



Nuclear Renaissance and Waste Management

The following article is excerpted from one written by Dr. Charles McCombie, Executive Director of Arius (Association of Regional and International Underground Storage), headquartered in Baden, Switzerland. The original article in its entirety can be found in the September Arius newsletter at: <http://www.arius-world.org/pdfs/AriusNewsletter15.pdf>

The growth in existing nuclear programs and the spread of nuclear technology to new countries will have a serious effect on the back-end of the fuel cycle owing to the increased concerns about proliferation and waste management. To counter the fears about proliferation, countries will have to assure the global nuclear community that sensitive materials (in particular spent fuel) are being carefully safeguarded. Various multinational proposals have also been made (e.g. by Russia and the U.S.) with the objective of returning spent fuel to its country of origin.

It will be a serious risk if the expected future rapid increase in nuclear power is attempted without proper regard for waste issues – as was the case during the initial build up of nuclear in the 1960s and 1970s. Attempts to initiate new nuclear power plant programs without a back-end strategy will open nuclear power to criticism and will intensify disposal-based opposition by environmental groups. The so-called ‘waste problem’ must be recognized as being solved if adequate public acceptance of nuclear is to be achieved. In particular, acceptance of the safety of the disposal of the spent fuel/high level waste will be a key to success.

Impacts on multinational repository initiatives – Of particular relevance to Arius activities are the influences of the nuclear renaissance on multinational initiatives for storage and disposal. The potential impacts can be considered under three headings, each related to a recognized benefit of shared nuclear facilities – economics, safety and security, and political/public support.

The high cost of repositories means that new or small nuclear power plant programs will not be able to afford a national repository and must be interested in prospects for cost sharing. It may even be that there are so many small nuclear countries looking for a disposal route that there is a market for competing multinational repositories. On the other hand, some currently small programs may grow large enough to

make national disposal a feasible strategy – particularly if repository implementation is in the far future. The economics of the back-end may also be directly connected with front-end costs if competition to supply reactor fuel or uranium leads to offers of leasing either of those as a sales argument. A final point related to economics is that increased use of nuclear energy may result in spent fuel inventories that grow quickly enough to make new interim storage facilities necessary so that the financial benefits of pooling such facilities may be re-examined.

International concerns about safety and security have already led to pressure to concentrate nuclear materials at fewer, well-controlled locations. This can lead to more support for facilities shared by smaller countries or else to growth in importance of the ‘add-on scenarios’ defined by the IAEA and proposed now in the U.S. GNEP and the Russian GNPI. In any case, the spread of nuclear power will certainly result in increased international control of multinational initiatives. It may even increase the possibility of ‘supranational scenarios’ in which a direct, operational role in waste storage and disposal is taken by the IAEA or the EC. In the area of nuclear security, there is again a danger that governments and the industry will neglect the back-end relative to more critical risk areas such as nuclear power plant operation, uranium enrichment and fuel reprocessing. In the back-end itself, there is also a danger that proliferation concerns will lead to neglect of high-level and intermediate-level waste issues relative to spent fuel, although disposal plans for all long-lived wastes should be moved ahead simultaneously.

For multinational storage or disposal initiatives, as for national programs, the biggest challenge today is winning sufficient political and public support for siting facilities. Increased support at the international level (IAEA, EC) is to be expected – primarily for the safety and security reasons mentioned above. For small or new programs increased support for multinational strategies may result if the waste issue is judged crucial; a decrease in interest and support may occur if the waste issue is postponed for decades. Large programs may feel under increased pressure to provide ‘add-on’ solutions requiring them to accept wastes from other countries and nuclear opposition groups will certainly use such arguments. The GNEP proposals have already led to debate of this sort in

the U.S. and Canada. On the other hand, the many countries aiming to become nuclear energy users could lead to an increase in the numbers of those willing actively to pursue the option of shared disposal. This could lead to new, formalized multinational or regional groupings being founded and the existence of such groups would serve as evidence that new nuclear nations are acting responsibly to develop waste disposal solutions that are based on siting only in willing and capable host countries.

Conclusions – A renaissance has been prophesied by the nuclear industry at various times over the past 20 or more years – with no visible result. However, the current surge of interest in expanding or initiating nuclear programs appears more concrete than on any previous occasion. Avoiding energy shortages, reducing future energy costs and mitigating global climate change are all powerful arguments. The resurgence of nuclear can have positive or negative effects on the global efforts devoted to implementing safe and acceptable waste management strategies. It is imperative that the positive impulses dominate if the nuclear renaissance is to succeed.

In its original period of expansion, the nuclear industry paid too little attention to waste disposal, working under the understandable assumption that ample time remained for developing solutions. This led to waste management becoming identified by the public as the Achilles heel of nuclear power. From a technical point of view, the urgent tasks in rapidly expanding nuclear power are again not waste specific. They are related to building (or rebuilding) engineering capacities, ensuring supplies of large components, accelerating licensing processes, educating personnel, etc. But the industry cannot afford to ignore non-technical aspects nor to decide again that waste management tasks have a lower priority and can be put on the back burner.

Top Stories

TN, NRC discuss Amendment 11 issues

Senior management from Transnuclear, Inc. (TN) met with the NRC's Division of Spent Fuel Storage and Transportation (SFST) staff on Tuesday, November 20 to discuss TN's planned approach to respond to the lengthy Request for Additional Information (RAI) the vendor received on October 22. TN's responses are due to the NRC by December 21.

Amendment 11 for TN's NUHOMS dry storage system (Certificate of Compliance 1004) was submitted to the NRC on April 10, 2007. The amendment proposes two significant changes: (1) to convert the Technical Specifications (TS) to the standard format contained in NUREG-1745, and (2) to remove transfer cask dose limits so that the lightweight transfer cask, the OS197L could be used under a general license.

TN added a lightweight transfer cask, designated the OS197L TC to the NUHOMS Updated Final Safety Analysis Report for CoC 1004 under the provisions of 10 CFR 72.48 to support Omaha Public Power District (OPPD) needs at the Fort Calhoun Station. The OS197L has 25 tons of shielding removed from the standard transfer cask to enable it to meet the 75-ton crane capacity. The cask uses supplemental shielding on the trailer that transports the loaded cask to the storage pad. The NRC performed an inspection of the 72.48 documentation and identified a level IV violation based on three examples where the Technical Specification limits should have been submitted to the NRC for prior review and approval. Amendment 11 resolves the issues identified in the violation.

On October 9, Michael Weber, director of the NRC's Office of Nuclear Material Safety and Safeguards, notified OPPD that the staff believes "it does not appear that having Amendment 11 changes codified in the regulations by November 2008 is feasible unless the Amendment is modified." OPPD would need the amendment approved by that time to support a dry storage campaign in early 2009, which is necessary to maintain a full-core reserve in the spent fuel pool. The utility is also pursuing a crane upgrade as an alternate solution, which would allow it to lift the standard 100-ton NUHOMS transfer cask.

NRC project manager Jennifer Davis restated the staff's position that the review would have a better chance of being completed in time to meet OPPD's needs if the scope were narrowed to what is necessary for Fort Calhoun. That would mean limiting the use of the OS197L to the radiation protection parameters bounded by the Fort Calhoun site, reducing the heat load for the use of the OS197L to that which is absolutely necessary to support Fort Calhoun's next planned cask loading campaign, and eliminating the request for improvement of the technical specifications for the entire system. There was no indication at the meeting that TN plans to reduce the scope, but TN stated the December 21 deadline for its responses will be met.

TN categorized the 123 questions and found that 89 of them were for clarification, 11 of them were common to the Amendment 10 RAI (responses to that were submitted in early November) to which TN will respond by reference, 9 questions required supplemental or confirmatory analysis, 5 required revised analysis, 6 related to temporary shielding, and 3 related to the temporary cask cover. Most of the two and one-half hour meeting was spent discussing radiation and shielding portions of the amendment. The two parties had a difference in opinion in several areas about what TN should have to put in the CoC and the technical specifications and what is covered by 10 CFR Part 50, which would be the utility's responsibility. TN argued that the staff is asking for a lot of detail in the Safety Analysis Report and the Certificate of

Compliance when many of the concerns would be resolved as part of the evaluation of the OS197L by the utility before the cask is ever used. If a licensee wants to use this cask, it must demonstrate it meets all the criteria; TN cannot analyze every possible scenario, the vendor argued.

A lengthy discussion took place over RAI 5-3, which asked TN to revise the CoC "Basic Components" to list the supplemental shielding for the OS197L transfer cask on the transfer trailer and in the decontamination area as important to safety. TN maintained that "Basic Components" in the CoC includes major components like the dry shielded canister (DSC), the horizontal storage module (HSM), and the transfer cask (TC), and stated that the trailer shielding is only used for ALARA (as low as reasonably achievable) purpose. The trailer shielding is not credited during any of the 10 CFR 72 accidents, including the dose rates after loss of neutron shielding and cask drop and dose rates are below the 10 CFR 72.106 limits for accidents; therefore, inclusion of trailer shielding for the OS197L cask in the CoC is not required.

Staff argued that the supplemental shielding should be considered a "Basic Component" because the transfer cask absolutely cannot be used without the supplemental shielding, and it is a safety significant part of the system, and therefore should be in the Certificate of Compliance. The trailer shielding is also required to meet the conditions of 10 CFR 20, "Standards for Protection Against Radiation." Staff stated that the trailer shielding is a very important component to meeting the dose limit, which raises it to the level of "Basic Component." NRC reviewer Elizabeth Thompson emphasized that the trailer is a part of the design, and it belongs in the CoC because it is a part of the system – the transfer cask cannot be used without it. TN noted that the requested changes identified in this amendment had been reviewed by their clients, and they were worried about setting a precedent with respect to what goes in the CoC. Thompson stated that TN "set the precedent by building this cask in the first place."

A related RAI, 5-25, which asked TN to justify why the decontamination area shielding is not important to safety, also generated a lot of discussion. The RAI stated that "the supplemental shielding in the decontamination area is being used as an integral part of the OS197L transfer system during loading, in a similar manner as the bare transfer cask. This shielding is required to meet the requirements of 10 CFR 72.104(a) regarding the dose limits for normal conditions of operation." The RAI adds that supplemental shielding used to meet these requirements should be classified as important to safety.

The 100-meter dose rate from the bare OS197L transfer cask is 4.53 mrem/hour. Without the supplemental shielding in place, depending on the layout of the fuel handling building with respect to the controlled area boundary, the dose limits may be exceeded at 100 meters in less than 6 hours for a

single cask, "and the limits of 10 CFR 20.1301(a) may easily be challenged." Interim Staff Guidance 13 states that at least 20 casks should be considered when evaluating compliance with 10 CFR 72.104.

TN stated that the decontamination area shield is used only inside the fuel building, and is not classified as Important to Safety because it is considered as a 10 CFR Part 50 component operated inside the fuel building. It will be subjected to the requirements of 10 CFR 50, and a general licensee will be required to perform a 10 CFR 72.212 evaluation for the dose consequences of all operations inside the fuel building, including the handling of the OS197L transfer cask. The 72.212 evaluation will also address the controlled area boundary dose evaluation based on the layout of their own fuel building and distance to the controlled area boundary and assign appropriate requirements on the decontamination area shielding. NRC reviewer Shana Helton said she was "flabbergasted" that the decon area is not considered part of the system.

After much discussion on these two RAIs, the staff stated it "understands" TN's position and will review the RAI response when it is submitted, which was the conclusion of several of the RAI discussions.

RAI 5-1 asked TN to include material and nominal dimensions of major shielding features for various transfer cask designs in the CoC. TN President Tara Neider said this question would have significant impact on potential users because if TN has to put specific dimensions into the CoC, that will preclude any adjustments from being made at all and thus would require an amendment be submitted for even a minor change. TN stated that NUREG-1745 only includes a very generic description of transfer cask "multi-walled (carbon steel/lead/carbon steel) cylindrical vessel with a water jacket attached to the interior. It does not include any nominal dimensions. Staff appeared to back down on this question and said they are not trying to be "overly prescriptive" or looking for specific dimensions. Shana Helton noted that NUREG-1745 was developed before anyone envisioned the 72.48 process would be used for major changes such as the removal of shielding, and she suggested TN look at the Statement of Consideration for 72.48 when developing a response to this RAI.

The disagreement over what should be a part of the system requirements and what should be left to the utility's analysis under Part 50 continued with the discussion RAI 5-2 and 5-7a, which said TN should require the use of a single failure proof crane for all movement of the bare OS197L transfer cask and its supplemental shielding. TN stated that it recommends the use of a signal failure proof crane, but that this requirement should not be imposed in the tech specs because any lifting inside the fuel building is subject to the plant's heavy load program under 10 CFR 50 and is not a part of 10 CFR 72

regulations. To ensure this, the Heavy Loads requirement is being added as a condition in the CoC, and requirements for lifting and handling the OS197L transfer cask outside the fuel building are already included in the tech specs. If a licensee does not use a single failure proof crane inside the fuel building, that licensee will have to evaluate the drop accidents inside the fuel building under 10 CFR 50.59 and 10 CFR 72.212 and evaluate the consequences. Neider noted that this concern is already covered, and that too many requirements in the CoC and the tech specs generates confusion and does not add value. NRC staff had no comments and said they will review the response as it is submitted.

More details on specific RAIs will be included in next week's issue of StoreFUEL, UxC's monthly report on NRC licensing activities. NRC project manager Jennifer Davis noted that the staff is currently reviewing Amendment 10 responses, and they do not yet know if another RAI will be needed for that amendment. Additional followup via telecom will be necessary because some of the staff reviewers could not be present at the meeting.

U.S. and Russia sign new plutonium disposition agreement

The U.S. and Russia have signed an agreement to advance a cooperative plutonium disposition program to convert at least 34 tons of weapons grade plutonium into a form unusable in weapons from each country's respective weapons stockpile.

Under the new plan, the U.S. will cooperate with Russia to convert Russian weapons-grade plutonium into mixed oxide fuel (MOX) and irradiate the MOX fuel in the BN-600 and BN-800 fast reactors. The BN-600 is currently operating and the BN-800 is under construction, both at the Beloyarsk plant site. These two fast reactors will dispose of Russia's surplus weapons plutonium without creating new stocks of separate weapons-grade plutonium. Under the plan, Russia would begin disposition in the BN-600 in the 2012 timeframe, with disposition in the BN-800 following soon thereafter. The U.S. DOE will support Rosatom's efforts to establish MOX fuel production for the BN-800 reactor. Once dispositions begin the two reactors could dispose of approximately 1.5 metric tons of Russian weapons plutonium per year (meaning it will take more than 22 years to destroy the 34 metric tons once both reactors are operating).

The U.S. will contribute \$400 million to the program in accordance with agreed milestones and schedule as previously pledged under the 2000 Plutonium Management and Disposition Agreement. U.S. and Russian officials will meet in the coming months to amend the existing plutonium disposition agreement to reflect this joint statement. The funds, however, are subject to Congressional appropriations.

The U.S. and Russia also intend to continue cooperation on

Industry Calendar

- January 16-18, 2008
Spent Fuel Management Seminar
Institute of Nuclear Materials Management
<http://www.inmm.org/>
Mandarin Oriental, Washington, DC, USA
- January 22, 2008
NEI Fuel Supply Forum
Nuclear Energy Institute
<http://www.nei.org/newsandevents/>
The Willard InterContinental, Washington, D.C., USA
- February 24-28, 2008
Waste Management 2008
WMSymposia, Inc.
<http://www.wmsym.org/>
Phoenix Convention Center, Phoenix, AZ, USA
- April 8-11, 2008
World Nuclear Fuel Cycle Meeting
WNA and NEI.
<http://www.nei.org/newsandevents/>
Miami Intercontinental Hotel, Miami, FL, USA
- May 13-15, 2008
NEI Dry Storage Information Forum
Nuclear Energy Institute
<http://www.nei.org/newsandevents/>
Hyatt Regency Coconut Point, Bonita Springs, FL, USA
- September 7-11, 2008
International High-Level Radioactive Waste Management
American Nuclear Society
<http://www.ans.org/meetings/>
Las Vegas, NV, USA

Details are available at:
<http://www.uxc.com/c/data-industry/uxc-calendar.aspx>

the development of an advanced gas-cooled, high temperature reactor, which may increase additional possibilities for disposition of Russia's plutonium beginning in about 2015.

Ed Lyman of the Union of Concerned Scientists said the BN-600 can burn only about three-tenths of a ton of plutonium a year, putting the Russian plutonium disposition on the "slow track." The original concept would have disposed of the plutonium in larger LWRs, but the Russians rejected that option.

The project will need additional financing, and DOE and Rosatom also intend to seek other donor funding, which would be used to reduce Russian outlays for, and facilitate timely implementation of, disposition in the BN-800.

On September 17, Energy Secretary Samuel Bodman declared he would increase the American share of the weapons-grade plutonium by 9 metric tons, bringing the United States total to 43 metric tons.

U.S. Senator Pete Domenici, ranking member of the Senate Energy and Water Appropriations Subcommittee, said he is "hopeful that this joint agreement might help us resolve the FY 2008 funding situation for DOE and these nonproliferation

programs. The House and Senate are on vastly different paths, but the progress announced today could move us closer to a satisfactory resolution of the largest single U.S. non-proliferation project.”

The program has stalled in recent years, prompting Domenci to support restricting funding to Russia, as well as compose bill language expressing continued frustration with the lack of Russian efforts to fulfill the terms of the bilateral Plutonium Management and Disposition Agreement.

Some critics of the program in Russia believe that the money should instead be put towards building geologic repositories for the waste. The program will take several decades and will cover only a fraction of the weapons-grade plutonium both countries possess.

News Briefs

NRC schedules hearing on Nevada's challenge to DOE LSN certification

The NRC's Pre-License Application Presiding Officer (PAPO) Board will hear oral arguments on December 5 in Las Vegas regarding Nevada's challenge to DOE's October 19 certification of its document collection on the Licensing Support Network (LSN) for the Yucca Mountain proceeding. The hearing will be fed via satellite to the NRC and to broadcast media nationwide, and will be available for public viewing at the ASLB hearing room in NRC headquarters in Rockville, MD.

The PAPO Board consists of three judges from the NRC's Atomic Safety and Licensing Board panel. The hearing will begin at 9:00 a.m. Pacific time in the NRC's Las Vegas Hearing Facility.

NRC issues ESP for North Anna site

The NRC has approved the issuance of an Early Site Permit (ESP) to Dominion Nuclear North Anna for the potential construction of a new reactor at the North Anna Power Station site. The company filed its ESP application September 23, 2003. The ESP will be valid for 20 years, providing Dominion the option to consider nuclear among other potential generation choices. During that period, the company, or any other potential applicant interested in that site, must still seek NRC approval for a Combined License to build one or more plants

on the site before any significant construction can begin.

The NRC's first ESP was issued for the Clinton site in Illinois on March 15, 2007, and the second ESP was for the Grand Gulf site in Mississippi on April 5. The NRC continues to work on the ESP application for the Vogtle site in Georgia.

Areva to build two EPRs in China; will study possible reprocessing plant

AREVA and the China Guangdong Nuclear Power Corp. (CGNPC) announced today, November 26 they have signed a "historic agreement" worth eight billion euros (US\$12 billion) under which AREVA, in conjunction with CGNPC will build two new generation European pressurized water reactors (EPRs) and will provide all the materials and services required to operate them. The agreement, signed by AREVA CEO Anne Lauvergeon and CGNPC Chairman Qian Zhimin, was signed during the state visit of French President Nicolas Sarkozy to China. Areva said the agreement is "unprecedented in the world nuclear market."

An engineering joint venture will be created soon, and CGNPC has also agreed to buy 35% of the production of UraMin. The EPR will be built in Taishan in Guangdong province. Following Finland and France, China will be home to the third and fourth EPR to be built in the world.

An agreement was also signed between China and France opening the way to industrial cooperation in the back-end of the nuclear fuel cycle. Under this agreement, Kang Rixin, Chairman of China National Nuclear Corporation (CNNC) and Anne Lauvergeon agreed to undertake feasibility studies related to the construction of a spent fuel reprocessing plant in China. They have also created a joint venture in the area of zirconium.

After the signing ceremony, which was attended by the French and Chinese heads of state, Anne Lauvergeon said "A new era is opening in the durable and constructive nuclear energy partnership between our two countries. This partnership represents a major step in the history of the Area group. It is the largest international commercial contract ever won by the French nuclear industry. It reaffirms our global nuclear leadership and reinforces our presence in one of the most promising markets for the decades to come."

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