            | 5 days 16 hrs                |
| 2006 | HI-STORM          | Sequoyah                    | 5                   | O                          | 2.32 REM                             | 6 days 9 hrs                 |
| 2006 | NUHOMS (32PT)     | Fort Calhoun                | 4                   | I                          | 1.300 REM                            | 3 days 18 hrs                |
| 2007 | HI-STORM (MPC-32) | Sequoyah                    | 6                   | O                          | 2.693 REM                            | 4 days 11 hrs <sup>(2)</sup> |
| 2007 | HI-STORM (MPC-68) | Browns Ferry                | 1                   | O                          | 0.924 REM                            | 7 days                       |
| 2008 | NUHOMS (32PTH)    | St. Lucie                   | 6                   | I                          | 1.251 REM                            | 3 days 21 hrs                |
| 2008 | NUHOMS (32PTH)    | Seabrook                    | 6                   | I                          | 1.017 REM                            | 2 days 21 hrs                |
| 2008 | HI-STORM          | Sequoyah (MPC-32)           | 6                   | O                          | 1.420 REM                            | 4 days                       |
| 2008 | NUHOMS (61BT)     | Monticello                  | 10                  | I                          | 7.769 REM                            | 7 days                       |
| 2009 | NUHOMS            | Cooper (61BT)               | 8                   | I                          | Contracted Future Loading            |                              |
| 2009 | NUHOMS (32PT)     | Fort Calhoun                | 6                   | O                          | Contracted Future Loading            |                              |

<sup>(1)</sup> Significant involvement in project. <sup>(2)</sup> Metamic<sup>®</sup> neutron absorber. Source: TriVis INMM Presentation, January 2009

performed every task necessary for the creation of an ISFSI from start to finish at least five times to date. TriVis has loaded both Holtec and Transnuclear systems.

TriVis understands that the key to a successful loading campaign is preparation and training, and it accomplishes these tasks at its training facility just outside of Birmingham in Pelham, Alabama. Here, one room is devoted to the basics of loading casks, which includes vacuum drying, venting, leak testing, and NDE services. A mockup of a Holtec HI-STORM MPC and a NUHOMS canister are used for training, practicing, and demonstration runs for both utility management and the NRC. UxC was invited to visit the TriVis facility in mid-February to observe preparations for the upcoming initial dry storage campaign at Cooper, which will load eight of Transnuclear's NUHOMS 61BT systems beginning in early April if all goes according to plan. Nebraska Public Power District personnel were also there observing the processes, and the NRC was scheduled to come the next week to observe the welding, vacuum drying, and NDE processes. The photos on page 5 in the left column show the vacuum drying system and TriVis crewmembers honing their vacuum drying skills.

Another room at the TriVis facility is dedicated to welding services, where TriVis personnel are trained and qualified to weld, and can practice on a mock up cask. The photos on the right column show Transnuclear's Automated Welding System (AWS), and TriVis welders teaching the AWS to precise locations before the practice weld begins. Supervising the welders is Johnny Kelley, Operations Manager, who oversees the entire TriVis operations department, including training and field operations.

In 2008, TriVis conducted loading operations at two Florida Power and Light plants – St. Lucie and Seabrook – both of which loaded six NUHOMS 32PTH systems. TriVis also loaded six HI-STORM 100 systems at Sequoyah, and ten NUHOMS 61BTs at Monticello in a campaign that was exe-

cuted in harsh winter conditions, as seen by the accompanying photo (taken by TriVis personnel).

The St. Lucie, Seabrook, and Monticello campaigns were the initial campaign for those sites, and TriVis performed procedure review, dry run activities, provided the heavy rigging, processed the canisters (water removal, drying and backfill), conducted the welding and NDE programs, and provided the survey equipment and personnel. The Sequoyah loading was the fourth campaign for that site, and TriVis performed the same duties there. The table above shows the loading results for campaigns TriVis has been involved with since 2002, including the total occupational exposure, and the loading duration per campaign.

While many companies are cutting back because of global economic conditions, TriVis is expanding, and this summer will add another 31,000 square foot manufacturing facility, which will house the training facility and a TriVis manufacturing facility. The staff, comprised of about 100 full time employees, includes engineers of all disciplines who have experience in plant design, field construction, analyses, and other areas. The company is also expanding its welding services, and plans to branch out into new welding markets in both the nuclear and non-nuclear markets.

Before founding TriVis in 1999, David Bland, TriVis President, worked for Southern Nuclear Operating Company, where he oversaw the loading of the first spent fuel dual purpose cask, the Holtec HI-STAR 100. He said that first load "went like clockwork" thanks to "brutal practice during the dry run" even though all the equipment was also first-of-a-kind. Every site is different, so each site must allow plenty of time for planning and preparation. "You can't start too early," Bland advises, even with the experience TriVis has gained over the years. Bland spends most of his time running the company now from the company's executive office location a few miles away, and leaves the day-to-day responsibilities

and travel to the rest of his management staff. He still manages to find time, though, to stop by the training facility and make sure Kelley is keeping the crew on task and on schedule, as seen below.

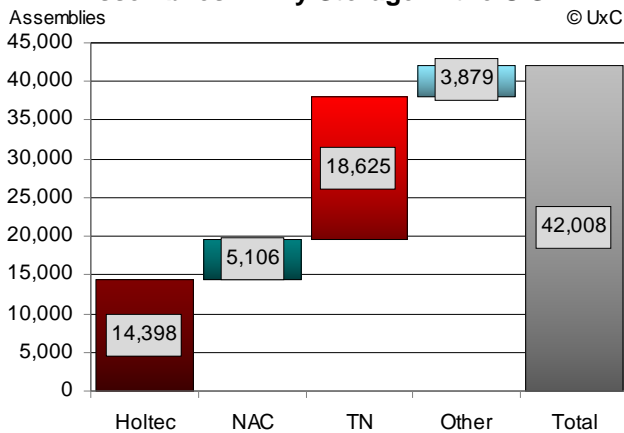


## Loading Briefs

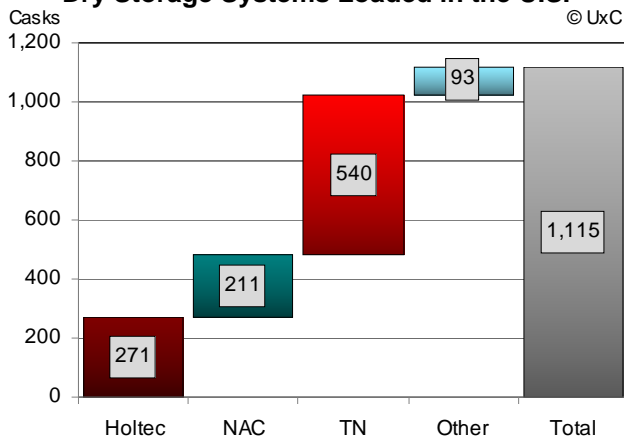
*(Note: all ongoing dry storage plans are included in the Loading Briefs; those reactors whose information has changed since last month are in blue and have an asterisk (\*) before the information.)*

According to data collected by UxC as of March 3, to the best of our knowledge, no spent fuel storage systems were

**Assemblies in Dry Storage in the U.S.**



**Dry Storage Systems Loaded in the U.S.**



loaded in February, so the data remains unchanged from the February 3 issue of *StoreFUEL*.

**American Electric Power (AEP):** AEP has selected Holtec International for dry storage at Cook. Operations will begin in late 2011 with an initial loading of 10 HI-STORM 100 systems. Implementing dry storage at Cook will allow the plant to operate past 2015, and incremental phases of cask loading and potential facility expansion would support operation of the plant through the current operating licenses of 2034 for Unit 1 and 2037 for Unit 2. The design phase is scheduled to be completed by September 2009, and construction of the ISFSI is slated to be completed in 2010.

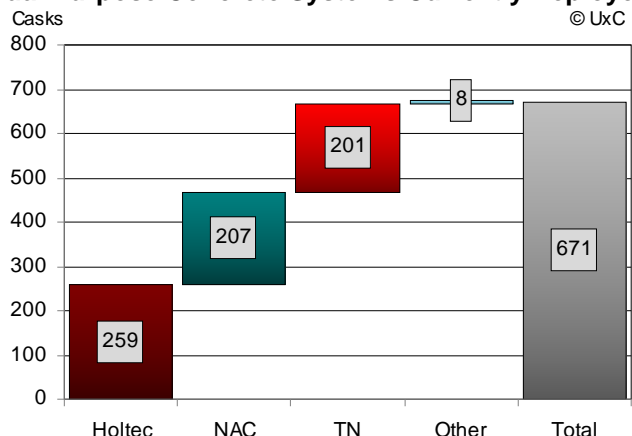
**Arizona Public Service (APS):** APS now has 57 NAC-UMS spent fuel systems currently loaded at Palo Verde. Two NAC-UMS systems were loaded in December 2008/January 2009. APS has ordered a total of 84 UMS systems from NAC. The ISFSI has sufficient capacity for all the spent fuel that will be generated through the end of the operating license.

**Constellation Energy:** Calvert Cliffs has 48 NUHOMS 24P and 12 NUHOMS 32P systems on the ISFSI. The Calvert Cliffs ISFSI is capable of storing spent fuel assemblies in 120 storage modules. Nine Mile Point has contracted to use the NUHOMS 61BT when it implements dry storage.

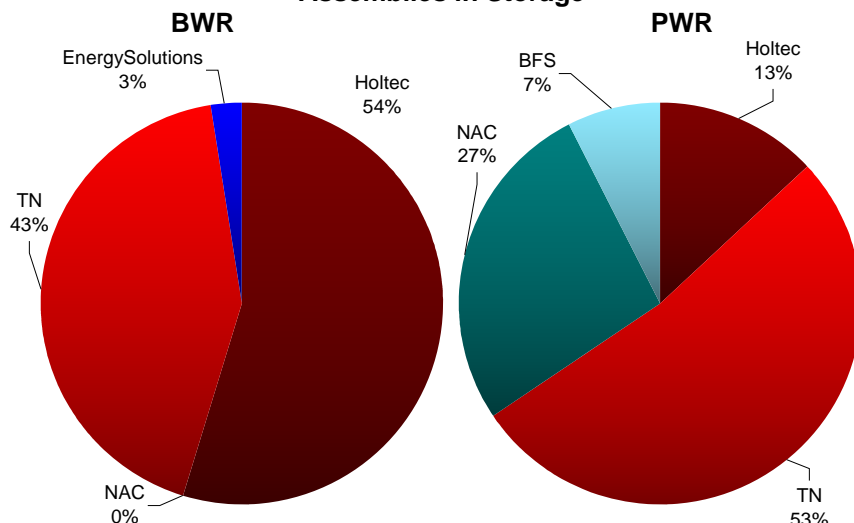
**Dairyland Power Cooperative:** Dairyland Power Cooperative (DPC) selected NAC International's NAC-MPC dry storage system to store spent fuel at the LaCrosse Boiling Water Reactor (LACBWR) beginning in 2010. DPC informed the US NRC on June 19, 2008 that its goal is to complete all dry cask loading preparations and begin ISFSI operations prior to October 2010. Furthermore, DPC urged the NRC to complete its review of the NAC-MPC cask amendment application no later than November 2009, so that DPC could complete the loading of spent fuel in the NAC-MPC systems during 2010. NAC submitted the application to amend the NAC-MPC to accommodate Dairyland spent fuel in January 2009.

**Detroit Edison:** Detroit Edison plans to implement dry storage in 2010, and selected Holtec International to supply 12 HI-STORM 100 Version B cask systems, including the MPC-

**Dual Purpose Concrete Systems Currently Deployed**



## Assemblies in Storage



68 for the Fermi plant. First loading will consist of six systems, and is scheduled to take place before the fall 2010 refueling outage.

In July 2008, Fermi installed a new wire rope on the Reactor Building Overhead Crane to return it to its original 125 ton (single failure proof) capacity, and load tested it to 125% of that capacity (156.25 tons). On September 8, 2008, Fermi broke ground on a new ISFSI Storage Building. The floor slab/foundation was poured on October 6. No other construction is planned until after the spring 2009 refueling outage. At that time, Fermi will build the storage pad, the cask fabrication pad, improve haulpath roads, and install rails in the reactor access building.

**Dominion Energy:** Dominion has three ISFSI pads in use at Surry, employing five cask designs. Two ISFSIs have a site-specific license, and the third pad has a general license where Surry is employing the NUHOMS 32PTH system. Surry now has six 32PTH systems loaded. Surry also has 26 TN-32s in use, one Westinghouse MC-10, 26 GNB systems, and two NAC-128 systems.

Twelve 32PTH systems are under contract for use at North Anna; four have been loaded so far. North Anna also has 27 TN-32 storage casks in use.

At Millstone, eight (8) NUHOMS 32PTs are currently loaded after a fall 2007 loading campaign with spent fuel from the Unit 2 pool. The Unit 3 pool has storage capacity until 2015. The ISFSI is sized to accommodate up to 135 HSMs if needed during the life of the reactor. Nineteen HSMs have been constructed on the site.

Kewaunee will use the NUHOMS 32PT system under a general license. Ten HSMs were delivered in January 2008 and have been installed. The cask handling crane has been upgraded from a 110-ton capacity to a 125-ton, single-failure proof crane. Cask loading pit modifications were made to

accommodate a large cask. Kewaunee plans to load four 32PT systems in summer 2009. Dominion intends to conduct loading campaigns every two or three years at Kewaunee and Millstone, and Dominion will share equipment and personnel between the two sites. Dominion is constructing a storage pad to accommodate 32 HSMs, and plans to construct a second storage pad to house an additional 32 HSMs at a later time. A back-to-back array with 16 HSMs in each row will be utilized.

Dominion will be loading DSCs at all four stations this year.

In 2008, the US Court of Federal Claims awarded Dominion nearly \$154.8 million in damages due to the US Department of Energy's failure to collect and dispose of spent nuclear fuel beginning January 31, 1998 as directed by the terms of DOE's Standard Contract. Dominion Resources Inc. (Dominion Nuclear Connecticut and Dominion Resources, Inc.) and Virginia Electric and Power Company – collectively referred to as Dominion – had claimed \$52 million and \$122 million, respectively for the costs incurred to store spent fuel at the Millstone plant in Connecticut and at the North Anna and Surry plants in Virginia. The award is for spent fuel costs incurred through June 30, 2006. The 10-day trial took place in May 2008. More complete details of the award were presented in SpentFUEL October 17, 2008.

**Duke Power:** At McGuire, 10 TN-32 and 21 NAC-UMS systems are currently storing spent fuel. Duke has selected NAC International's MAGNASTOR system to use at McGuire Nuclear Station beginning in 2010. Duke also signed an agreement with NAC for a limited number of additional NAC-UMS systems to use at McGuire for its September 2009 loading campaign.

At Catawba, eight NAC-UMS systems are on the storage pad. The two-unit Catawba plant has two spent fuel pools, each with 1,421 storage cells. Catawba has two ISFSI pads; the current inventory of spent fuel will fill a single pad. Both pads are capable of supporting various dry storage systems, either horizontal or vertical. NAC is providing 24 systems for Catawba.

At Oconee, 84 NUHOMS 24P systems have been loaded. Duke plans to load 28 NUHOMS 24PHB systems between 2006 and 2009. Eighteen (18) 24PHBs have been loaded to date at Oconee.

Duke applied to the NRC to renew the Oconee site-specific ISFSI license, which included an exemption request to extend the license renewal period to 40 years. The schedule origi-

nally called for the renewed license and Safety Evaluation Report to be issued by January 30, 2009. Duke submitted responses to an RAI at the end of January, but a date for the SER issuance has not been announced. The current license expires in January 2010. If the exemption is not granted for the extended period, then Duke will be required to request a second license renewal for the site-specific ISFSI license over the course of plant operations. A 20-year license renewal would expire on January 31, 2030, which is about four years before the Oconee renewed plant operating licenses expire. Duke projects that even if DOE begins to take spent fuel in 2017, the Oconee ISFSI would not be emptied of spent fuel before 2030.

**Energy Northwest:** Twenty-seven (27) Holtec HI-STORM 100 storage systems are currently in service on the ISFSI pad at the Columbia Nuclear Generating Station.

**Entergy Nuclear:** At Entergy Nuclear's plants, Arkansas Nuclear One (ANO) now has 24 VSC-24 casks and 29 HI-STORMs (using both the MPC-24 and MPC-32) in use. Entergy plans to load two HI-STORMs at ANO 2 in spring 2009, and ANO-1 will load three HI-STORMs by the middle of 2009.

In 2007, the US Court of Federal Claims awarded Entergy Arkansas \$48.6 million in damages related to DOE's failure to meet its obligations under the Nuclear Waste Policy Act.

River Bend now has 11 HI-STORM 100 systems (MPC-68) loaded and in service after completing a fall 2008 loading campaign. The ISFSI has a 44-cask capacity, with the capability to expand if needed. River Bend will not load any casks in 2009.

Grand Gulf has seven Holtec HI-STORM 100 systems (MPC-68) on the storage pad, with another campaign scheduled for mid-2009. On June 24, 2008 Entergy notified the NRC that spent fuel assemblies had been loaded into dry storage that did not meet the fuel specifications of the CoC. The NRC subsequently conducted an inspection from November 17-19, 2008 to investigate the report. According to the December 15, 2008 NRC Inspection Report, inspectors determined that two violations of NRC occurred during the 2008 loading campaign. One violation involved loading eight (8) spent fuel assemblies into an MPC that exceeded the fuel decay heat and burnup limits specified in the CoC. Secondly, Entergy had identified that fuel assemblies with burnup values over 45,000 MWd/MTU had been loaded into MPCs without the use of the supplemental cooling system, which is required by the technical specifications. These Severity Level IV violations are being treated as non-cited violations since the Grand Gulf staff discovered the deficiencies and are taking steps to prevent recurrence.

In addition, a 2006 inspection of the Grand Gulf spent fuel cask crane resulted in the identification of numerous deficiencies and maintenance issues, but the NRC inspectors re-

viewed the corrective actions and procedural changes and found that the deficiencies had been repaired and procedural changes had been implemented to ensure that adequate maintenance and testing of the spent fuel cask crane would occur.

The US Court of Federal Claims determined that Grand Gulf should receive over \$10 million in damages related to DOE's failure to take title to the spent fuel.

At the James A. FitzPatrick plant, nine HI-STORMs with MPC-68 canisters are on the storage pad. The next campaign will likely be in summer of 2009,

Waterford is expected to implement dry storage in 2011.

All of the spent fuel from the spent fuel pool at the Indian Point 1 reactor is now in dry storage. The fifth and final canister, containing the last load of 32 spent fuel assemblies, was placed on the spent fuel storage pad on September 19, 2008, completing a five-cask campaign that began in July 2008. The spent fuel pool is now emptied of the 500,000 gallons of water, which is expected to end the leak of strontium 90 at the plant. The water will be treated consistent with NRC regulatory requirements and according to the terms of the existing New York State Department of Environmental Conservation (DEC) discharge permit for the facility.

Indian Point 2 loaded three MPC-32 canisters into HI-STORM 100 overpacks in early 2008. Nine more are scheduled to be loaded mid-2009. The pad is sized to accommodate a sufficient number of casks to allow both units to operate with full-core discharge capability through an additional 20-year period beyond the end of the current operating licenses, and also to store 5 casks with the 160 Unit 1 assemblies.

The Indian Point ISFSI is a 96 ft. x 208 ft. concrete storage pad that will provide storage locations for 78 Holtec HI-STORM 100S(B) casks. The casks will be arranged in a 6 x 13 array with 75 locations allocated for the casks. The remaining three locations will remain empty.

Indian Point 3 is proceeding with a plan to transfer used fuel from the Unit 3 spent fuel pool to the Unit 2 spent fuel pool using a 12-assembly transfer bell (small due to crane capacity). Fuel would then be loaded into storage casks using Unit 2 equipment. The first transfer of fuel would occur in late 2010.

Vermont Yankee completed the transfer of 340 spent fuel assemblies into five HI-STORM 100 storage systems in July 2008. The next campaign is scheduled for mid-2010. Vermont Yankee's ISFSI will have the capacity to store 36 systems.

Palisades has 18 VSC-24 systems that were loaded between 1993 and 1999. Palisades also has 11 NUHOMS 32PT systems and seven NUHOMS 24PTH systems in use. Pali-

sades plans to continue using the higher heat load NUHOMS 24PTH DSCs for all remaining casks that have not yet been installed. Palisades will not load casks in 2009, but plans to load five NUHOMS 24PTH systems in 2011.

**Exelon:** Nineteen (19) Holtec MPC-68 canisters in HI-STORM 100S storage overpacks are in use at Quad Cities, after a five cask campaign was completed on November 5, 2008. Quad Cities has ordered an additional 20 HI-STORM 100S overpacks and MPC-68 canisters. The site plans to load 8 casks in 2009 and 10 casks in 2010.

The Dresden station has 29 HI-STORMs and 4 HI-STARs in use on its ISFSI. Its next campaign is scheduled for March 2009. The current plan is to load eight HI-STORM 100s in 2009 and seven more in 2010.

Exelon has selected HI-STORM technology for Byron, Braidwood and LaSalle reactors as well. The initial contract for each of the three sites is for 24 HI-STORM 100 systems, ancillaries, and all associated engineering analyses. Byron and Braidwood, both PWRs, will use the MPC-32 canister, while LaSalle, a BWR, will use the MPC-68 canister inside the HI-STORM overpack. Six HI-STORM systems were delivered to the Byron plant in late October, and the site plans to load the first four casks in 2009, and an additional six casks in 2010. Deliveries to LaSalle will begin in early-to-mid 2009 and to Braidwood in 2010. LaSalle currently plans to load four casks in 2009 and six in 2010.

On December 11, 2008 the NRC completed its inspection of the dry cask storage pad construction activities at the Byron Power Station to determine if the pad design and construction activities were conducted in accordance with NRC requirements. The results of these inspections found no violations of NRC requirements, as the storage pad construction activities met all applicable NRC regulations and license conditions.

Limerick completed loading two NUHOMS 61BT systems in August 2008. The site experienced several days delay getting the unit vacuum dried and as a result, scaled back the 2008 campaign from the four planned casks to two casks. The site will probably conduct a five-cask campaign beginning in spring 2009, and another five-cask campaign in 2010. Exelon contracted for 24 61BTH systems in 2005 (the 61BTH system is currently under NRC review as part of Amendment 10 to the NUHOMS system).

Peach Bottom has 41 TN-68 systems in use after completing a dry storage campaign in spring 2008. Peach Bottom has ordered 20 more casks for delivery between 2009 and 2012. Most of these will be built according to Amendment 1 to the TN-68 storage certificate, which took effect October 30, 2007. ENSA, a Spanish fabricator, is making the casks. Peach Bottom currently plans to load three casks in 2009 and five in 2010.

Oyster Creek has 16 NUHOMS 61BT systems loaded. The next campaign is scheduled for 2010.

Overall, Exelon loaded 15 dry storage systems in 2008 at four sites. The utility plans to double this in 2009 and load 32 systems at sites and load a total of 43 systems in 2010, with campaigns planned for seven sites.

**FirstEnergy:** FirstEnergy will use Holtec International's HI-STORM spent fuel storage capacity at the Perry Nuclear Plant. Holtec will deliver 16 HI-STORM overpacks and 16 MPC-68 multipurpose canisters. Holtec will also provide all associated engineering services and an on-site transporter. The first six casks will be delivered in time for first fuel loading to begin in early 2010. The Perry spent fuel pool would lose full-core discharge capability during receipt of new fuel for the spring 2011 outage if fuel were not transferred into dry storage prior to that. Up to 74 additional systems will be added as needed. The Shaw Group, Inc. will provide engineering and design services for the fuel transfer system, pool-to-pad haul path design, storage pad design, and security design. Construction is scheduled to be complete in 2010.

FirstEnergy's Davis Besse plant has three NUHOMS 24P systems in use.

**Florida Power and Light (FP&L):** FP&L completed the initial loading of six Transnuclear NUHOMS 32PTH dry shielded canisters (DSCs) under the NUHOMS HD CoC at St. Lucie in mid-April 2008. For one cask, operational exposure was just 109 mrem. Loading the first DSC took just six days, and the vacuum drying for the 16kW load took 26 hours.

Seabrook has loaded six NUHOMS 32PTH DSCs under the NUHOMS-HD certificate. Turkey Point will load the NUHOMS HD system in 2011. FPL will submit a Part 50 License Amendment Request to increase the crane capacity from 105 tons to 130 tons. No license amendments are required for St. Lucie or Seabrook. Enercon Services, Inc. is responsible for the engineering and design of the ISFSIs for the three plants.

Ten (10) NUHOMS 61BT systems are in use at the Duane Arnold Energy Center. Duane Arnold will not need to conduct another fuel transfer project until around 2010.

At Point Beach, 16 VSC-24 systems and nine (9) NUHOMS 32PT systems are in use. The next loading campaign at Point Beach will be in 2009. FPL's objective is to maintain a full core reserve in each spent fuel pool.

**\*Nebraska Public Power District (NPPD):** In November 2006, NPPD awarded a contract to Transnuclear, Inc. for the design, fabrication and delivery of a dry storage system for the Cooper Nuclear Station for \$10,562,280. The contract includes eight NUHOMS 61BT systems, leased equipment and loading services. TriVis, Inc. is providing loading services, and during March will conduct NRC-observed dry runs for the initial campaign, which is scheduled to begin in April and load

the eight NUHOMs 61BT systems. Black & Veatch is providing the architectural and engineering design services for the Cooper ISFSI, and Enercon Services, Inc. provides mechanical engineering staff augmentation for the ISFSI project. .

NPPD was granted an amendment to the Cooper operating license to increase the capacity of the spent fuel storage pool from 2,366 to 2,651 assemblies to regain and maintain a full core reserve in the spent fuel pool until the ISFSI is operational. Cooper will add two new racks in the spent fuel pool, the first of which will add 117 storage locations, and the second will add 168 storage locations. The second rack will be used as a contingency only if there is a need to offload the entire core into the spent fuel pool.

**Omaha Public Power District (OPPD):** OPPD completed Fort Calhoun's initial dry storage loading of four NUHOMS 32PT systems on August 17, 2006. OPPD is planning to conduct another campaign to load 6 more NUHOMS 32PT systems in mid-2009. The utility said at a February 19, 2008 public meeting with the NRC that the planned crane uprate at the plant is expected to be completed in time to use the 106-capacity crane in that loading campaign. OPPD is also following the progress of NUHOMS Amendment 11, which would authorize the use of TN's lightweight transfer cask.

**\*Pacific Gas & Electric (PG&E):** PG&E began transferring spent fuel into dry storage on July 23, 2008 at the Humboldt Bay Nuclear Plant, and completed the campaign on December 11, 2008. All 390 spent fuel assemblies that were generated during the 13 years the plant operated have now been loaded into five Holtec HI-STAR 100 HB storage systems. A sixth cask will store greater-than-class-C waste. Each system can accommodate 80 Humboldt Bay spent fuel assemblies. The spent fuel pool has now been drained, and decommissioning is proceeding. A total of 129 assemblies were identified as being damaged, and were placed into special damaged fuel cans before being loaded into the cask system.

Humboldt Bay received a site-specific license from the US NRC in November 2005 that authorized the storage of spent fuel at the plant's ISFSI, which is a unique in-ground concrete structure with storage capacity for six of the HI-STAR 100HB systems.

The ISFSI is 77 feet long, 14-feet deep and about 20 feet wide. It rests below ground on the highest point on the property, 44 feet above sea level, which provides protection from a possible tsunami. The storage vault is comprised of six below-grade, vertically oriented, cylindrical storage cells that are constructed of steel-reinforced concrete with a carbon steel liner. Each storage cell can accommodate one cask. The elevation of the vault top, without the lids installed, is nearly flush with the ground surface, and the lids are about 16 ¼ inches high. The storage facility is designed to withstand an 8.8 magnitude earthquake. Since it is constructed below

grade, the radiological effects stemming from a possible earthquake are expected to be very small. PG&E noted that this cask system is currently the only one in the US that is underground. The low heat removal requirements of the old fuel allowed for the underground storage vaults. The ISFSI is very close to public access, so the underground design is important, as the dose is kept very low.

Diablo Canyon will commence its initial dry storage campaign beginning June 1, 2009. Holtec HI-STORMs will be employed at that site. The initial phase will have capacity for 1,280 assemblies, which is sufficient through nearly the end of the operating license; subsequent phases could add capacity for an additional 3,136 assemblies.

PG&E has been forced to postpone its dry storage operations at Diablo Canyon several times due to litigation filed by the activist group, SLOMFP (San Luis Obispo Mothers for Peace). On October 23, 2008 the Commission voted 3-1 to deny SLOMFP's petition that sought to force the NRC to prepare a full environmental impact statement (EIS) that considered the impacts of a possible terror attack on the plant. Commissioner Jaczko gave the lone dissenting vote. The order said that SLOMFP's contention is "without merit" and "does not require the Staff to prepare and environmental impact statement." This ruling cleared the way for Diablo Canyon to begin loading in 2009. However, on February 9, 2009, the group filed an initial brief with the Ninth Circuit Court of Appeals, accusing the NRC of "illegal secrecy and of refusing to comply with the National Environmental Policy Act (NEPA) and the Atomic Energy Act (AEA)."

According to the February 11 press release, MFP asserts that, in approving a license for the Diablo Canyon ISFSI, the NRC should have granted MFP a closed hearing on the adequacy of the NRC's Environmental Assessment (EA). The NRC claimed that security considerations ruled out a hearing. MFP also accuses the NRC of "unlawfully using secret criteria to deny the possible environmental impacts of an attack on the dry casks at Diablo Canyon."

In the 95-page brief, MFP said that the Commission "attempted to erect an impregnable legal barrier to any criticisms of its decision not to prepare an EIS regarding the environmental impacts of an attack on the Diablo Canyon ISFSI..." MFP argued that the NRC was required under NEPA to grant MFP the closed hearing "to which it was entitled under the AEA."

MFP claims that when preparing its EA Supplement, the NRC staff "arbitrarily screened out attacks that would not cause immediate fatalities, even though the dominant impact of an attack on a spent fuel storage facility would be land contamination and ensuing long-term illnesses and economic effects. The NRC also screened out consideration of attacks that were time consuming or demanded significant resources,

thus arbitrarily and irrationally excluding consideration of reasonably foreseeable attacks with a greater level of sophistication.”

The group says the EA Supplement is “fatally defective because it completely fails to justify the NRC’s refusal to prepare an EIS,” and asked the Court to grant MFP a closed hearing on the adequacy of the EA Supplement. MFP also asks the Court to reverse the finding of no significant impact.

SpentFUEL October 24 provided more complete details of the Commission’s order. SLOMFP filed a Petition for Review with the Ninth Circuit US Court of Appeals on December 12, 2008 challenging the NRC’s decision.

Diablo Canyon has sufficient space in the spent fuel pools to operate with a full-core reserve until 2010 if necessary. Eight HI-STORM 100SA casks will be loaded in the initial campaign. PG&E has already ordered another eight systems, which are scheduled to be delivered to the site in early 2009; therefore, PG&E could opt to load as many as 16 casks in 2009.

Holtec performed cask loading services for Humboldt Bay and will do the same for Diablo Canyon.

**PPL Susquehanna:** Susquehanna now has 27 NUHOMS 52B systems storing 1,404 assemblies and 26 NUHOMS 61BT systems storing 1,586 assemblies in use by the middle of December, after loading six 61BT systems during the fall 2008 campaign. The plant plans to load seven more canisters from August through November 2009, and 12 in 2010.

**PSEG:** Hope Creek now has 12 HI-STORM 100 systems with MPC-68 canisters in place after a successful eight cask campaign that began on July 7, 2008. PSEG’s plan to load four casks in 2009 has been postponed until 2010 when the site will load 4 HI-STORM 100 systems for Hope Creek and the initial 4 HI-Storm 100 systems for Salem unit 1. The ISFSI is designed for 200 casks—89 of these will be for Salem fuel and the rest for Hope Creek fuel. A contract is in place for Salem and loading will begin there in 2010.

**Progress Energy:** Progress Energy has 14 NUHOMS systems loaded – eight of the 7P systems and six NUHOMS 24PTH systems loaded at the H.B Robinson site after a May 2008 loading campaign, which marked TN’s 500<sup>th</sup> system loaded. Two more NUHOMS 24PTH systems will be loaded in fall of 2009. The ISFSI is designed to provide life-of-plant storage.

The Brunswick site will implement dry storage in 2010 using the NUHOMS 61BTH, and Crystal River in 2012. Dry storage is not needed at Harris for the foreseeable future because it has four spent fuel pools.

Progress Energy was awarded \$82.8 million from the US Court of Appeals for costs incurred due to DOE’s failure to remove spent fuel from the reactor sites. The sum covers the

costs Progress Energy has incurred to activate fuel storage facilities at plants in the Carolinas and costs to transfer spent nuclear fuel between plants for storage. Progress Energy had originally asked for \$91 million in costs incurred between January 31, 1998 and December 31, 2005, which is the time period established by the Court for the complaint. Costs incurred after 2005 can be recovered in future claims.

**Southern California Edison:** The San Onofre Nuclear Generating Station (SONGS) currently has 17 NUHOMS 24PT1 and 14 NUHOMS 24PT4 systems loaded. The ISFSI is currently undergoing expansion to add 62 additional spaces.

**Southern Company:** Hatch has now 35 HI-STORM and 3 HI-STAR cask systems currently deployed. Plant Hatch plans to load four more casks beginning in July 2009. Farley has loaded 10 HI-STORM systems and plans to load seven systems beginning in August of 2009.

Southern Company was awarded \$77 million for spent fuel damages related to the government’s partial breach of the Standard Contract. DOE is expected to appeal.

**TVA:** The Sequoyah Nuclear Plant has 20 Holtec HI-STORM systems with the MPC-32 canister currently deployed after a fall 2008 campaign that loaded six casks. TVA recently ordered an additional 16 HI-STORM systems for near term delivery. These casks will be loaded in spring 2010. The Sequoyah ISFSI has capacity for 90 casks. By 2028, TVA plans to add a second pad if needed.

The Browns Ferry plant has four HI-STORM 100s with the MPC-68 canister on its ISFSI. The next campaign is scheduled for September 2009 when 12 HI-STORMs will be loaded. Future campaigns are expected to load 5 to 10 casks each time. TVA recently ordered 29 additional HI-STORM systems for near term delivery. The contract includes an option to acquire an additional 36 systems for use Browns Ferry and/or Sequoyah.

Phase 1 of the project provides sufficient storage for all three units through 2016. Phases 2 and 3 will be brought online as needed if DOE does not accept spent fuel after 2016. The entire dry cask project at Browns Ferry will provide storage capacity through 2018, which will include spent fuel from Unit 1 when it comes back online. The ISFSI is capable of accommodating 96 casks (92 casks plus four spares). A second pad could be built in 2018 if necessary

TVA has an inventory of about 2600 MTHM of used fuel. Its current used fuel production rate is about 170 MTHM per year with the six operating units, but will increase to about 240 MTHM per year when TVA has nine operating units.

At Watts Bar, TVA plans to re-rack the spent fuel pool by 2013, and build an ISFSI by 2020.

**Xcel Energy:** Prairie Island has 24 TN-40 casks loaded. The site will load a total of five (5) TN-40 casks over the next

two years (2009-2010), with three scheduled to be loaded in 2009.

Prairie Island will be switching to the TN-40HT in 2011, and submitted an amendment on March 28, 2008 to modify the site-specific ISFSI license to authorize the use of the TN-40HT, which will enable Prairie Island to store spent fuel with up to 5.0 weight percent initial enrichment and up to 60,000 MWd/MTU burnup. The TN-40HT will also be licensed for transport. Transnuclear is performing the analyses and a Part 71 transportation license amendment request will be filed with the US NRC in 2009, with approval expected in 2010.

Xcel has applied for renewed operating licenses at Prairie Island, which will allow operations until 2033 and 2034, respectively. Xcel Energy filed an application with Minnesota regulators on May 16, 2008 for two Certificates of Need for the Prairie Island nuclear generating plant, one to add another 35 dry storage systems to support plant operations during the license renewal period, and one to increase the generating capacity of each unit by 82 MWe.

Xcel Energy proposes to provide the additional spent fuel storage at Prairie Island by extending the concrete storage pads within the existing ISFSI located at the plant. The ISFSI is currently licensed to store 48 TN-40 casks; the proposed extension will be sufficient to accommodate the additional 16 casks. Two new pads will probably be installed around 2020. The ISFSI is laid out so that the storage pads could be extended to accommodate a total of 100 casks without having to change the security perimeter. The extra space could be used for casks to decommission Prairie Island if necessary.

The estimated installed cost of the ISFSI in 2008 dollars is \$155.7 million, including the following component costs: state regulatory process – \$2 million; cask licensing – \$4.6 million; ISFSI construction – \$3 million; ISFSI relicensing – \$2.8 million; 35 TN-40HT casks – \$143.3 million.

At Monticello, the Minnesota Public Utilities Commission has unanimously approved Xcel Energy's request to implement dry storage. Monticello is using TN's NUHOMS 61BT system, and is loading under Amendment 9 to that system. Ten canisters were loaded between September and December 2008. TriVis conducted the loading campaign. None will be loaded in 2009.

Approximately 30 storage systems are expected to be required, and the facility has room to add up to 35 more if needed when the plant is decommissioned. Northern States Power Company, a subsidiary of Xcel Energy that owns the Prairie Island and Monticello plants, was awarded \$116 million by the US Court of Federal Claims in NSP's lawsuit against the US Department of Energy for failure to remove spent fuel from the reactor sites. Xcel has filed a separate suit for storage costs from 2005 through 2007.

## Coming Up

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### EnergySolutions

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- Submit RAI responses for application to transport VSC-24s in the TS125 transportation package (early 2009)

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### Holtec International

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- Receive final CoC and related documents for Amendment 6 to the HI-STORM 100 system (tie-rod amendment)
- Receive revised CoC for Amendment 7 to the HI-STORM 100 (100U design)
- Receive Part 71 CoC for HI-STAR 60
- Receive Part 71 CoC for HI-STAR HB
- Submit amendment to allow storage of higher enriched BWR fuel in the HI-STORM system
- Submit application for HI-STORM 100FW (April 2009)

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### NAC International

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- Submit Part 71 application for the NAC-STC transport cask to accommodate LACBWR fuel
- Submit Part 71 application to certify the MAGNASTOR System canister for transport in the MAGNATRAN transport cask
- Prepare and provide SAR Amendments for the UNITAD System (September 2009)

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### Transnuclear, Inc.

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- Receive final CoC/SER for NUHOMS Amendment 10
- Receive draft CoC/SER for NUHOMS Amendment 11
- Receive draft CoC/SER for NUHOMS HD Amendment 1 (March 2009)
- Submit responses for second RAI for TN-40 (March 2009)
- Submit application to revise MP197 transportation certificate to add two new packages (April 2009)
- Receive Part 71 CoC for TN-40
- Submit NUHOMS Amendment 12 application for high-capacity, high-heat canisters (2009)
- Submit Part 71 application for TN-40HT (2009)
- Submit amendment to Standardized NUHOMS system to add TN-designed TAD canisters

# Decommissioning Report

The operating license for the Kewaunee Power Station (KPS) is scheduled to expire on December 21, 2013, and in accordance with the 10 CFR 50.75(f)(3), the plant's operator, Dominion Energy, is required to submit its preliminary decommissioning cost estimate five years before the expiration of the license. Dominion has submitted a license renewal application to the US NRC to extend the life of the reactor and further delay decommissioning activities, but the five-year requirement, regardless of the license's submittal, requires that the decommissioning cost estimate must still be produced and submitted.

An updated site-specific estimate of the cost to decommission KPS was conducted by EnergySolutions for Dominion in 2006, and has now been updated for the purposes of the decommissioning cost estimate. The 2006 estimate stated that KPS will use the "DECON" scenario or early site release, which will allow the facility to be removed from regulatory control after license termination and final decommissioning activities to begin shortly thereafter. In the case of KPS, the DECON assumption assumes: termination of spent fuel pool operations seven years after shutdown; onsite spent fuel storage in Multi-Purpose Canisters (MPCs) on the ISFSI; no dry transfer facility; a Class V and C waste disposal facility will become available in 2025; Class B and C waste currently in inventory will be stored onsite until decommissioning, and that Yucca mountain spent fuel repository will open in 2020.

The newly updated EnergySolutions decommissioning cost estimate also assumes a DECON strategy for the KPS. However, three main items are different from the 2006 study that requires further clarification. The 2006 decommissioning cost study assumed that Dominion Energy Kewaunee (DEK) will obtain a site specific license for the Kewaunee ISFSI, but now the Kewaunee ISFSI is planning to use the general license provision of Part 72 instead of a site specific license under the terms of the updated cost estimated.

The second aspect to be updated from the 2006 report is that the 2008 study assumes Class B and C Low Level Radioactive Waste (LLRW) from decommissioning activities will be stored onsite at the KPS ISFSI. However, the assumption to store this waste is considered "conservative" by DEK as it is

only an assumption for the cost study and does not determine that such storage will actually be necessary.

The third and final aspect updated in the 2008 report also is in respect to Class B and C LLRW, which the 2008 study considers that all of the waste generated from the present until 2013 as part of decommissioning fund wastes because DEK is addressing these wastes as operational rather than decommissioning. DEK does admit that this, like the second aspect mentioned above, does conservatively address Class B and C waste in the cost study.

The decommissioning cost estimate includes updated cost summaries by account broken into four specific areas, which include: License Termination-50.75(c), Spent Fuel Management-50.54 (bb), Greenfield, and the overall project total. License termination looks to cost over \$380.6 million and includes aspects like planning, decontamination, removal of major components, disposition of interim waste, and a final status survey. The Spent Fuel cost estimate totals over \$322.4 million and is broken down in the chart below. And finally, the Greenfield restoration looks to cost over \$21.4 million and includes demolition of the clean buildings and total site restoration. All of these totals add up to a Scenario Total of \$724,477,000 and looks to have all milestones completed by the year 2050.

| Spent Fuel Decommissioning Components          | Thousands of dollars |
|--|----------------------|
| Fuel Pool Island Planning and Design           | \$22,815             |
| Spent Fuel Cooling and Transfer to Dry Storage | \$119,398            |
| Dry Storage                                    | \$174,012            |
| ISFSI Demolition and Final Site Restoration    | \$6,175              |

## The Office Intern

Several years ago there was an office intern who was none too swift. One day he was typing and turned to a secretary and said, "I'm almost out of typing paper. What do I do?"

"Just use the copier machine paper," she told him.

With that, the intern took his last remaining blank piece of typing paper, put it on the photocopier and proceeded to make five blank copies.

## StoreFUEL Subscription Details

*StoreFUEL and Decommissioning Report* is now published the first Tuesday of every month, 12 times a year, by The Ux Consulting Company, LLC (UxC). The cost of a one year subscription is U.S. \$1,600.00. *StoreFUEL and Decommissioning Report* presents information gathered through the activities of the publisher. Although great effort is dedicated to show accuracy, data are sometimes obtained from sources believed by UxC to be reasonably accurate; therefore, no warranties, express or implied are made, nor any liabilities assumed by UxC for the accuracy, effect or usefulness of any data contained in *StoreFUEL and Decommissioning Report*.

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## Dry Cask Storage in the U.S. by Vendor

| Vendor              | System         | Type                 | Reactor                       | Type                | Utility          | Casks       | Assemblies   |
|---------------------|----------------|----------------------|-------------------------------|---------------------|------------------|-------------|--------------|
| BFS/ES              | FuelSolutions  | VSC-24               | ANO                           | PWR                 | Entergy          | 24          | 576          |
|                     | FuelSolutions  | W150                 | Big Rock Point <sup>1,3</sup> | BWR                 | Consumers        | 8           | 441          |
|                     | FuelSolutions  | VSC-24               | Palisades                     | PWR                 | Entergy          | 18          | 432          |
|                     | FuelSolutions  | VSC-24               | Point Beach                   | PWR                 | FPL              | 16          | 384          |
| <b>Total BFS/ES</b> |                |                      |                               |                     |                  | <b>66</b>   | <b>1833</b>  |
| DOE                 | Foster Wheeler | MVDS                 | Ft. St. Vrain                 | HTGR                | PS Colorado      |             | <b>1464</b>  |
| GNB                 | Castor         | V/21 and X33         | Surry                         | PWR                 | Dominion         | <b>26</b>   | <b>558</b>   |
| Holtec              | HI-STORM       | MPC-24               | ANO                           | PWR                 | Entergy          | 17          | 408          |
|                     | HI-STORM       | MPC-32               | ANO                           | PWR                 | Entergy          | 12          | 384          |
|                     | HI-STORM       | MPC-68               | Browns Ferry                  | BWR                 | TVA              | 4           | 272          |
|                     | HI-STORM       | MPC-68               | Columbia                      | BWR                 | Energy Northwest | 27          | 1836         |
|                     | HI-STORM       | MPC-68               | Dresden                       | BWR                 | Exelon           | 29          | 1972         |
|                     | HI-STAR        | MPC-68               | Dresden                       | BWR                 | Exelon           | 4           | 272          |
|                     | HI-STORM       | MPC-32               | Farley                        | PWR                 | Southern Nuclear | 10          | 320          |
|                     | HI-STORM       | MPC-68               | Fitzpatrick                   | BWR                 | Entergy          | 9           | 612          |
|                     | HI-STORM       | MPC-68               | Grand Gulf                    | BWR                 | Entergy          | 7           | 476          |
|                     | HI-STORM       | MPC-68               | Hatch                         | BWR                 | Southern Nuclear | 35          | 2380         |
|                     | HI-STAR        | MPC-68               | Hatch                         | BWR                 | Southern Nuclear | 3           | 204          |
|                     | HI-STORM       | MPC-68               | Hope Creek                    | BWR                 | PSE&G            | 12          | 816          |
|                     | HI-STAR        | MPC-80               | Humboldt Bay <sup>1,3</sup>   | BWR                 | PG&E             | 5           | 390          |
|                     | HI-STORM       | MPC-32               | Indian Point 1 <sup>3</sup>   | PWR                 | Entergy          | 5           | 160          |
|                     | HI-STORM       | MPC-32               | Indian Point 2                | PWR                 | Entergy          | 3           | 96           |
|                     | HI-STORM       | MPC-68               | Quad Cities                   | BWR                 | Exelon           | 19          | 1292         |
|                     | HI-STORM       | MPC-68               | River Bend                    | BWR                 | Entergy          | 11          | 748          |
|                     | HI-STORM       | MPC-68               | Vermont Yankee                | BWR                 | Entergy          | 5           | 340          |
|                     | HI-STORM       | MPC-32               | Sequoyah                      | PWR                 | TVA              | 20          | 640          |
|                     |                | TranStor cask        | MPC-24E/EF                    | Trojan              | PWR              | Portland GE | 34           |
| <b>Total Holtec</b> |                |                      |                               |                     |                  | <b>271</b>  | <b>14398</b> |
| NAC                 | NAC-MPC        | MPC-26               | Conn Yankee <sup>2,3</sup>    | PWR                 | Ct. Yankee       | 43          | 1019         |
|                     | NAC-MPC        | MPC-36               | Yankee Rowe <sup>2,3</sup>    | PWR                 | YAEC             | 16          | 533          |
|                     | NAC-UMS        | UMS-24               | Maine Yankee <sup>2,3</sup>   | PWR                 | Maine Yankee     | 64          | 1434         |
|                     | NAC-UMS        | UMS-24               | Catawba                       | PWR                 | Duke             | 8           | 192          |
|                     | NAC-UMS        | UMS-24               | McGuire                       | PWR                 | Duke             | 21          | 504          |
|                     | NAC-UMS        | UMS-24               | Palo Verde                    | PWR                 | APS              | 57          | 1368         |
|                     | NAC-I28        | NAC-I28              | Surry                         | PWR                 | Dominion         | 2           | 56           |
| <b>Total NAC</b>    |                |                      |                               |                     |                  | <b>211</b>  | <b>5106</b>  |
| TN                  | NUHOMS         | 24P                  | Calvert Cliffs                | PWR                 | Constellation    | 48          | 1152         |
|                     |                | 32P                  | Calvert Cliffs                | PWR                 | Constellation    | 12          | 384          |
|                     |                | 24P                  | Davis-Besse                   | PWR                 | FirstEnergy      | 3           | 72           |
|                     |                | 61BT                 | Duane Arnold                  | BWR                 | FPL              | 10          | 610          |
|                     |                | 32PT                 | Fort Calhoun                  | PWR                 | OPPD             | 4           | 128          |
|                     |                | 12T                  | INEEL                         | PWR                 | DOE              | 29          | 177          |
|                     |                | 61BT                 | Limerick                      | BWR                 | Exelon           | 2           | 122          |
|                     |                | 32PT                 | Millstone                     | PWR                 | Dominion         | 8           | 256          |
|                     |                | 61BT                 | Monticello                    | BWR                 | Xcel Energy      | 10          | 610          |
|                     |                | 32PTH                | North Anna                    | PWR                 | Dominion         | 4           | 128          |
|                     |                | 24PHB                | Oconee                        | PWR                 | Duke             | 18          | 432          |
|                     |                | 24P                  | Oconee                        | PWR                 | Duke             | 84          | 2016         |
|                     |                | 61BT                 | Oyster Creek                  | BWR                 | Exelon           | 16          | 976          |
|                     |                | 24PTH                | Palisades                     | PWR                 | Entergy          | 7           | 168          |
|                     |                | 32PT                 | Palisades                     | PWR                 | Entergy          | 11          | 352          |
|                     |                | 32PT                 | Point Beach                   | PWR                 | FPL              | 9           | 288          |
|                     |                | 24PT                 | Rancho Seco                   | PWR                 | SMUD             | 21          | 493          |
|                     |                | 24PTH                | Robinson                      | PWR                 | Progress         | 6           | 144          |
|                     |                | 7P                   | Robinson                      | PWR                 | Progress         | 8           | 56           |
|                     |                | 32PTH                | Seabrook                      | PWR                 | FPL              | 6           | 192          |
|                     | 24PT1          | SONGS 1 <sup>3</sup> | PWR                           | Southern Cal Edison | 17               | 395         |              |
|                     | 24PT4          | SONGS 2              | PWR                           | Southern Cal Edison | 14               | 336         |              |
|                     | 32PTH          | St. Lucie            | PWR                           | FPL                 | 6                | 192         |              |
|                     | 32PTH          | Surry                | PWR                           | Dominion            | 6                | 192         |              |
|                     | 52B            | Susquehanna          | BWR                           | PPL                 | 27               | 1404        |              |
|                     | 61BT           | Susquehanna          | BWR                           | PPL                 | 26               | 1586        |              |
|                     | TN Metal Casks | TN-32                | McGuire                       | PWR                 | Duke             | 10          | 320          |
|                     |                | TN-32                | North Anna                    | PWR                 | Dominion         | 27          | 864          |
|                     |                | TN-68                | Peach Bottom                  | BWR                 | Exelon           | 41          | 2788         |
|                     |                | TN-40                | Prairie Island                | PWR                 | Xcel Energy      | 24          | 960          |
| TN-32               |                | Surry                | PWR                           | Dominion            | 26               | 832         |              |
| <b>Total TN</b>     |                |                      |                               |                     |                  | <b>540</b>  | <b>18625</b> |
| Westinghouse        | MC-10          | MC-10                | Surry                         | PWR                 | Dominion         | 1           | 24           |
| <b>Totals:</b>      |                |                      |                               |                     |                  | <b>1115</b> | <b>42008</b> |

<sup>1</sup> One cask is storing GTCC waste in use. <sup>3</sup> All spent fuel from the shutdown plant.

<sup>2</sup> CY has 3 casks storing GTCC waste; Yankee Rowe has one and Maine Yankee has four casks

## Dry Cask Storage in the U.S. by Utility

| Utility             | Reactor                     | Type | Vendor | Cask System    | Canister Type | Total loaded | Assemblies Stored |
|---------------------|-----------------------------|------|--------|----------------|---------------|--------------|-------------------|
| APS                 | Palo Verde                  | PWR  | NAC    | NAC-UMS        | UMS-24        | 57           | 1368              |
| Constellation       | Calvert Cliffs              | PWR  | TN     | NUHOMS         | 24P           | 48           | 1152              |
| Constellation       | Calvert Cliffs              | PWR  | TN     | NUHOMS         | 32P           | 12           | 384               |
| Consumers           | Big Rock Point <sup>1</sup> | BWR  | BFS/ES | FuelSolutions  | W150          | 8            | 441               |
| Ct. Yankee          | Conn Yankee <sup>1</sup>    | PWR  | NAC    | NAC-MPC        | MPC-26        | 43           | 1019              |
| DOE                 | INEEL                       |      | TN     | NUHOMS         | 12T           | 29           | 177               |
| Dominion            | Millstone                   | PWR  | TN     | NUHOMS         | 32PT          | 8            | 256               |
| Dominion            | North Anna                  | PWR  | TN     | TN Metal Casks | TN-32         | 27           | 864               |
| Dominion            | North Anna                  | PWR  | TN     | NUHOMS         | 32PTH         | 4            | 128               |
| Dominion            | Surry                       | PWR  | GNB    | Castor         | V/21 and X33  | 26           | 558               |
| Dominion            | Surry                       | PWR  | NAC    | NAC-I28        | NAC-I28       | 2            | 56                |
| Dominion            | Surry                       | PWR  | TN     | NUHOMS         | 32PTH         | 6            | 192               |
| Dominion            | Surry                       | PWR  | TN     | TN Metal Casks | TN-32         | 26           | 832               |
| Dominion            | Surry                       | PWR  | W      | MC-10          | MC-10         | 1            | 24                |
| Duke                | Catawba                     | PWR  | NAC    | NAC-UMS        | UMS-24        | 8            | 192               |
| Duke                | McGuire                     | PWR  | NAC    | NAC-UMS        | UMS-24        | 21           | 504               |
| Duke                | McGuire                     | PWR  | TN     | TN Metal Casks | TN-32         | 10           | 320               |
| Duke                | Oconee                      | PWR  | TN     | NUHOMS         | 24P           | 84           | 2016              |
| Duke                | Oconee                      | PWR  | TN     | NUHOMS         | 24PHB         | 18           | 432               |
| Energy Northwest    | Columbia                    | BWR  | Holtec | HI-STORM       | MPC-68        | 27           | 1836              |
| Entergy             | ANO                         | PWR  | BFS/ES | FuelSolutions  | VSC-24        | 24           | 576               |
| Entergy             | ANO                         | PWR  | Holtec | HI-STORM       | MPC-24        | 17           | 408               |
| Entergy             | ANO                         | PWR  | Holtec | HI-STORM       | MPC-32        | 12           | 384               |
| Entergy             | Fitzpatrick                 | BWR  | Holtec | HI-STORM       | MPC-68        | 9            | 612               |
| Entergy             | Grand Gulf                  | BWR  | Holtec | HI-STORM       | MPC-68        | 7            | 476               |
| Entergy             | Indian Point 1              | PWR  | Holtec | HI-STORM       | MPC-32        | 5            | 160               |
| Entergy             | Indian Point 2              | PWR  | Holtec | HI-STORM       | MPC-32        | 3            | 96                |
| Entergy             | Palisades                   | PWR  | BFS/ES | FuelSolutions  | VSC-24        | 18           | 432               |
| Entergy             | Palisades                   | PWR  | TN     | NUHOMS         | 24PTH         | 7            | 168               |
| Entergy             | Palisades                   | PWR  | TN     | NUHOMS         | 32PT          | 11           | 352               |
| Entergy             | River Bend                  | BWR  | Holtec | HI-STORM       | MPC-68        | 11           | 748               |
| Entergy             | Vermont Yankee              | BWR  | Holtec | HI-STORM       | MPC-68        | 5            | 340               |
| Exelon              | Dresden                     | BWR  | Holtec | HI-STORM       | MPC-68        | 29           | 1972              |
| Exelon              | Dresden                     | BWR  | Holtec | HI-STAR        | MPC-68        | 4            | 272               |
| Exelon              | Limerick                    | BWR  | TN     | NUHOMS         | 61BT          | 2            | 122               |
| Exelon              | Oyster Creek                | BWR  | TN     | NUHOMS         | 61BT          | 16           | 976               |
| Exelon              | Peach Bottom                | BWR  | TN     | TN Metal Casks | TN-68         | 41           | 2788              |
| Exelon              | Quad Cities                 | BWR  | Holtec | HI-STORM       | MPC-68        | 19           | 1292              |
| FirstEnergy         | Davis-Besse                 | PWR  | TN     | NUHOMS         | 24P           | 3            | 72                |
| FPL                 | Duane Arnold                | BWR  | TN     | NUHOMS         | 61BT          | 10           | 610               |
| FPL                 | Point Beach                 | PWR  | BFS/ES | FuelSolutions  | VSC-24        | 16           | 384               |
| FPL                 | Point Beach                 | PWR  | TN     | NUHOMS         | 32PT          | 9            | 288               |
| FPL                 | St. Lucie                   | PWR  | TN     | NUHOMS         | 32PTH         | 6            | 192               |
| FPL                 | Seabrook                    | PWR  | TN     | NUHOMS         | 32PTH         | 6            | 192               |
| Maine Yankee        | Maine Yankee <sup>1</sup>   | PWR  | NAC    | NAC-UMS        | UMS-24        | 64           | 1434              |
| OPPD                | Fort Calhoun                | PWR  | TN     | NUHOMS         | 32PT          | 4            | 128               |
| Portland GE         | Trojan                      | PWR  | Holtec | TranStor cask  | MPC-24E/EF    | 34           | 780               |
| PPL                 | Susquehanna                 | BWR  | TN     | NUHOMS         | 52B           | 27           | 1404              |
| PPL                 | Susquehanna                 | BWR  | TN     | NUHOMS         | 61BT          | 26           | 1586              |
| Progress            | Robinson                    | PWR  | TN     | NUHOMS         | 7P            | 8            | 56                |
| Progress            | Robinson                    | PWR  | TN     | NUHOMS         | 24PTH         | 6            | 144               |
| PS Colorado         | Ft. St. Vrain               | HTGR | DOE    | Foster Wheeler | MVDS          |              | 1464              |
| PSE&G               | Hope Creek                  | BWR  | Holtec | HI-STORM       | MPC-68        | 12           | 816               |
| PG&E                | Humboldt Bay <sup>1</sup>   | BWR  | Holtec | HI-STAR        | MPC-80        | 5            | 390               |
| SMUD                | Rancho Seco                 | PWR  | TN     | NUHOMS         | 24PT          | 21           | 493               |
| Southern Cal Edison | SONGS 1                     | PWR  | TN     | NUHOMS         | 24PT4         | 14           | 336               |
| Southern Cal Edison | SONGS 1 <sup>2</sup>        | PWR  | TN     | NUHOMS         | 24PT1         | 17           | 395               |
| Southern Nuclear    | Farley                      | PWR  | Holtec | HI-STORM       | MPC-32        | 10           | 320               |
| Southern Nuclear    | Hatch                       | BWR  | Holtec | HI-STORM       | MPC-68        | 35           | 2380              |
| Southern Nuclear    | Hatch                       | BWR  | Holtec | HI-STAR        | MPC-68        | 3            | 204               |
| TVA                 | Browns Ferry                | BWR  | Holtec | HI-STORM       | MPC-68        | 4            | 272               |
| TVA                 | Sequoyah                    | PWR  | Holtec | HI-STORM       | MPC-32        | 20           | 640               |
| Xcel Energy         | Prairie Island              | PWR  | TN     | TN Metal Casks | TN-40         | 24           | 960               |
| Xcel Energy         | Monticello                  | BWR  | TN     | NUHOMS         | 61BT          | 10           | 610               |
| YAEC                | Yankee Rowe <sup>2</sup>    | PWR  | NAC    | NAC-MPC        | MPC-36        | 16           | 533               |
| <b>Totals:</b>      |                             |      |        |                |               | <b>1115</b>  | <b>42008</b>      |

<sup>1</sup> Includes GTCC waste    <sup>2</sup> All the spent fuel from the shuttered Unit 1