

## Led by NAC International, Deep Isolation Raises \$20 Million; Announces Estonia Contract

Deep Isolation announced November 18 that it has closed a \$20 million Series A raise, led by NAC International, which specializes in systems for the storage, transportation, and disposal of spent nuclear fuel, high-level waste, and other nuclear materials.

President and CEO of NAC Kent Cole stated, “Deep Isolation is leveraging proven horizontal drilling and conveyance technology from the oil and gas industry to develop a patent-protected method for effectively disposing of used nuclear fuel and high-level waste. The Deep Isolation method in our view is safer and more efficient than prior competing alternatives and avoids the complexities and risks of putting people underground to emplace and monitor the wastes.” He added, “As proud lead investor in this round and a strategic partner, we are eager to work with Deep Isolation and its other strategic partners to break through the barriers that have previously constrained implementation of disposal solutions.”

No country in the world has successfully disposed of high-level nuclear waste or spent nuclear fuel, although Finland is the first country to obtain a construction license for a permanent deep geological repository at Olkiluoto in the municipality of Eurajoki in western Finland. Nuclear waste can represent a significant obstacle to expanding nuclear energy programs as the lack of a solution for waste is often cited as the number one reason why many people oppose nuclear energy.

“We need clean energy, and we also need to be responsible,” said Deep Isolation CEO Elizabeth Muller. “In the case of nuclear power, this means finding a permanent solution for nuclear waste.”

Deep Isolation noted that cleantech investors are increasingly recognizing that nuclear energy needs a workable solution for waste in order to remain a beneficial part of the clean energy mix. NAC’s parent company, Hitachi Zosen Corporation, is committed to taking on global environmental challenges, which makes the company compatible with Deep Isolation’s mission and global footprint.

According to Deep Isolation’s press release, the value of

disposing of the current nuclear waste inventory worldwide is about \$660 billion. Deep Isolation has more than 40 inventions filed and 10 patents granted and allowed. The company applies directional drilling technology to safely and securely dispose of nuclear waste deep underground (*SF* No 1213 June 1, 2018).

NAC and Deep Isolation have been working together since 2019 when the companies signed an initial agreement, and then in July 2020, NAC agreed to design, manufacture, and supply the canisters that will be used to store and/or dispose of nuclear waste in deep boreholes. Under the terms of the agreement announced this week, NAC will take a seat on Deep Isolation’s Board of Directors.

Climate change has me concerned, but there are many reasons to remain hopeful. I’m seeing the world respond to environmental disasters such as the West Coast fires with a renewed sense of urgency, and cleantech investors are taking note.

The fact that Deep Isolation just closed \$20 million in Series A funding shows that socially responsible investors are willing to support a cleantech company with a mission to become an integral part of a low-carbon future.

As an environmentalist, I believe that safely and permanently disposing of the world’s current nuclear waste inventory while providing a path forward for new nuclear is the responsible thing to do for future generations and the planet.

Elizabeth Muller, CEO Deep Isolation

Since its formation in 2016, Deep Isolation has published multiple technical papers, formalized collaborations with well-respected industry leaders, such as Bechtel National and Schlumberger, and completed a public demonstration in Texas in 2019. This year, it established a customer base in the US and in Europe. It has also obtained its first customer contracts and has received “a half dozen Letters of Intent” from future customers.

According to Investopedia.com, startup companies, such as Deep Isolation,

engage in efforts to raise capital through rounds of external funding. This provides outside investors the opportunity to invest cash in a growing company in exchange for equity or partial ownership of that company. The earliest stage is known as “pre-seed funding,” which is usually supplied by the founders themselves and other close supporters, family, and friends. That is followed by “Seed funding,” which is the first official equity funding stage. Deep Isolation was able to close its “oversubscribed” Seed Round in January 2019 after receiving a total of just over \$10 million from a diverse group of approximately 30 investors consisting of environmentalists, venture capitalists investing their personal funds, successful entrepreneurs, as well as concerned citizens (*SF*

No 1244 January 18, 2019).

Once a company has developed an established base and a positive track record, that business may opt to move onto the Series A funding round where it is important to have a plan for developing a business model that will generate long-term profits. Investors at this stage are looking for companies with great ideas that have a strong strategy for making the idea into a successful and profitable business. The average Series A funding as of 2020 is \$15.6 million but it is now common for firms going through Series A funding rounds to be valued at up to \$23 million.

### Preliminary study with Fermi Energia

Deep Isolation also announced that its Middle East and Africa (EMEA) team, based in London, will collaborate on a preliminary study with Fermi Energia that “will include a qualitative geological readiness assessment of Deep Isolation’s horizontal deep borehole solution in Estonia.” The assessment will serve as an initial evaluation of whether Estonia’s geology would be suitable for a deep borehole repository for spent fuel from a small modular reactor (SMR) that has yet to be developed. Deep Isolation’s team will work with Fermi Energia and Steiger, Estonia’s “foremost geologic and drilling company.”

The study will focus on safety and cost-effective drilling, with safety being defined as “the extent to which geology can support the isolation of radionuclides from the biosphere.” The final report is expected to be completed by early 2021.

## Top Story

### First canister of SNF placed in new interim storage facility at Chernobyl

A historic milestone was reached at the Chernobyl Nuclear Power Plant (ChNPP) in Ukraine when on November 18, the first canister of spent nuclear fuel was loaded into the new Interim Storage Facility (ISF-2), representing the culmination of more than two decades of work at the site. The first double-wall shielded canister (DWC) was filled with 93 spent fuel assemblies and was placed in ISF-2 for the up to 100-year storage period. These assemblies were removed



Photo source: ChNPP

## Industry Calendar

- December 2-3, 2020  
**NWTRB Fall 2020 Board Meeting --**  
<https://nwtrb.gov/meetings/upcoming-public-meetings>  
Online
- March 7-11, 2021  
**WM Symposia**  
<https://wmsym.org>  
Online
- March 8-11, 2021  
**NRC Regulatory Information Conference**  
<https://nrc.gov/public-involve/conference-symposia/ric/>  
Online
- May 10-13, 2021  
**International Conference on Fast Reactors and Related Fuel Cycles**  
<https://iaea.org/events/fr21>  
Beijing, China
- June 7-11, 2021  
**Sixth International Conference on Geological Repositories (ICGR)**  
[https://www.oecd-nea.org/confdb/conf?id=432](https://www.oecd-nea.org/confdb/confdb/conf?id=432)  
Sirkus Hall of Pasasitorni Helsinki, Finland
- November 30 – December 2, 2021  
**WNE – World Nuclear Exhibition 2021**  
<https://www.world-nuclear-exhibition.com>  
<https://www.world-nuclear-exhibition.com/Paris-Nort-Villepinte>  
Paris, France

Details are available at:

<https://www.uxc.com/c/data-industry/Calendar.aspx>

from the site’s aging storage facility before being processed and packaged in DWCs to be placed in the new storage facility. This project was performed by ChNPP personnel under the supervision of the International Atomic Energy Agency, the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU), and Holtec International, who is supplying the canisters.

In total, more than 21,000 spent fuel assemblies from Chernobyl reactors 1-3 will be transferred to ISF-2 over the next decade. ISF-2 is the largest dry spent fuel storage facility in the world and has a lifespan of a minimum of 100 years. The facility is funded by the Nuclear Safety Account – an international donor fund managed by the European Bank for Reconstruction and Development (EBRD).

“Hot tests” at ISF-2 began on September 10, 2020 (*SF* 1327 September 11, 2020). ChNPP had been granted a specific permit for commissioning of the ISF-2. By late October, 93 spent fuel assemblies were transported from the old storage facility to ISF-2 where they were successfully divided into fuel bundles that were placed into fuel tubes and inserted into the DWC. ChNPP staff sealed the canister by welding the internal lid, performing gas and vacuum drying, filling the canister with helium, sealing the internal lid, welding the

external lid, filling the space between the DWC shells with helium, and sealing the external lid of the canister. ChNPP noted that during the course of all these operations, the quality of sealing weld joints was continuously monitored by visual check and liquid penetrant test of weld joints. Once the DWC was filled with helium, the DWC vessel internal and external shell air-tightness was checked.

The photo, from the ChNPP website, shows the first part of ISF-2, taken November 18. More photos are on the ChNPP website's press release.

Steven White, EBRD Associate Director, Nuclear Safety, said, "Important work remains to be completed to secure the full operating license, expected in early 2021, but the successful testing and loading of the first full fuel load provides all those involved with cause for some celebration."

Construction of ISF-2 began in 2001 to replace the older wet type storage facility that was built immediately after the 1986 accident but not designed for long-term use, and its operating life is set to expire in 2028. A total of 232 DWCs will be used to store the assemblies transferred from the old storage facility to ISF-2.

ISF-2 cost €400 million (US \$474 million) and was financed with contributions from Belgium, Canada, Denmark, the European Union, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Russia, Sweden, Switzerland, Ukraine, the United Kingdom, and the United States.

## News Briefs – Non-US

### Canada's NWMO to lead dialogue for an integrated radioactive waste management strategy

Canada's Minister of Natural Resources, the Honourable Seamus O'Regan, announced November 16 that the government will be conducting a review of Canada's *Policy Framework for Radioactive Waste* to ensure that a strong policy is in place that continues to meet international standards and best practices, is based on the best available science, and reflects the values and principles of Canadians. To that end, over the coming months, the Canadian government will be taking steps to review and modernize Canada's approach to managing radioactive waste.

Minister O'Regan envisions this initiative as having two elements, as follows:

- Conducting a comprehensive review of the country's existing Radioactive Waste Policy Framework "to ensure that Canada has a modern policy framework that is consistent with international standards and best practices, and takes into account the values that matter most to Canadians."
- Ensuring Canada has an Integrated Strategy in place for the safe management of all its radioactive wastes. Chal-

lenges that Canada is facing must be addressed, and solutions for the long-term management of existing waste and for future waste streams from new nuclear technologies must be identified. The strategy should position Canada as a world leader, and it should be aligned with international standards and best practices.

To accomplish this endeavor, Minister O'Regan asked the Nuclear Waste Management Organization (NWMO), the not-for-profit organization already working to implement Canada's plan for the long-term management of spent nuclear fuel, "to lead a dialogue to develop an integrated strategy for Canada's radioactive waste through close collaboration among waste owners and producers, Indigenous peoples and other interested Canadians." This new work is in addition to the NWMO's work to develop a plan and identify a site for the safe disposal of Canada's spent nuclear fuel. The integrated strategy should build on NWMO's plan for the long-term management of Canada's spent fuel.

Minister O'Regan said the strategy should include the following components:

- A description of the current waste management situation in Canada in terms of current and future volumes, considering potential small modular reactor (SMR) waste, characteristics, locations, and ownership of the waste.
- An update on current plans and progress in advancing long-term management and disposal solutions for Canada's wastes and the gaps that must be addressed.
- Conceptual approaches for dealing with current and future radioactive waste inventory, including technical options for long-term management or disposal of the various waste types and options for the number of long-term waste management facilities in Canada.
- Considerations of the staging, integration, establishment, and operation of long-term waste management facilities.

Laurie Swami, President and CEO of the NWMO, said in a press release, "This is important work, and we look forward to lending our expertise to make informed and practical recommendations to the Canadian government on a more comprehensive radioactive waste management strategy for low- and intermediate-level waste."

The engagement phase will continue until March 31, 2021, followed by a "What We Heard Report" that will be released for public comment. The modernized policy will be released in fall 2021. Go to [www.radwastereview.ca](http://www.radwastereview.ca) for more information.

### Japan's Nuclear Waste Management Organization approved to begin repository studies

Japan's Nuclear Waste Management Organization (NUMO) has received approval from the Ministry of Economy, Trade and Industry (METI) to begin literature surveys as the first step in assessing sites in two municipalities in the

Hokkaido Prefecture for suitability to host a deep geological repository (DGR) for Japan's high-level radioactive waste. NUMO said in its November 17 press release that literature surveys will be conducted in the town of Suttsu and the village of Kamoenai "and will continue to share information on geological disposal projects. Through 'places of dialogue,' we will work on understanding activities related to geological disposal projects, explaining the progress of literature surveys, and examining the concrete implementation of the regional development vision."

NUMO added, "We hope that everyone in Japan, including Suttsu Town and Kamoenai Village, will deepen their understanding of the geological disposal system and the geological environment of Japan, and how to realize geological disposal in society as a whole. We will continue to engage in dialogue activities nationwide so that we can think together." Residents of Suttsu were reported to be divided over the issue.

Kamoenai and Suttsu are about 40 kilometers (about 25 miles) apart, and both are experiencing financial distress due partly to the downturn in the fishing industry as a result of the global COVID-19 pandemic and dwindling population. The Japanese government will offer up to ¥2 billion (US\$19.3 million) in subsidies to any municipality that participates in the literature survey. The Hokkaido government, however, has an ordinance that radioactive waste is unacceptable in the prefecture.

NUMO is the responsible body to develop a DGR, which would be built at least 300 meters below ground. Under Japan law, investigations are categorized into three stages: (1) literature survey (about two years), (2) preliminary investigation (about four years), and (3) detailed investigation (about fourteen years). The results are released at the end of each stage and the opinions of the prefectural governor and head of the relevant municipality are to be heard again before moving on to the next stage. If there are any objections, then the process is suspended. The three-stage process takes about 20 years. In 2002, NUMO initiated public invitations to municipalities to accept investigations.

The five-year business plan may be found at [https://www.numo.or.jp/press/jigyokeikaku\\_henkou.pdf](https://www.numo.or.jp/press/jigyokeikaku_henkou.pdf) in Japanese only.

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## Mitie Group secures IFM contract for Magnox sites across UK

Mitie Group, a facilities management and professional services company, announced November 16 that it has secured a new integrated facilities management (IFM) contract from Magnox Ltd, which manages one of the most extensive decommissioning programs in Europe. Mitie will provide integrated facilities management for 14 sites, including 12 nuclear sites, a hydroelectric plant and a technical office, across the UK. The contract is valued at £56 million (US\$74.1 million) over the course of five years with the option to extend

the contract for an additional five years.

Under this new contract, Mitie will provide engineering maintenance, cleaning, waste management, helpdesk, front of house, mailroom management and landscaping services. Mitie said that it will focus on repair and maintenance services, including water treatment and fire alarm inspections. This is essential to keeping buildings safe and all equipment operating efficiently so that Magnox teams can perform their decommissioning tasks successfully.

Magnox Ltd is a subsidiary of the Nuclear Decommissioning Authority (NDA) and is responsible for decommissioning the 12 nuclear sites and managing the waste that was generated by producing more than 1,000TWh of nuclear power over six decades of commercial operation. Magnox is also responsible for safely managing the waste generated during nuclear research and electricity generation going back nearly 75 years.

Mitie will work to improve Magnox employees' experience while working on site by rolling out its IFM application, Aria, during the contract. Aria is used via an application or computer system that can manage tasks including an "Ask" section that will allow Magnox employees to easily raise any on-site issues such as a spillage that needs to be cleaned or leaky water pipes that need to be repaired. These issues will be directly corresponded to Mitie, which will then track the job's progress through completion.

Furthermore, Mitie will introduce its reporting platform, Mozaic, to the site. Through Mozaic, Magnox service managers will be able to log new issues, track progress of the repair and maintenance jobs conducted onsite, and review how much time was spent on each task.

Mitie Group has previously worked with other customers in the UK nuclear industry including Sellafield Ltd, the Nuclear Decommissioning Authority, and Low Level Waste Repository Limited.

Caron Weaver, Magnox Ltd Engineering and Asset Management Director, commented, "We are delighted to be working with Mitie as part of our mission to fully decommission the Magnox sites across the UK. We are confident this contract represents excellent value for money and are looking forward to Mitie bringing innovation and driving efficiency in the delivery of these vital FM services."

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## UK firm develops spent fuel storage racks that can triple the capacity of current racks

Three firms in the county of Cumbria in the United Kingdom have developed an innovative solution for spent fuel storage that could save the UK £2 billion (US\$2.6 billion) in nuclear decommissioning costs, the UK government announced November 13. West Cumberland Engineering Ltd out of Workington, Bendalls Engineering Ltd of Carlisle, and TEAM Industrial Services, which is based in Kendal and Carlisle, have delivered the first "Hybrid 1 63 Can Rack" to

the Sellafield site in Cumbria. This rack “triples the number of fuel cans that can be held in one underwater storage container.” This development is significant, the announcement said, because storage space is limited in the country’s only storage pool for Advanced Gas-cooled Reactor (AGR) fuel at the THORP plant at Sellafield. The racks will also help reduce the time to remove fuel from AGR reactors, which is where the potential £2 billion in savings would be realized.

Andrew Pringle, AGR operating Program Manager for Sellafield Ltd, said that the current storage can hold up to 20 fuel cans; the Hybrid 1 design can store 63 fuel cans in one rack. The first rack has been placed in the THORP Receipt and Storage Pond, with 15 more to install, followed by the Hybrid 2 Rack, which is an enhanced design to optimize manufacturing. This technology will ensure AGR spent fuel can be stored and will enable the accelerated defueling of AGR reactors from 8 years to 3.5 years.

The Sellafield Ltd., EDF Energy, the Nuclear Decommissioning Authority, and Direct Rail Services all provided input. The three companies from Cumbria will manufacture 8 of the Hybrid 1 racks and Grahams Engineering Ltd. of Lancashire will manufacture 8 more.

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## Ignalina can begin handling system of damaged nuclear fuel

Ignalina Nuclear Power Plant (INPP) recently announced that on November 6, Lithuania’s State Nuclear Safety Inspectorate (VATESI) approved the report on the program for the damaged spent fuel handling system at the plant as operational and also approved the final safety analysis report. “Hot tests” of the damaged fuel handling system were performed at Unit 1 of INPP where damaged fuel was placed in three containers and transported to the Interim Spent Fuel Storage Facility (ISFSF, project B1). This confirmed the compliance of the damaged fuel handling system with the design and nuclear safety requirements.

VATESI’s approval of the documents allows INPP to begin industrial operation of the damaged fuel handling system. The damaged spent fuel includes assemblies that have been deformed or have shell defects, such as cracks, fissures, etc, that have allowed direct contact of the fuel pellets with water.

INPP noted that working with damaged fuel is a new, more technically complex, and time consuming technological process. Efforts to work on damaged fuel at INPP Unit 1 started in September of this year when the first container with damaged fuel was placed in the ISFSF.

A total of 128 damaged fuel assemblies remain in Unit 1 and 189 in Unit 2. All of the damaged fuel will be placed in 22 containers out of the 190 containers stored in the ISFSF. The project to put the damaged fuel into storage is scheduled to be completed by the end of 2022.

Project B1 is financially supported by the Ignalina International Decommissioning Support Fund (IIDSF), which is administered by the European Bank for Reconstruction and Development (EBRD). The Donors’ Assembly is managing the International Fund for the Decommissioning of the Ignalina NPP. Donors are the European Commission, Austria, Belgium, United Kingdom, Denmark, Finland, France, Germany, Ireland, Luxembourg, Netherlands, Norway, Poland, Spain, Sweden, and Switzerland.

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## News Briefs – US

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### NEI Chair favors reprocessing

*Reuters* reported November 16 that Maria Korsnick, President and Chief Executive Officer of the Nuclear Energy Institute (NEI), said during an interview that reprocessing spent nuclear fuel could help disposition some of the spent fuel inventory that is accumulating at nuclear power plants in the United States. Korsnick was quoted as saying, “Reprocessing is a very interesting part of the solution set.” She noted that France has demonstrated reprocessing can be performed safely and added that “I’m confident that we have the technological expertise to do this well.” Rita Baranwal, the Assistant Secretary of Energy for Nuclear Energy at the Department of Energy has also made public statements in favor of reprocessing.

Korsnick told *Reuters* that the industry is ready to work with the incoming Biden administration on energy issues, including nuclear waste.

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### NRC staff approves transfer of the Indian Point operating licenses from Entergy to Holtec

The Nuclear Regulatory Commission (NRC) staff has informed the Commission that an order approving the transfer of the Indian Point Generating Station Units 1-3 licenses, and the general license for the Indian Point (IP) independent spent fuel storage installation (ISFSI) from Entergy to Holtec International will be issued “on or about” November 23, 2020. Upon approval of the license transfers and the sale of the units from Entergy to Holtec once Indian Point 3 is permanently shut down on or before April 30, 2021, a Holtec subsidiary, Holtec Decommissioning International (HDI), will be the licensed operator and will perform decommissioning activities at Indian Point using the DECON method. HDI has contracted with Comprehensive Decommissioning International (CDI) to be the decommissioning general contractor. HDI will be responsible for regulatory interface, the Nuclear Decommissioning Trust (NDT) fund management, and oversight of CDI.

Holtec and Entergy, through their affiliates, submitted the license transfer application on November 21, 2019 requesting approval for the license transfers. The companies asked the NRC to approve the application by November 2020 to facilitate a timely transaction after Indian Point closes. Indian

Point 1 permanently ceased operation in 1974; Unit 2 was shut down in April 2020, and operations at Unit 3 will end in April 2021. The transfer transaction will not close until after Unit 3 is permanently shut down. After the necessary regulatory approvals and transaction close, Holtec would assume ownership of the site, the NDTs real property and spent nuclear fuel.

Holtec will transfer all of the spent fuel into its dry fuel storage cask systems at the on-site ISFSI where it will remain until DOE removes it in accordance with its legal obligations, or until Holtec's proposed HI-STORE CISF is ready to begin accepting spent fuel. Indian Point already has 52 HI-STORM 100 systems in service storing spent fuel from all three units.

Several organizations filed requests for a hearing and to comment on the license transfer application. The requests remain pending before the Commission. If the hearing requests are granted, they will take place after the approval of the license transfer application. The order approving the application "includes a condition that the approval is subject to the Commission's authority to rescind, modify, or condition the approved transfers based on the outcome of any post-effectiveness hearing on the license transfer application." The NRC received over 400 comment submissions on the license transfer application. These comments may be found at [www.regulations.gov](http://www.regulations.gov) under docket NRC-2020-0021. The NRC staff considered the comments as part of its evaluation of the application.

Concurrent with the issuance of the order approving the license transfer, the NRC staff will also issue approval of an exemption request that will allow HDI to use funds from Indian Point 1, 2, and 3 nuclear decommissioning trusts for spent fuel management and site restoration activities, and to make these withdrawals without prior NRC notification. The exemption will only apply if and when the transaction has closed.

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## **New study shows positive implications for nuclear waste treatment**

A team of researchers at Pacific Northwest National Laboratory (PNNL), Florida International University, and the Illinois Institute of Technology are closer to understanding how technetium-99 can be treated by simple iron, which PNNL noted is inexpensive and readily available. The researchers have recently completed experiments in which nearly all – 99.8 percent – of technetium was removed from a liquid solution after being put in contact with iron particles. This occurs as the iron oxidizes or loses electrons during a chemical process called reductive removal.

Technetium is used in millions of medical imaging procedures each year and one of its radioisotopes is a useful tracer material in nuclear medicine. However, another isotope,

technetium-99, is very long-lived and poses a risk to the environment and the health of people. The element can be found in nuclear reactor waste and at former uranium processing sites used during the Cold War, such as the Hanford Site in Washington State. Per technetate, the most prevalent form of technetium, is water soluble and has a high potential for seeping in the soil and groundwater.

Technetium removal has been the subject of previous studies under controlled anaerobic conditions and/or with relatively low loadings of technetium. This team is the first study to show how the reaction between technetium and iron occurs spontaneously under aerobic conditions (the presence of free oxygen) with high concentrations of technetium, and to understand how the technetium is incorporated into the iron mineral lattice. Clusters of technetium partially incorporate into iron minerals, such as magnetite, during simultaneous iron oxidation and mineralization, which is the same incorporation mechanism that would be expected in a natural system.

Daria Boglajenko, an environmental scientist at PNNL, said "We just let them sit in contact with each other." She added, "That's what's different about this study. We did not control any parameters such as acidity or temperature or oxygen content. We just let the reaction unfold spontaneously, as it would in nature if these two compounds came in contact with each other."

The researchers continued to analyze the reaction products at the atomic scale with instruments at PNNL's Radiochemical Processing Laboratory and two US Department of Energy (DOE) Office of Science user facilities—EMSL, the Environmental Molecular Sciences Laboratory at PNNL, and the Advanced Photon Source, located at Argonne National Laboratory.

This research could be beneficial for nuclear waste cleanup. Corresponding author of the study Tatiana Levitskaia, a chemist at PNNL, stated, "The fact that this experiment was conducted in conditions that would spontaneously occur with the introduction of iron, known as zero valent iron, has positive implications for environmental cleanup efforts in the subsurface or nuclear waste treatment systems."

The team also discovered that the presence of technetium slows the oxidation of the metallic iron and its ultimate transformation from ferrihydrite to magnetite, which gives the technetium time to incorporate into the magnetite. Once embedded within the crystalline structure, the technetium does not re-oxidize back to the mobile form of per technetate. Instead, it is isolated for the long-term minimizing the risk of being released back into the groundwater or subsurface environment.

PNNL said the research team continues to work with zero valent iron. They have tested its ability to separate and sequester technetium at Hanford where cleanup will involve vitrification for long-term storage. A portion of technetium may not fully incorporate into the vitrified glass and result as

a secondary waste stream. Zero valent iron could be effective in removing technetium from these secondary wastes.

The research was supported by DOE's Office of Environmental Management and its Minority Serving Institution Partnership Program. It was performed as part of DOE's Technetium Management Project.

The article, "Spontaneous redox continuum reveals sequestered technetium clusters and retarded mineral transformation of iron," was published in the July 2020 edition of *Communications Chemistry*.

## NRC issues Confirmatory Order to APS related to dry cask storage loading

The NRC announced November 18 it has issued a Confirmatory Order to Arizona Public Service (APS) related to regulatory issues involving loading dry storage systems at the Palo Verde Nuclear Generating Station. The Confirmatory Order is being issued as a result of a successful alternative dispute resolution (ADR) mediation session in which APS made commitments to the NRC to address regulatory compliance issues that led to two apparent violations of NRC requirements.

The NRC conducted an inspection of the Palo Verde independent spent fuel storage installation (ISFSI) from March 1-5, 2020. Specifically, the inspection reviewed compliance with the requirements specified in NAC International's MAGNASTOR Final Safety Analysis Report (FSAR), and NRC regulations. Two apparent violations were identified and were considered for escalated enforcement action.

The two apparent violations involved APS's failure (1) to perform a written evaluation for a change to the NAC MAGNASTOR dry storage system and obtain a license amendment for a change in methodology for performing tip-over calculations; and (2) to adequately analyze the consequences of a hypothetical MAGNASTOR CC5 spent fuel cask tip-over accident on the Palo Verde ISFSI. The apparent violations were documented in a July 6, 2020 inspection report.

In response to the apparent violations, APS requested an ADR mediation session to resolve the issues. This was held on September 16, 2020 and a preliminary settlement agreement was reached. If APS satisfactorily completes the actions the company agreed to, the NRC will not issue a Notice of Violation and will not issue a civil penalty.

The NRC identified these same two apparent violations during an inspection of NAC International's corporate office from February 24-27 (*SF* No. 1327 September 11, 2020). NAC chose to meet with the NRC in a Pre-decisional Enforcement Conference (PEC) to provide additional information related to the NRC's findings (*SF* No. 1333 October 23, 2020).

Palo Verde ISFSI has 152 NAC-UMS storage systems in service, but the site has changed to NAC's MAGNASTOR storage system. Palo Verde began using this technology in mid-July and has at least seven in service.

The Inspection Report may be found in ADAMS using Accession No. ML20168A355, and the Confirmatory Order may be found using Accession No. ML20323A035.

## NextEra Energy applies for a second license renewal for Point Beach

The *La Crosse Tribune* reported November 18 that NextEra Energy, the operator of the Point Beach Nuclear Power Plant in Two Rivers, Wisconsin, has submitted a license application to the US NRC to renew the operating license for Point Beach 1 and 2 for an additional 20 years, helping Wisconsin to meet Governor Tony Evers' goal of carbon-free electricity by 2050. The Point Beach site is on the shore of Lake Michigan near Green Bay. The 1,200-MWe plant is Wisconsin's single largest source of energy, and it employs about 600 people plus contractors.

The original license for Unit 1 was issued in 1970 and the license was renewed in December 2005. It will expire on October 5, 2030. The original Unit 2 license was issued in 1973, renewed in December 2005 and will expire on March 8, 2033.

### Publication schedule

The next *SpentFUEL* will be published on Wednesday, November 25<sup>th</sup> since UxC offices will be closed the 26<sup>th</sup> and 27<sup>th</sup> in observance of the US Thanksgiving holiday.

### Breaking News

Germany's government is advising people to stock up on sausages and cheese. This is starting to look like the Wurst Käse scenario.

### Database?

Would you like to know where I store all these great dad jokes? They're in my dad-a-base.

## SpentFUEL Subscription Details

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