July 17–July 23, 2015

A report to members of the Nuclear Energy Institute

NUCLEAR ENERGY Overview

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Research Finds Few Obstacles to Long-Term Operations for Nuclear Plants

- ***Multi-year program researching effects of long-term reactor operations***
- ***Scientists harvest samples from decommissioned reactors for study***
- ***Early results show no technical obstacles to long-term operations***

July 23, 2015—An old piece of cable from a nuclear reactor might not seem like a unique or interesting thing—but for Jeremy Busby, it's pure gold.

Jeremy Busby

"That cable was 46 years old when we pulled it out of service," said Busby, a senior research staffer at the U.S. Department of Energy's Oak Ridge National Laboratory (ORNL) near Knoxville in east Tennessee.

"Our studies show that that particular type of cable, in that specific environment, probably has a useful life on the order of hundreds of years. And that was through a very systematic analysis. Now, we'd like to reproduce that on other cables from nuclear power plants."

That bit of cabling is helping Busby and his team to understand what happens to components, systems and structures at nuclear power plants over long periods of time. U.S. nuclear energy facilities are initially licensed to operate for 40 years. However, more than 75 reactors have had their licenses renewed for an additional 20 years. Some licensees are expected to seek second license renewals in the coming years, for an additional 20-year period of operations.

To help DOE learn whether nuclear power plants can operate safely and reliably beyond 60 years, samples from decommissioned reactors are key.

A multi-year, multi-million-dollar research effort by DOE and the Electric Power Research Institute is closely studying three parts of a nuclear power plant—the reactor vessel, concrete structures and cabling.

"Our research is focused on components that would essentially be cost-prohibitive to replace," said Tina Taylor, EPRI's director of strategic programs. "It is important to develop an understanding of any aging that might be expected beyond 60 years and to initiate aging management plans, monitoring strategies and, if needed, mitigation techniques that can be applied safely and cost-effectively."

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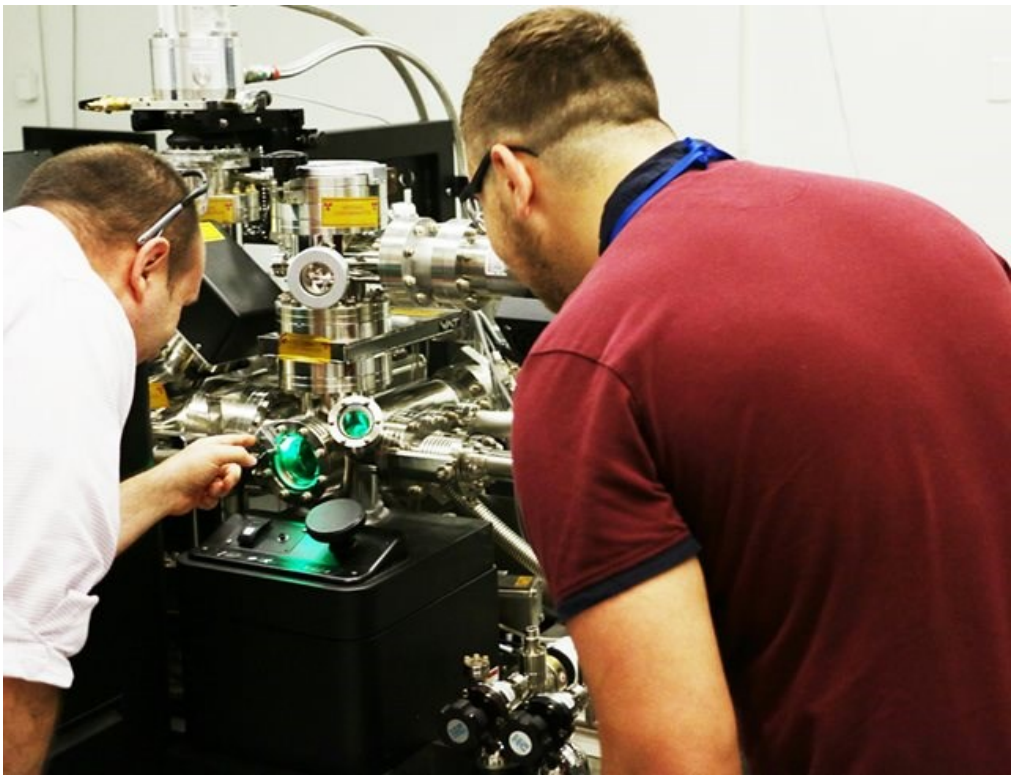
This forum will allow for comprehensive and interactive discussions of regulatory requirements and operational challenges associated with fire protection programs.

Specific topics to be discussed include industry and NRC management perspectives; emerging operating experience; fire probabilistic risk assessment; NFPA 805 transition; inspection experience; industry best practices; and research and development.

For more information and to register visit: http://www.nei.org/Conferences/Fire-Protection-Information-Forum.



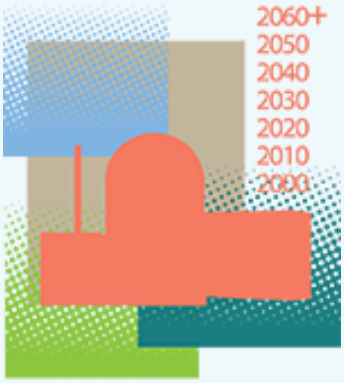
ORNL's Phil Edmondson and James Ferriday from the U.K.'s University of Sheffield use atom probe tomography to investigate the irradiation performance of low-alloy steels used in reactor pressure vessel components. [Photo: ORNL]

DOE and EPRI have "harvested" components and samples from the Jose Cabrera plant in Spain and the decommissioned Zion Station in Illinois. These materials are especially useful because they come from nuclear power plants that operated for decades—38 years for Jose Cabrera and more than 20 years for Zion. Some of these plants' components and structures were exposed to similar temperatures, radiation and other stresses as currently operating reactors.

"Zion has very valuable, relevant material," Busby said. "We have good archives on what was where. We know what this material was, what its service history was. This allows us some confidence to use it as a reliable benchmark for other things. We know it's relevant to the U.S. fleet."

Busby said DOE has harvested cabling and cable insulation from Zion and is now looking to acquire sections of the reactor pressure vessel and concrete samples.

But even a couple of decades fall far short for their purposes. To mimic longer operating periods and stresses, Busby and his colleagues take the harvested material into the lab to "bake it and break it"—bombarding samples with heat and radiation and then striking them with a hammer.



SLR Roadmap Now Available

U.S. nuclear energy facilities are licensed to operate for 40 years and licensees can apply for extensions of up to 20 years. Companies are expected to begin seeking second license renewals for up to an additional 20 years in the near future.

NEI's second license renewal roadmap documents the industry's assessment of the milestones that must be reached so the NRC can review second license renewal applications for the first companies seeking them.

The roadmap can be found at: www.nei.org/slr.

"With a thing like cable polymer insulation, just placing them in a furnace at a higher temperature will allow you to accelerate that aging and get 60 years equivalent in, say, five years," Busby said. "You have to be very careful not to cook it at too hot a temperature, or you'll change the answer. So you also have to bring in modeling to understand what the limits are and if you're looking at the right mechanism."
If harvested samples aren't available, historic databases can help fill in the gaps.

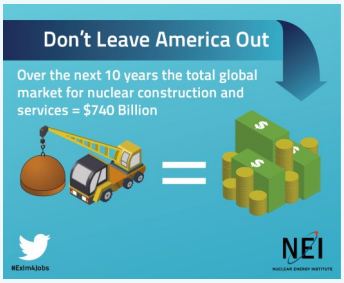
"We didn't have a lot of data [on concrete]," Busby said. "But we've built the database up. Part of that is finding other data from old government programs that wasn't public that helped us fill the database. We have a lot better feel than we did three years ago."

Keith Leonard and Maxim Gussev prepare to analyze a harvested reactor core component in ORNL's hot cell facility. [Photo: ORNL]

Much work remains to be done, but early results indicate that there are no generic technical reasons to prevent well-maintained nuclear power plants from operating beyond 60 years, EPRI's Taylor said.

She believes the current Aging Management Programs (AMPs) at plant sites are the linchpin to long-term operations.

"Much of what nuclear plant owners will need to do to continue safely operating these plants are extensions of existing AMPs," Taylor said. "These programs are specifically in place to monitor, understand, and mitigate or repair any aging-related degradation."



Busby said that, ultimately, DOE's job is to develop the best models to help industry, government and regulatory decision-makers make informed decisions.

"We want to help inform licensing decisions, and we need to make sure our data is high quality, valuable and useful," Busby said. "There's more to learn, but we've had some real successes."

NEI's Second License Renewal Roadmap has more information on what the nuclear energy industry must do for the Nuclear Regulatory Commission to issue second license renewals for the first companies seeking them. << Thaddeus Swanek, *tjs@nei.org*

Killing China Nuclear Trade Would 'Profoundly' Diminish US Global Influence

- ***NEI urges renewal of China 123 agreement***
- ***Ending nuclear trade would jeopardize up to 45,000 U.S. jobs***
- ***U.S. influence on global nuclear safety and nonproliferation would decrease***

July 23, 2015—The Nuclear Energy Institute is urgently requesting the U.S. Senate to oppose a measure that would disapprove a renewed bilateral nuclear trade agreement with China, warning that a failure to renew the agreement would have "profoundly negative impacts" on U.S. economic interests and the nation's influence on global nuclear safety, security and nonproliferation.

Congress is reviewing a "Section 123" bilateral trade agreement with China that would replace the current agreement slated to expire in December. Under the Atomic Energy Act of 1954, a Section 123 agreement is required for the export of U.S. nuclear materials and products to the burgeoning Chinese market. The current agreement expires in December.

The White House on April 21 submitted the treaty to Congress for a review period of 90 continuous session days, which could conclude as soon as July 31 or extend until September. Without a joint resolution of disapproval from both Houses, the agreement would enter into force shortly thereafter. However, on July 15, Sens. Marco Rubio (R-Fla.) and Tom Cotton (R-Ark.) introduced S.J. Res. 19 to disapprove the agreement.

A July 21 letter from NEI President and Chief Executive Officer Marvin Fertel to Senate leaders Mitch McConnell (R-Ky.) and Harry Reid (D-Nev.) explains the severe repercussions of a failure to continue U.S.-China nuclear trade.

"Without renewal, all cooperation between the world's two largest economies on commercial nuclear energy technology and construction will cease," Fertel states. With China now building 24 nuclear plants and planning to start on another 14 by 2017, it will account for "more than 40 percent" of the global construction market in coming decades. The direct economic benefit to the United States from participation in China's aggressive build program is expected to be between $70 billion and $204 billion, including annual support for up to 45,000 direct American jobs, Fertel notes.

The U.S. Energy Information Administration said China is expected to surpass South Korea and Russia in installed nuclear generating capacity by the end of the year, placing China fourth behind the United States, France and Japan. EIA said although China's nuclear share of total electricity generation is now only 2 percent, the percentage of non-fossil electricity—including nuclear, hydro and renewables—is expected to rise to 15 percent in five years and to 20 percent by 2030.

Fertel notes that continued robust commercial engagement by U.S. industry will significantly influence China's nuclear program during its decades of planned growth. "Through export of U.S. safety-advanced technology, an excellent safety culture, and operational experience, nuclear safety in China can be enhanced," NEI's letter states.

Continued U.S. commercial involvement in the Chinese nuclear industry also helps meet U.S. goals on nuclear nonproliferation, as cited by NEI in an April 2013 letter from the Center for Strategic & International Studies to President Obama.

Fertel warns that if the U.S. nuclear energy industry is forced to withdraw from the Chinese market, "other vendor nations like Russia and France will benefit," and China will accelerate its plans to indigenize its nuclear technology, "with a corresponding loss of high-paying, high-technology jobs here at home." Lastly, Fertel notes that failing to renew the Section 123 agreement would signal other nations that the United States is "not a reliable trading partner." **<<** Chris Charles, *cic@nei.org*

NRC Shows Shortcomings in Prioritizing Rulemakings

- ***Some of NRC's high- or medium-priority actions have little safety benefit***
- ***Discrepancies between "unified agenda" list and "regulatory priorities" webpage***
- ***Industry calls for consolidating lists to better assess cumulative regulatory impact***

July 23, 2015—The U.S. Nuclear Regulatory Commission needs to refine the process it uses to prioritize rulemakings to make a better distinction between proposed rules that offer high value in terms of safety or security and those that do not, the Nuclear Energy Institute said in comments on the agency's spring 2015 "unified regulatory agenda." The agenda is part of the U.S. General Services Administration's semiannual compilation of the regulatory activities of approximately 60 agencies, departments and commissions.

The NRC's list includes several rulemaking actions ranked as high- or medium-priority that would provide little safety benefit, NEI Senior Director of Strategic Programs John Butler said in a July 20 letter to the NRC. Butler also noted that the agency's prioritization process does not appear to consider the costs of the rulemakings or their alternatives.

"We encourage the NRC, as part of its efforts to address agency priorities [under Project AIM 2020] to consider ways by which the Common Prioritization of Rulemaking scoring process can be more closely tied to the safety/security benefits of proposed rulemaking action," he said.

NEI's Plant Site Emergency Contacts Database

NEI's Nuclear Plant Site Emergency Contacts database facilitates routine communications among industry professionals and effects a ready response to plant events or other developments.

It contains basic data on U.S. nuclear energy facilities, joint information centers, emergency planning zone populations and emergency plan contacts for all sites, as well as media and public information contacts.

To submit updates for a plant site or for more information, contact NEI's Jennifer Maloney at *jxm@nei.org*.

Butler noted that the commission has approved the staff's recommendations to re-baseline the agency's work as part of an effort to develop and improve work prioritization processes. This re-baselining provides a good opportunity to reassess the need for rulemakings that are of marginal value to public health and safety, Butler said. "We are hopeful that this effort will be effective in determining the need and priority of all rulemaking actions."

Butler also noted inconsistencies between the NRC's spring 2015 unified agenda and rulemaking priorities listed on the agency's website. The unified agenda includes 66 rulemakings in various stages of development—10 more than the spring 2014 agenda. However, it is missing about 15 rulemaking actions identified as high- or medium-priority through the NRC's CPR process, he said.

Butler added that the unified agenda conversely includes activities that are not listed on the regulatory priorities webpage, so that neither list shows the full scope of NRC rulemaking activities.

"We encourage the NRC to assess all planned rulemaking activities in the CPR process and to include a full listing of rulemaking actions in future regulatory agenda and as part of the 'Rulemaking Priorities' website," Butler said. "Such a comprehensive listing of all NRC rulemakings that are planned and under way is necessary to fully assess the cumulative effects of regulations." **<<** Lynne Prodoehl, *dln@nei.org*

Japan Nuclear Update

First Japanese Reactor Expected to Restart in August

Kyushu Electric Power Co.'s Sendai 1 is expected to be connected to the grid next month, according to a schedule published by the company. The reactor is expected to ramp up to full power within 10 days after connection, with commercial operations beginning by late September.

Sendai 1 is expected to become the first nuclear unit to restart in Japan since September 2013, when all of the country's reactors were shut down for inspection in the wake of the 2011 Fukushima accident. Japan's Nuclear Regulatory Authority must confirm that reactors meet enhanced safety requirements before restarting. The NRA is currently completing pre-operation inspections at Sendai 1, the final regulatory step before restart.

Kansai Electric Power Co.'s Takahama 3 progressed toward its restarting with the submission to the NRA of a 45,000-page revised engineering work document. The document is a prerequisite to pre-operational inspections.

Lasers to Aid Fukushima Fuel Removal

A joint research agreement between three major Japanese organizations promises new innovations in laser technology for the removal of fuel debris at the Fukushima Daiichi plant.

The Japan Atomic Energy Agency, Hitachi-GE Nuclear Energy and Sugino Machine signed the agreement on July 15 to research and develop new laser and water-jet technologies for cutting thick steel plates in underwater and in-reactor environments.

They will demonstrate the suitability of methods developed to aid in the retrieval of fuel debris during the decommissioning of the reactors at Fukushima Daiichi.

The contract runs until the end of March 2017. << NEI Staff, *overview@nei.org*

Milestones

Calvert Cliffs 3 COL Withdrawn

The U.S. Nuclear Regulatory Commission has formally accepted Unistar Nuclear Energy's withdrawal of its combined construction and operation license (COL) application for its Calvert Cliffs Unit 3 reactor project.

Unistar submitted the COL application in July 2007, but the NRC's review had been on partial hold since 2010, when co-owner Constellation Energy withdrew from Unistar and left the company wholly owned by France's EDF. U.S. regulations prohibit wholly foreign-owned companies from obtaining operating licenses for U.S. nuclear plants.

In May the NRC announced that it would revise its assessment of foreign ownership of U.S. nuclear facilities and develop a graded approach.

China's Fuqing 2 Achieves First Criticality

China National Nuclear Corp.'s Fuqing 2 achieved first criticality on July 22. The domestically developed Generation II CPR-1000 will undergo testing before it is connected to the grid. The reactor is one of four CPR-1000s under construction or nearing operation at the Fuqing site in Fujian province. A fifth reactor, a Generation III Hualong One design, has been under construction since March.

Second AP1000 Steam Generator in Place at Haiyang 2

The second steam generator was lifted into place this week for the Haiyang 2 AP1000 reactor being built in China. The first steam generator was put in place earlier this month.

Four Westinghouse AP1000 pressurized water reactors are under construction in China—two at Haiyang and the other two at the Sanmen site. << NEI Staff, *overview@nei.org*

Contracts

China to Build Two Reactors in Iran

The Atomic Energy Organization of Iran reports that a total of four new reactors are to be built within the next several years, with China announcing a new plan to build two nuclear reactors in the Makran region of southern Iran.

In addition to the Chinese reactors, Iran's Fars news agency said in January that Russia's Rosatom would be building two more reactors at the existing Bushehr site, with construction to begin this year. Iran's only operating commercial nuclear reactor, Bushehr 1, was completed by Rosatom.

Ukraine, China to Cooperate on Fuel Cycle

Ukraine's Nuclear Fuel Concern and China Nuclear Energy Industry Corp. have signed a memorandum of cooperation on the nuclear fuel cycle, focusing on uranium exploration, mining and processing; mine modernizations; zirconium production technologies; and the development of a Ukrainian fuel cycle. **<<** NEI Staff, *overview@nei.org*

Transitions

Industry

Harry Anthony has been named president of the Uranium Producers of America. Anthony is a senior adviser to Uranium Energy Corp., where he previously served as a board member and as chief operating officer.

Jeff Lyash has been named president and chief executive officer of Ontario Power Generation. He was most recently president of CB&I Power.

Robin Rickman has been named vice president of corporate development for molten-salt reactor developer Terrestrial Energy. He was previously director of new reactor projects at Westinghouse and is a member of the Nuclear Energy Institute's small modular reactor working group.

Government

The Department of Energy's Office of Environmental Management has selected ***Douglas E. Hintze*** as the manager of its new field office in Los Alamos, N.M. Hintze has served as assistant manager for mission support at the DOE Savannah River Operations Office since September 2012.