

Looking back at 2021

By *Nuclear News* staff

Quite a year was 2021. In the following pages, we have compiled what we feel are the past year's top news stories—please enjoy this recap from a busy year in the nuclear community. But first, what about ANS itself? Let's look at some of ANS's activities in 2021.

Publications

It was a busy year for ANS publications. The Society published two books in 2021: Volume II of *Light Water Reactor Materials* (a textbook and reference for students and researchers), and *Three Mile Island and Beyond: Memories of a Life in Nuclear Safety* (a memoir from Harold Denton, a regulator who was thrust into the spotlight as spokesperson for the Nuclear Regulatory Commission during the 1979 accident). Both books are available from the online ANS Store (ans.org/store).

In March, ANS journal *Nuclear Technology* (NT) published a special issue of selected papers from the 2019 International Topical Meeting on Probabilistic Safety Assessment and Analysis (PSA 2019). Also in March, the proceedings for the Consortium for Advanced Simulation of Light Water Reactors Virtual Meeting was announced as available, and the proceedings for the International Topical Meeting in Advances in Thermal Hydraulics came out in April.

June saw the availability of the proceedings for the Conference on Nuclear Training and Education: A Biennial International Forum (CONTE 2021). Back with journals, NT published a special issue of selected papers from the 2020 Nuclear and Emerging Technologies for Space Topical Meeting (NETS 2020) in June and followed that in July with a fully open access special issue on the MOOSE Multiphysics Computational Framework. NT wasn't done: in September, the journal published a special issue on the Nuclear, Humanities, and Social Science Nexus—a truly cross-disciplinary collection.

In October, *Nuclear Science and Engineering* paid tribute to the National Criticality Experiments Research Center with a special issue, while *Fusion Science and Technology's* October–November issue featured selected papers from the 24th Topical Meeting on the Technology of Fusion Energy. November also saw the publication of a unique issue of NT

on the Manhattan Project Nuclear Science and Technology Development at Los Alamos National Laboratory (see page 82).

Meetings

The ANS meetings during the year were many: CONTE 2021 in February; NETS 2021 and the 2021 ANS Student Conference in April; the 2021 ANS Virtual Annual Meeting in June; the Utility Working Conference and Vendor Technology Expo in August; Mathematics & Computation 2021 and the 2021 International Congress on Advances in Nuclear Power Plants in October; PSA 2021, the Young Professionals Congress 2021, and the Virtual Graduate School Fair in November; and the 2021 ANS Winter Meeting and Technology Expo in November–December.

Webinars and policy statements

Altogether, ANS produced 31 webinars on a variety of topics over the past 12 months. You can find on-demand recordings of the webinars on the ANS website at ans.org/webinars. Online, you also can find the three ANS position statements produced in 2021 (ANS-83, ANS-51, and ANS-18), along with all historical ANS position statements. Just visit ans.org/policy/statements.

Standards

For ANS standards, the following were published last year:

- ANSI/ANS-3.14-2021, *Process for Infrastructure Aging Management and Life Extension of Non-Reactor Nuclear Facilities* (new standard)
- ANS-56.8-2020, *Containment System Leakage Test Requirements* (revision of ANS 56.8-2002 [R2016])
- ANSI/ASME/ANS RA-S-1.4-2021, *Probabilistic Risk Assessment Standard for Advanced Non-Light Water Reactor Nuclear Power Plants* (new standard)
- ANSI/ANS-55.1-2021, *Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants* (revision of ANS-55.1-1992 [R2017])

The following standards projects were initiated:

- ANS-2.18, *Evaluating Radionuclide Transport in Surface Water for Nuclear Power Sites* (new standard)
- ANS-2.32, *Remediation of Radioactive Contamination in the Subsurface at Nuclear Power Plants* (new standard)

- ANS-2.36, *Accident Analysis for Aircraft Crash into Reactor and Nonreactor Nuclear Facilities* (new standard)
- ANS-55.1, *Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants* (revision of ANS-55.1-1992 [R2017])
- ANS-55.6, *Liquid Radioactive Waste Processing System for Light-Water Cooled Reactor Plants* (new standard/historical revision of ANS-55.6-1993 [R2007])
- ANS-60.1, *Civilian Nuclear Export Controls* (new standard)

Members

This past year, we lost several prominent members of the nuclear community, including Peter Lyons, 78, ANS Fellow and member since 2003, a former NRC commissioner and assistant secretary of energy for nuclear energy; Don Olander, 89, ANS Fellow and member since 1961, longtime faculty member at the University of California–Berkeley and coauthor of two ANS-published books (*Light Water Reactor Materials*, Volumes I and II); Max Carbon, 99, ANS Fellow and member since 1959, founding chair of the University of Wisconsin–Madison’s Department of Nuclear Engineering and former member of the NRC’s Advisory Committee on Reactor Safeguards; and Hans Fauske, 85, ANS Fellow and member since 1973, widely considered to be a leading authority on fast breeder reactor safety and a coauthor of the ANS-published book *Experimental Technical Bases for Evaluating Vapor/Steam Explosions in Nuclear Reactor Safety*.

Other ANS members who left us in 2021 include Norman Francis, 98; Jeffrey Gorman, 85; Bill Teer, 86; Jimmy Crocker, 86; John Detandt, 64; David Lubitz, 95; Russell Starkey, 78; Russell Mosteller, 75, an ANS Fellow; Zoltan Rosztoczy, 87; Bernard Wehring, 84, an ANS Fellow; Charles Flanagan, 90; Charles Bergeron, 76; E. Charles Crume, 89; Nathan Hurt, 100; John Ireland, 70; Richard Eckert, 92; Gary Hedrick, 72; Hikido Katsumi, 97; Raymond Berzins, 86; A. Ziya Akcasu, 96; D. Maxwell Ellett, 99; Wesley Pearl, 100; Robert Lightle, 98; Edward Pulver, 86; Albert Wilson, 94; Joshua Molgaard, 41; Kamal A. El-Shiekh, 85; and Carleton Bingham, 92.

In addition, George Schultz, 100, the former U.S. secretary of state who was honored during the 2020 Virtual Winter Meeting, passed away in February 2021. A new ANS scholarship was created in his name—the George P.

Schulz and James W. Behrens Graduate Scholarship, which supports students in the Washington, D.C., area who are focusing on science and technology policy.

A final word

A heartfelt thank you to our readers—without you, *Nuclear News* would cease to exist. Your support in 2021 sends us strong into 2022. Now read on to revisit some of the top news stories from the year just left behind.

Continued



January 2021

Biden picks Hanson for NRC top spot



Christopher Hanson participates in a commission briefing on the agency's response to the COVID-19 pandemic. (Photo: NRC)

President Biden designated Christopher T. Hanson the 18th chairman of the Nuclear Regulatory Commission following the January 20 resignation of Kristine Svinicki, the longest-serving commissioner in the agency's history (2008–2021). Hanson had been nominated for a commission seat by President Trump in February 2020 and confirmed by the Senate in May, with a term expiring on June 30, 2024. Prior to joining the NRC, Hanson served as a staff member on the Senate Appropriations Committee's Energy and Water Subcommittee under Sen. Dianne Feinstein (D., Calif.), and before that as a senior advisor in the Department of Energy's Office of Nuclear Energy.

February 2021

Radiation release and reactor shutdown puts NIST neutron research on hold

2021 proved to be a lost year for neutron measurement studies at the NIST Center for Neutron Research (NCNR) after elevated radiation levels were detected on February 3 as the NCNR research reactor was powered up following a scheduled refueling and maintenance outage. Investigations by the Nuclear Regulatory Commission and NIST later concluded that a fuel cladding failure led to the shutdown of the 20-MWt research reactor in Gaithersburg, Md. In October, NIST requested permission to restart the

Energy secretary nominee Granholm comments on Yucca Mountain

Jennifer Granholm, the nominee to lead the Department Energy, told the Senate Energy and Natural Resources Committee on January 27 that the Biden administration disapproved of Yucca Mountain as the country's nuclear waste repository, setting the nuclear waste management policy for the new administration. Granholm said that the administration would pursue a consent-based strategy as proposed by President Barack Obama's Blue Ribbon Commission on America's Nuclear Future.



Delay announced for U.K. nuclear project

The unfortunate effects of the COVID-19 pandemic on nuclear new-build projects weren't restricted to Georgia Power's Vogtle site: EDF Energy reported on January 27 that the expected startup date for Unit 1 at its Hinkley Point C site in England was being pushed back from late 2025 to June 2026. "In these very challenging circumstances, it's a considerable achievement that we hit 18 of our 20 milestones [in 2020], with the last two not far behind. That has been done with fewer people on site and with considerable disruption among our suppliers," said Stuart Crooks, the project's managing director.



NCNR Guide Hall. (Photo: NIST)

reactor, contingent upon improving operator training and meeting 18 identified corrective actions.

Uranium conversion facility to reopen

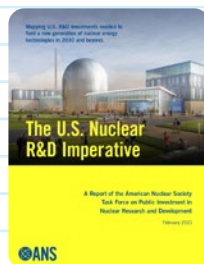


The Metropolis Works plant. (Photo: Honeywell)

Honeywell announced plans on February 9 to resume production at its Metropolis Works uranium conversion facility in 2023. The Charlotte, N.C.–based company said that it planned to hire 160 full-time employees, as well as contractors, by the end of 2022. Idled in early 2018 because of a worldwide oversupply of uranium hexafluoride, the Metropolis, Ill., plant is the nation’s sole uranium conversion facility. In March 2020, the NRC renewed the facility’s license for 40 years, allowing operations at the plant to 2060.

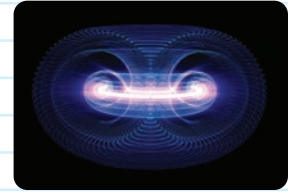
ANS task force assesses U.S. nuclear energy R&D funding for 2020s

A task force commissioned by the American Nuclear Society published an assessment in February of U.S. nuclear energy research and development funding needs for the 2020s. The report, *The U.S. Nuclear R&D Imperative*, outlined the level of federal investments required to enable a commercial scale-up of U.S.-designed advanced reactors in the 2030s while maximizing nuclear energy’s contributions to decarbonization, economic growth, and U.S. influence in global nuclear safety and standards.



A new goal for fusion: 50 MWe for the U.S. grid by 2035–2040

Coordinated federal and private industry investments could yield an operational fusion pilot plant in the 2035–2040 time frame, according to *Bringing Fusion to the U.S. Grid*, a consensus study report released on February 17 by the National Academies of Sciences, Engineering, and Medicine Committee on the Key Goals and Innovations Needed for a U.S. Fusion Pilot Plant. Developed at the request of the Department of Energy, the report identifies key goals, innovations, and investments needed to develop a U.S. fusion pilot plant that can serve as a model for producing electricity at the lowest possible capital cost.



Bulgaria to evaluate NuScale SMRs for Kozloduy

Portland, Ore.–based NuScale Power signed a memorandum of understanding with Kozloduy Nuclear Power Plant–New Build Plc (KNPP-NB) in February to discuss the possible deployment of NuScale’s small modular reactor technology at Bulgaria’s Kozloduy site. NuScale agreed to support KNPP-NB as it analyzes the suitability of the American firm’s SMRs for Kozloduy, located in northwest Bulgaria. According to NuScale on February 17, the analysis will include the development of a project timeline “with milestone deliverables for a feasibility study” and a project-specific cost estimate, as well as engineering, planning, licensing, and other activities.



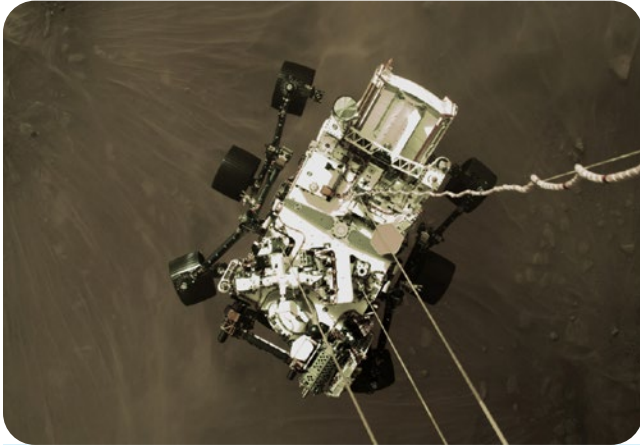
Bulgaria’s Kozloduy nuclear plant.

Continued

February, continued

NASA's Perseverance lands radioisotope-powered science on Mars

NASA mission control and space science fans around the world celebrated the safe landing of the Mars 2020 Perseverance rover on February 18 after a journey of 203 days



A still image captured as NASA's Perseverance rover touched down on Mars on February 18. The cylindrical, finned RTG is visible at the back of the rover.

March 2021

Marking the 10th anniversary of Fukushima

March 11 marked the 10th anniversary of the earthquake and tsunami that killed approximately 19,000 people in Japan and subsequently triggered the Fukushima Daiichi accident. The International Atomic Energy Agency rated Fukushima as a level 7 major accident, the highest on its scale. As a result of the accident, Japan made the decision to reduce its use of nuclear power. Writing on the anniversary of the accident, ANS President Mary Lou Dunzik-Gougar and executive director/CEO Craig Piercy said that the country continued to pay the price for shutting down its nuclear plants, noting that since 2011, scientists estimate higher carbon emissions from Japan's increased fossil fuel use caused over 4,000 premature deaths per year from air pollution. *Nuclear News* published its March issue with the theme "Fukushima: 10 Years On."

and 293 million miles. Only radioisotope thermoelectric generators (RTGs) can provide the long-lasting, compact power source that Perseverance needs to carry out its long-term exploratory mission. Perseverance carries an RTG powered by the radioactive decay of plutonium-238 that was supplied by the Department of Energy with contributions from Idaho National Laboratory, Oak Ridge National Laboratory, and Los Alamos National Laboratory.

Granholt confirmed as new DOE head

Jennifer Granholt was confirmed by the Senate as the nation's 16th energy secretary on February 25, becoming the second woman (after the Clinton administration's Hazel O'Leary) to hold the post. The final tally was 64-35, with several Republicans joining Democrats in support of the former Michigan governor. During her January 27 confirmation hearing, Granholt had confirmed the Biden administration's opposition to Yucca Mountain as the repository for the nation's used nuclear fuel. Granholt described the storage issue as a "sticky situation."

New Russian unit up and running

Unit II-2 at the Leningrad nuclear power plant entered commercial operation on March 22, bringing the total number of operating power reactors in the Russian fleet to 38. The 1,066-MWe unit is one of two Russian-designed



Unit II-2 at Russia's Leningrad plant. (Photo: Rosenergoatom)

Generation III+ VVER-1200 pressurized water reactors now in service at the plant, the other, Unit II-1, having begun commercial operation in October 2018. Leningrad II-2 replaces Leningrad I-2, a 925-MWe RBMK-1000 light water-cooled graphite-moderated reactor that permanently ceased operation in November 2020 after 45 years of service. Fuel loading for the new unit commenced in July 2020, followed by initial criticality in August and grid connection in October. On March 10, Russia's nuclear regulator, Rostechnadzor, confirmed the reactor's compliance with design documentation, technical regulations, and energy efficiency requirements

April 2021



Barakah-1 (right) is now providing the UAE with reliable electricity around the clock. (Photo: ENEC)

First UAE unit begins commercial operation

Emirates Nuclear Energy Corporation (ENEC) announced on April 6 that Unit 1 at the United Arab Emirates' Barakah nuclear power plant had begun commercial operation. Barakah-1 is one of four 1,345-MWe APR-1400 pressurized water reactors at the facility, which is operated by ENEC subsidiary Nawah Energy Company. The unit had achieved initial criticality on August 1, 2020. The World Nuclear Association's director general, Sama Bilbao y León, offered her congratulations on the milestone, saying, "When, in a few short years, the remaining three reactors join Unit 1, the Barakah plant will supply 25 percent of the electricity in the United Arab Emirates, a major contribution to the UAE's plans to transition to a low-carbon energy system.

Ohio bill repealing nuclear subsidies signed by governor

The final nail in the coffin of Ohio's controversial nuclear subsidies was driven home on March 31 when Gov. Mike DeWine signed H.B. 128—a bill that stripped those subsidies from H.B. 6, the scandal-scarred piece of legislation that DeWine had signed into law in 2019 to aid Ohio's economically challenged nuclear facilities, Davis-Besse and Perry. The new law retained H.B. 6's subsidies for utility-scale solar projects, however, and for two coal plants (one in Ohio, one in Indiana).

Nine-month outage preps the Advanced Test Reactor for years of research

After a core internals changeout at the Advanced Test Reactor (ATR) at Idaho National Laboratory, the one-of-a-kind pressurized water test reactor—which is operated at low pressures and temperatures as a neutron source—will



Operations staff prepare to remove the reactor's old neck shim housing, which provides structural support for the rest of the ATR core assembly. (Photo: Peter Ritchie, INL)

Continued

April, continued

be ready for another decade or more of service, with the potential for more experimental capacity in years to come. The project began in April, and the ATR is expected to be back in service in early 2022. The neutrons produced by the ATR are in high demand, especially since the permanent shutdown of Norway's 60-year-old Halden reactor in 2018. Pressure has grown to expand the testing capacity of the ATR, which is already in its sixth decade of operations.

Next decade of DOE cleanup outlined in updated strategic vision

In April, the Department of Energy's Office of Environmental Management (EM) released its *Strategic Vision 2021–2031*, a blueprint to the cleanup program's anticipated accomplishments over the next decade. The new strategic vision, which was developed with feedback from regulators, tribal nations, local communities, and other partners, updates EM's previous report, *A Time of Transition and Transformation: EM Vision 2020–2030*, released in March 2020.



A radiological worker surveys the inside of a TRUPACT-II containment lid during waste handling operations at the Waste Isolation Pilot Plant. (Photo: DOE)

35 years later, Chernobyl continues to warn, inspire

Reactor No. 4 of the Chernobyl nuclear power plant in Ukraine exploded on April 26, 1986, sending radioactive material into the environment and across Europe. As of the 35th anniversary, Ukrainians were looking to the site of the world's worst nuclear disaster "for inspiration, solace,



The New Safe Confinement in final position over reactor 4 at the Chernobyl nuclear power plant in 2017. (Photo: Tim Porter)

and income," according to an ABC News/Associated Press report. The report also highlighted the present-day work being done to decommission all four of Chernobyl's reactors by 2064 and the increase in tourism to the site that has occurred since HBO aired its 2019 miniseries on the accident.

Extension of subsidies for Hope Creek, Salem approved

New Jersey's Board of Public Utilities voted unanimously on April 27 to extend, for an additional three years, the zero-emission certificate (ZEC) program benefitting the state's two operating nuclear power plants, Hope Creek and Salem. The two facilities produce more than 90 percent of New Jersey's carbon-free electricity and about 40 percent of its overall power. Public Service Enterprise Group, owner of Hope Creek and co-owner, with Exelon, of Salem, had filed applications to extend the ZECs in October 2020, citing the state's clean energy policy, the lower cost of ZECs compared with solar and offshore wind subsidies, and the continued deterioration of power markets.



The Hope Creek nuclear power plant. (Photo: Peretzp)

Indian Point closes, ending some 60 years of clean power generation

The long list of U.S. nuclear plants prematurely closed in recent years became a bit longer on April 30 when the last reactor at the Indian Point Energy Center, Unit 3, powered down for the final time. The shutdown, at 11 p.m. local time, marked the end of nearly 60 years of zero-carbon electricity generation at the Buchanan, N.Y., facility. The plant's closure was the result of a settlement agreement reached in 2017 by Entergy and the State of New York and environmental groups opposed to Indian Point's operation. According to Entergy on April 28, its decision to accede to the shutdown was driven by a number of factors, including "sustained low current and projected wholesale energy prices that reduced



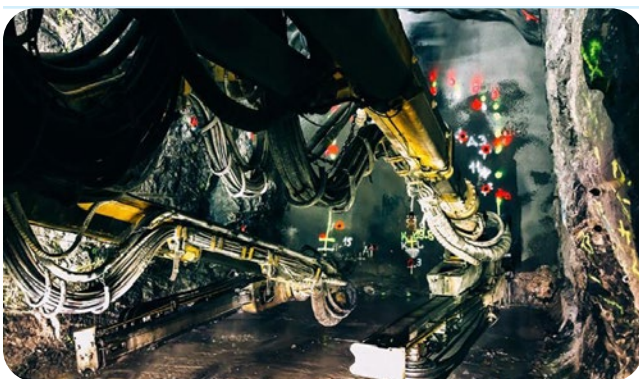
Indian Point-3's turbine hall and generator. (Photo: Entergy)

revenues." Indian Point's Unit 2 reactor ceased operation exactly one year previous, on April 30, 2020. (The plant's Unit 1 reactor operated from 1962 to 1974.)

May 2021

Excavation of first deposition tunnels begins at Finnish repository

Posiva Oy, the company responsible for the disposal of Finland's spent nuclear fuel, announced on May 7 that it had begun excavating the first disposal tunnels at the Onkalo deep geologic repository near the Olkiluoto nuclear power plant. When it begins disposal operations, expected in the mid-2020s, Onkalo will be the first geological disposal facility in the world for spent nuclear fuel. Posiva, which is owned by Finnish nuclear plant operators Fortum and Teollisuuden Voima, said that the start of construction was a significant milestone, as it came after years of research and development activities on methodology for rock construction.



A deposition tunnel is excavated into bedrock at Finland's Onkalo facility. (Photo: Posiva)



Plastic waste on a Galapagos beach. Sunlight, wind, and waves break down large plastic debris into microplastics. (Photo: F. Oberhaensli/IAEA)

Nuclear techniques to monitor—and prevent—plastic pollution

The world's oceans are expected to contain one metric ton of plastic for every three metric tons of fish by 2025, and by 2050 there may be more plastic than fish, based on current trends. That's according to the International Atomic Energy Agency, which in May announced a new program—NUclear TEChnology for Controlling Plastic Pollution (NUTEC Plastics). The program is expected to enhance laboratory capabilities to use nuclear technology to track and quantify microplastics and cocontaminants in oceans and to reduce the volume of plastic waste by using gamma and electron beam radiation technologies to complement traditional plastic recycling methods.

Continued

May, continued



The Kewaunee nuclear power plant in Wisconsin. (Photo: Dominion Generation)

EnergySolutions tapped to decommission Kewaunee power plant

Utah-based EnergySolutions and Dominion Energy announced in May an agreement under which EnergySolutions would acquire the closed Kewaunee nuclear power plant for prompt decommissioning. Located about 30 miles southeast of Green Bay, Wis., the single-unit, 574-MWe pressurized water reactor was shut down in May 2013 for financial reasons, and its spent fuel was moved to dry storage in 2017. If approved by regulators, EnergySolutions would complete the decommissioning of Kewaunee, releasing the site for unrestricted use in less than nine years.

June 2021

DOE enlists nuclear power plants in Hydrogen Shot goal

Energy secretary Jennifer Granholm launched the Department of Energy's Hydrogen Shot goal on June 7 to reduce the cost of clean hydrogen by 80 percent to \$1 per kilogram within one decade, including hydrogen produced through electrolysis or thermochemical processes using the electricity and heat from a nuclear power plant. Just four months later, on October 7, the DOE and Arizona Public Service announced a \$20 million DOE award for APS to install an electrolyzer at the three-unit Palo Verde plant, an investment decision based on analysis conducted under the DOE's H2@Scale program, which also supports hydrogen demos at Energy Harbor's Davis-Besse, Exelon's Nine Mile Point, and Xcel Energy's Prairie Island.

Entergy completes transfer of Indian Point to Holtec for decommissioning

May 28 saw the completion of the transfer of the New York's Indian Point nuclear power plant from Entergy Corporation to Holtec International and its subsidiaries for decommissioning. Under the asset transfer deal, Holtec Indian Point became owner of the closed plant, with Holtec Decommissioning International serving as the site's license holder and decommissioning operator. Holtec said it expects to complete the bulk of decommissioning work at Indian Point by 2033 at a cost of around \$2.3 billion. Indian Point joins Pilgrim and Oyster Creek in Holtec's growing fleet of nuclear power plants undergoing decommissioning, which will also include Palisades and Big Rock Point in a proposed sale set for 2022.



The new sign at the Indian Point Energy Center. (Photo: Holtec)



The "1 1 1" Hydrogen Shot targets clean hydrogen priced at \$1 per kilogram within one decade. (Photo: Shutterstock)



The Dungeness B nuclear power station, in Kent, southeastern England. (Photo: geograph.org.uk)

EDF retires U.K.'s Dungeness plant

EDF Energy on June 8 announced its decision to move the Dungeness B nuclear plant into its defueling phase “with immediate effect,” rather than proceed with a restart later in 2021. The company had previously stated that it intended to operate the facility, located in southeastern England, until at least 2028. Dungeness B, which houses twin 545-MWe advanced gas-cooled reactors (AGRs), had been in an extended outage since September 2018, during which time EDF had dealt with “a range of unique, significant, and ongoing technical challenges that are not found at the other six AGR power stations,” according to the company.

July 2021

Reps. Levin, Davis form bipartisan caucus to tackle stranded spent fuel issue

Hoping to drive progress on the safe storage, transportation, and disposal of spent nuclear fuel across the country, Reps. Mike Levin



(D., Calif.) and Rodney Davis (R., Ill.) in July formed the Spent Nuclear Fuel Solutions Caucus in the U.S. House of Representatives. The lawmakers said the caucus will serve as a forum where House members can come together to make headway on the issue, regardless of whether or not they have a preferred solution. Along with Sen. Edward J. Markey (D., Mass.), Levin also introduced in September the Nuclear Waste Task Force Act, legislation intended to establish a new task force to consider the implications of amending the Atomic

Centrus approved for HALEU production

Centrus Energy Corporation announced on June 14 that the Nuclear Regulatory Commission had approved the company’s license amendment request to produce high-assay low-enriched uranium at its Piketon, Ohio, enrichment facility. The Piketon plant is now the only U.S. facility licensed to enrich uranium up to 20 percent uranium-235, and it is expected to begin demonstrating HALEU production early in 2022. HALEU-based fuels will be required for most of the advanced reactor designs currently under development and may also be used in next-generation fuels for the existing fleet of reactors in the United States and around the world, according to Centrus.



Centrus’s American Centrifuge Plant, in Piketon, Ohio. (Photo: Centrus Energy)

Energy Act of 1954 to remove exemptions from environmental laws for nuclear waste.

NRC stops work on spent fuel reprocessing rule

Citing costs and a lack of industry interest, the Nuclear Regulatory Commission decided in July to discontinue its rulemaking for the reprocessing of spent nuclear fuel. The rulemaking would have amended the NRC’s regulations, adding a new regulatory framework for licensing commercial reprocessing facilities. “The NRC’s decision to discontinue this rulemaking is based on the estimated costs to conduct the rulemaking and the limited interest expressed or expected from industry to submit an application for any type of facility involving reprocessing technologies in the near term,” the NRC said in a July 29 *Federal Register* notice.

Continued

July, continued

China's 51st power reactor enters operation

China continued in July its relentless march toward the top of the list of nations with the most power reactors. China General Nuclear Power Group announced on July 31 that Unit 5 at the Hongyanhe plant in Liaoning Province had begun commercial operation, giving China 51 commercial-scale power reactors, only five fewer than France, which currently sits at the number-two spot on the list with 56 operating reactors. And number 52 shouldn't be too far behind. Structural integrity and integrated leak rate tests for Fuqing-6, located in Fujian Province, were completed on July 20, according to China Nuclear Power Engineering Company, the China National Nuclear Corporation subsidiary in charge of construction, equipment procurement, trial testing, and operational maintenance at CNNC plants.



Workers in the control room of the Honghanye-5 reactor. (Photo: Liaoning Hongyanhe Nuclear Power Company)

August 2021



A rendering of Ultra Safe Nuclear Corporation's micro modular reactor as proposed for construction on the University of Illinois-Urbana-Champaign campus. (Graphic: USNC)

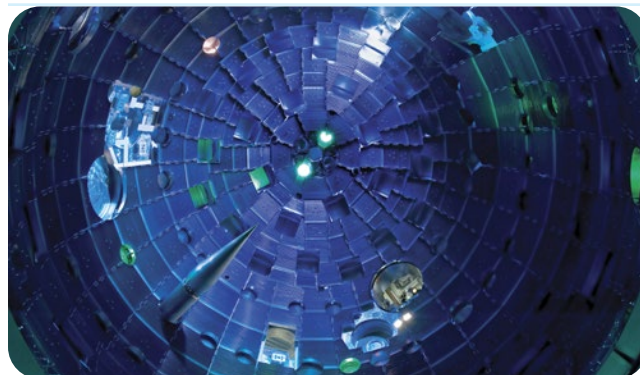
University infrastructure bill calls for investments in advanced nuclear, workforce

A bipartisan group of legislators introduced the National Nuclear University Research Infrastructure Reinvestment Act (H.R. 4819) in early August. In addition to funding upgrades to existing infrastructure and establishing regional or subregional consortia, the bill, introduced in the House of Representatives by Reps. Anthony Gonzalez (R., Ohio), Sean Casten (D., Ill.), Peter Meijer (R., Mich.), and Bill Foster (D., Ill.), would require the Department of Energy to create a new program to deploy "no more than four new research reactors" at U.S. universities to

demonstrate advanced and micronuclear reactor concepts, medical isotope production reactors, and other critical research infrastructure.

National Ignition Facility achieves record-breaking yield

Lawrence Livermore National Laboratory researchers on August 8 focused ultraviolet laser energy onto a target the size of a pencil eraser and generated more than 10 quadrillion watts of fusion power for 100 trillionths of a second. As rumors spread in the fusion research community about the yield of more than 1.3 megajoules of energy from an



NIF target chamber. (Photo: LLNL)

experiment at the National Ignition Facility (NIF), the moment at the “threshold of fusion ignition” was celebrated in an August 17 announcement by LLNL. The yield was eight times greater than that achieved from experiments conducted earlier in 2021 and 25 times more than NIF’s 2018 record yield. Experiments in pursuit of fusion ignition

September 2021



The arrival of the first central solenoid module at the ITER site was marked by a small ceremony with virtual participation from U.S. ITER, General Atomics, and the Department of Energy.

First central solenoid module arrives at ITER site in France

After a decade of design and fabrication, General Atomics (GA) shipped the first module of the central solenoid—the largest of ITER’s magnets—from the GA Magnet Technologies Center near San Diego, Calif., to the site in southern France where 35 partner countries are collaborating to build the world’s largest magnetic confinement fusion tokamak. GA announced in June that the module was beginning its journey on a heavy transport truck to Houston, Texas, where it was placed on an ocean-going vessel for shipment to southern France and then transported by ground to the ITER site. The module arrived at the site in early September. Fully assembled, the six-module central solenoid will be 18 meters tall and 4.25 meters wide and will weigh 1,000 metric tons.

are an important part of NIF’s central mission—providing data for the National Nuclear Security Administration’s Stockpile Stewardship Program—and could also advance high-energy-density science and make it possible to use inertial confinement fusion as a power source.

Spent fuel facility receives NRC license days after Texas moves to ban it

The Nuclear Regulatory Commission issued a license on September 13 to Interim Storage Partners (ISP), a joint venture of Waste Control Specialists and Orano USA, to construct and operate a consolidated interim storage facility for spent nuclear fuel in Andrews, Texas. Just four days earlier, on September 9, Texas governor Greg Abbott signed a bill to block such a facility from being built in the state, likely leaving the fate of the facility up to the courts. The ISP license is the second one issued by the NRC for a consolidated storage facility for spent nuclear fuel. The first was issued to Private Fuel Storage in 2006, but the facility was never constructed. The NRC is currently reviewing an application from Holtec International for a similar facility proposed for Lea County, N.M., with a decision on that application expected in January 2022.

Illinois governor signs energy bill aiding nuclear plants

In an hour-long ceremony held September 15 at Chicago’s Shedd Aquarium amid some fanfare, Illinois governor J.B. Pritzker signed into law the Climate and Equitable Jobs Act



Illinois governor J.B. Pritzker appreciates applause at the signing event for the state’s new energy bill.

Continued

September, continued

(S.B. 2408)—a sweeping overhaul of the state’s energy policies aimed at phasing out fossil-fuel power generation and placing Illinois on a path to become a 100 percent carbon-free energy producer by 2050. Passed earlier in the month by a Democrat-dominated Illinois legislature, the bill included \$694 million in assistance to three of Exelon’s struggling nuclear plants—Braidwood, Byron, and Dresden.



The headframe and buildings at the Gorleben salt dome in Germany. (Photo: Wikimedia Commons)

Eliminated as a repository site, Germany’s Gorleben salt mine to be closed

The German government announced on September 17 that it was closing the Gorleben salt mine in the Wendland region of Lower Saxony, officially removing the site from

consideration as a repository for radioactive waste. Gorleben became a target of antinuclear protests after being proposed as a potential repository in the 1970s.

Bruce Power receives regulatory approval to produce medical Lu-177

Bruce Power’s eight-unit CANDU nuclear power plant in Ontario, Canada, became the first power reactor globally to commercially produce the medical radioisotope lutetium-177 after receiving approval from the Canadian Nuclear Safety Commission on September 24. Isogen, a joint venture between Framatome and Kinectrics, will produce Lu-177 at Bruce for use in targeted cancer treatments that destroy cancerous cells while limiting damage to surrounding healthy tissue and organs.



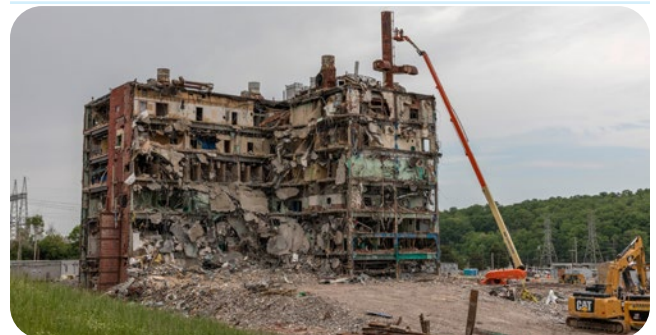
The Bruce nuclear power plant in Ontario, Canada. (Photo: Bruce Power)

October 2021

DOE awards nearly \$30 billion in Oak Ridge and Savannah River contracts

The Department of Energy’s Office of Environmental Management (EM) announced the award in October of two contracts for work at the department’s Oak Ridge Reservation in Tennessee and the Savannah River Site in South Carolina. United Cleanup Oak Ridge was awarded a 10-year, \$8.3 billion contract for the cleanup of the Oak Ridge Reservation in Tennessee, including the Y-12 National Security Complex, Oak Ridge National Laboratory, and the East Tennessee Technology Park (ETTP). The Oak Ridge Reservation Cleanup Contract replaces the ETTP cleanup contract held by URS/CH2M Oak Ridge that expires on January 31, 2022. Meanwhile, Savannah River Mission Completion was awarded the Integrated Mission Completion Contract at the Savannah River Site.

The contract has an estimated contract ceiling of approximately \$21 billion over a 10-year ordering period, with cost-reimbursement and fixed-price task orders to define the contract performance.



EM crews demolish Building 9207 in the former Y-12 Biology Complex at Oak Ridge. (Photo: DOE)



An F-35A Lightning II takes off from Eielson Air Force Base in Alaska. (Photo: U.S. Air Force/Airman 1st Class Jose Miguel T. Tamondong)

Microreactor planned for U.S. Air Force base in Alaska

The Department of the Air Force has selected Eielson Air Force Base as the site of a stationary microreactor that “will provide the installation with a clean, reliable, and resilient nuclear energy supply technology for critical national security infrastructure,” the department announced on October 15. The microreactor pilot program was initiated in response to the National Defense Authorization Act for Fiscal Year 2019 requirement to identify potential locations to site, construct, and operate a microreactor by the end of 2027. The government was considering a power purchase agreement contract for a period of up to 30 years for a microreactor that would be commercially owned and operated and licensed by the Nuclear Regulatory Commission.

Georgia Power again pushes back Vogtle project start dates

In what has become for nuclear advocates an all-too-familiar refrain, Georgia Power on October 21 announced another delay to the Vogtle nuclear expansion project. The new schedule projected a Unit 3 in-service date in the third



Vogtle-4 containment as it appeared in September. (Photo: Georgia Power)

quarter of 2022 and a Unit 4 in-service date in the second quarter of 2023, representing a three-month shift for each unit. This latest schedule revision, according to the company, was primarily due to the need for additional time to address continued construction challenges and to allow for the comprehensive testing necessary to fully meet quality and safety standards. Georgia Power noted that Unit 3’s fuel load could occur as early as the first quarter of 2022 but added that a fuel load date as late as May 2022 should still support a third-quarter 2022 in-service date.



“A cutaway view of an EPR. (Image: EDF)”

France submits EPR offer to Poland

French utility giant Électricité de France threw its chapecau into the ring in October to become the large-reactor supplier for Poland’s embryonic nuclear power program, joining U.S.-based Westinghouse Electric Company and its AP1000 technology. EDF submitted a nonbinding preliminary offer to the Polish government on October 12 for the construction of four to six EPR reactors, representing a total installed capacity of 6.6 to 9.9 GWe across two to three sites. An EPR program would “benefit from significant synergies with other EPR projects across Europe, in the spirit of a long-term European partnership between the Polish and French nuclear industries,” EDF said.

Continued

November 2021

U.S., Romania team up to build SMR plant

John Kerry, the Biden's administration's special presidential envoy for climate, joined Romanian president Klaus Iohannis on November 2 on the sidelines of the COP26 Conference in Glasgow to announce plans to build a first-of-a-kind small modular reactor plant in Romania. The SMR technology is to be provided by NuScale Power, based in Portland, Ore. NuScale will partner with the state-owned Romanian utility Nuclearelectrica on a six-module plant. According to a statement from the White House, the partnership will initially create over 3,700 U.S. and Romanian jobs, including possible union jobs, with the potential to create 30,000 jobs as the project grows.

First complete accident tolerant fuel assembly in operation at Calvert Cliffs

The nuclear industry's first 100 percent accident tolerant fuel assembly went into operation at Exelon Generation's Calvert Cliffs plant, the Department of Energy announced on November 8. The advanced fuel will operate in the reactor for the next four to six years and will be routinely inspected to monitor its performance. The lead fuel assembly was fabricated at Framatome's manufacturing facility in Richland, Wash., under a 2019 contract with Exelon. Inserted into Unit 2 during the reactor's spring refueling outage, the assembly contains 176 chromium-coated fuel rods and chromia-enhanced pellets that improve tolerance to changes in the reactor core and are expected to reduce corrosion and hydrogen production under high-temperature conditions, according to the DOE.

French president calls for new nuclear construction

In a televised address on November 9, French president Emmanuel Macron announced his government's intention to build new large nuclear reactors in France to address growing energy and environmental challenges. "If we want to pay for our energy at reasonable rates and not depend on foreign countries, we must both continue to save energy and invest in the production of carbon-free energy on our

soil," said Macron. "This is why, to guarantee France's energy independence, to guarantee our country's electricity supply, and to reach our goals— notably carbon neutrality in 2050—we will for the first time in decades revive the construction of nuclear reactors in our country and continue to develop renewable energy. These investments will allow us to live up to our commitments. As we close COP26 in Glasgow, this is a strong message from France."



Macron



Artist's rendering of a Natrium advanced reactor plant. (Image: TerraPower)

Wyoming site chosen for Natrium reactor

Bellevue, Wash.-based TerraPower selected Kemmerer, Wyo., as the preferred site for its Natrium reactor demonstration project, the company announced on November 16. The selection of Kemmerer—located near the Naughton power plant, a 448-MW coal-fired facility whose two remaining operating units are scheduled for retirement in 2025—followed an extensive evaluation process and meetings with community members and leaders, according to TerraPower. Factors considered in site selection included community support, physical characteristics of the site, the ability of the site to obtain a license from the Nuclear Regulatory Commission, access to existing infrastructure, and the needs of the power grid. TerraPower and PacifiCorp, owner of the Naughton plant, announced in June the plan to locate the Natrium project at the site of a retiring coal plant in Wyoming.

December 2021

Consent-based siting revived by DOE

With a notice published in the December 1 *Federal Register*, the Department of Energy signaled the restart of its consent-based siting process for identifying sites to store the nation's spent nuclear fuel. In the notice, the DOE issued a request for information (RIF), which it said will be used to further develop the department's consent-based siting process and overall waste management strategy. Responses to the RIF are due by March 4. "Hearing from and then working with communities interested in hosting one of these facilities is the best way to finally solve the nation's spent nuclear fuel management issues," said energy secretary Jennifer Granholm. "We know there are real benefits, from jobs to new infrastructure, that will result in interest in areas across the country. The public's input is central to identifying those locations to make this process as inclusive and effective as possible."



Artist's rendering of a BWRX-300 plant. (Photo: GE Hitachi Nuclear Energy)

GE Hitachi SMR chosen for Darlington project

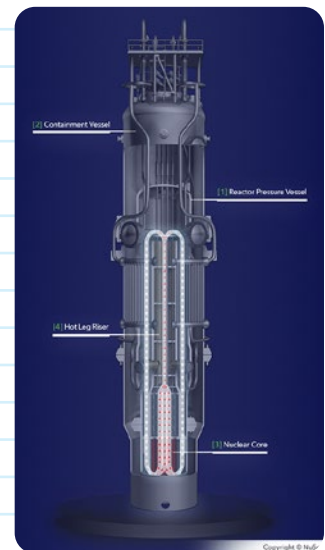
Ontario Power Generation (OPG) in December selected GE Hitachi Nuclear Energy (GEH) as its technology partner for the Darlington New Nuclear Project. The companies pledged to work to deploy GEH's BWRX-300 small modular reactor at OPG's Darlington nuclear plant, located in Clarington, Ontario. An evolution of GEH's 1,520-MWe Generation III+ ESBWR (approved by the Nuclear Regulatory Commission in 2014), the BWRX-300 is a 300-MWe water-cooled, natural-circulation SMR with

passive safety systems. At this writing, it was undergoing a Canadian Nuclear Safety Commission pre-licensing vendor design review. Darlington is the only site in Canada currently licensed for new nuclear. In October 2020, OPG announced that it was working with three grid-scale SMR developers—GEH, Terrestrial Energy, and X-energy—to advance engineering and design work, with the goal of identifying options for future deployment at Darlington.

NuScale Power introduces VOYGR

NuScale Power announced on December 2 that plants built to host its light water small modular reactor design will bear a new trade-marked name: VOYGR. According to NuScale's announcement, "the name VOYGR demonstrates that NuScale is changing the world by creating an energy source that is smarter, cleaner, safer, and cost competi-

While light on vowels, VOYGR is big on flexibility. NuScale's flagship plant is the VOYGR-12, which can be scaled up to 12 77-MWe NuScale Power modules for a total capacity of 924 MWe. NuScale is also offering the four-module VOYGR-4 (308 MWe) and the six-module VOYGR-6 (462 MWe). VOYGR can provide energy for electrical generation, district heating, desalination, hydrogen production, and other process heat applications, according to NuScale. ❌



A representation of NuScale Power's modular pressurized water reactor design. (Image: NuScale Power)