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NRC to address safety culture issues, employee concerns

NRC plans a series of actions in response to an agency report that raised issues with the regulator's safety culture. An attorney who represents whistleblowers, however, said further reform is needed.

The report by NRC's Office of Enforcement, or OE, was made available within the agency in January but not made public at that time. A redacted version of the report was released in June in response to a February Freedom of Information Act request by David Lochbaum, director of the nuclear safety project at the Union of Concerned Scientists.

OE said in the report that its study was conducted "as part of an agency-level response to recent employee surveys. The focus of the study was to develop and enhance activities that address concerns of reprisal and chilling effect for raising mission-related concerns and differing views."

It said that "the goal was to gain a better understanding of the issues and maximize potential strategies for improvements. The comprehensive study reviews historical data for context, examines the existing environment (including agency processes and practices), and reflects a broad range of insights from a multi-office focus group as well as insights from a variety of sources and benchmarking activities."

OE concluded: "The collected data indicate that perceptions of reprisal may

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NRC issues draft emergency planning rule on SMRs, advanced reactors

A draft proposed rule on emergency preparedness requirements for advanced reactors released by NRC staff includes options for smaller emergency planning zones and eliminates one of the two zones set for larger reactors.

The draft has yet to receive NRC management approval or commission review, the agency said in a note attached to the materials. It was released to support an August 22 meeting of a subcommittee of the agency's Advisory Committee on Reactor Safeguards.

The objective of the rulemaking is to promote regulatory clarity and stability, reduce requests for exemptions, recognize safety and technology enhancements and reflect the smaller and slower potential releases of fission products from certain reactors, all while continuing to provide reasonable assurance of adequative protection of the public, staff said in the draft Federal Register notice for the proposed rule. It would not apply to any LWR with a capacity over 1,000 MW thermal power, it said.

Existing regulations establish two types of emergency planning zones, one of about 10 miles for so-called plume exposure and a zone of 50 miles for an ingestion path exposure. The plume exposure area is one where predetermined protective measures are put in place; the ingestion pathway is one where exposure is less likely but can take place via food and water consumption.

The regulations allow emergency planning zones for reactors smaller than 250 MWt and

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Oyster Creek to revise decommissioning plan

Exelon Generation will develop and submit to NRC a new decommissioning plan for its Oyster Creek nuclear power plant in New Jersey, which the company said July 31 will be purchased and decommissioned within eight years by a joint venture of Holtec International and SNC-Lavalin, decades sooner than previously planned.

The 670-MW boiling water reactor began commercial operation in December 1969 and is one of the oldest nuclear units still in operation in the United States. Under an agreement with the state of New Jersey, Exelon agreed to shut Oyster Creek by December 2019, allowing the company to avoid installing expensive cooling towers.

However, Exelon announced earlier this year that it would permanently shut the plant September 17.

Exelon and Holtec International said in a joint statement July 31 that "Holtec will assume ownership of the site, real property and used nuclear fuel. As the site's owner, Holtec will manage all site decommissioning and restoration activities."

They said that "the transaction is

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expected to close in the third quarter of 2019, pending the [US] Nuclear Regulatory Commission's and other regulatory approval, and will not impact the scheduled shutdown of Oyster Creek."

Bryan Hanson, chief nuclear officer of Exelon Generation, said in the statement that "Holtec's commitment to the nuclear industry and its presence in New Jersey will allow many of our employees previously facing relocation to continue living and working in the Garden State. Further, with three decades of experience in nuclear fuel technologies and a partnership with global decommissioning leader SNC-Lavalin, Holtec is ideally positioned to complete the decommissioning of Oyster Creek safely and swiftly."

Under NRC regulations, the agency reviews decommissioning plans for nuclear power plants. NRC would also need to review and approve a request to transfer Oyster Creek's operating license to the joint venture, known as Comprehensive Decommissioning International.

Under a previous decommissioning plan submitted to NRC in May (INRC, 11 Jun, 2), Exelon said it planned to delay the start of most decommissioning activities at Oyster Creek until December 2073, placing the plant until then in a dormant state known as Safstor. Under that previous plan, decommissioning activities were scheduled to be completed in December 2077, with site restoration activities continuing until April 2080.

However, CDI and SNC-Lavalin said in a statement July 31 that CDI plans to begin decommissioning the plant in 2019, "pending transaction closure."

The companies said, "With its experience and state-of-the-art technologies, CDI is well equipped to decommission Oyster Creek within eight years, more than 50 years ahead of the industry-allowed 60-year timeline." That 60-year time limit for completing the decommissioning of a nuclear plant after it surrenders its operating license following permanent shutdown is also required by NRC regulations.

The exact value of the transaction was not disclosed, but CDI and SNC-Lavalin said it is "worth hundreds of millions of dollars."

In its previous decommissioning plan submitted to NRC in May, Exelon estimated that "radiological decommissioning" of Oyster Creek under the proposed Safstor option would cost about $1.1 billion. Spent fuel management was estimated to cost an additional $290.1 million, and site restoration was expected to cost about $60.2 million, it said.

Since July 1, Oyster Creek has reduced its output as part of a "coastdown" to its closure, and the unit was operating at 70% of capacity early July 31, plant spokeswoman Suzanne D'Ambrosio said in an email. Output was reduced further in recent days to perform maintenance on the plant's feedwater system, D'Ambrosio said.

"As the company determines its next steps, our Resident Inspectors will continue to monitor whether the problem [of feedwater heater tube leakage of water] is adversely impacting operations and follow any troubleshooting and repair plans," NRC spokesman Neil Sheehan said in an email July 30.

"We have no immediate safety concerns," Sheehan said.

— *Steven Dolley, Washington*

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NRC announces senior management appointments

NRC has recently announced a number of senior management changes.

Marian Zobler has been selected by NRC commissioners to become the agency's general counsel effective August 5, NRC said in an August 2 statement. Zobler replaces Margaret Doane, who in July became the agency's executive director for operations after the retirement of Victor McCree.

Zobler joined NRC in 1990. Before becoming acting general counsel after Doane's appointment as EDO, she served as deputy general counsel for rulemaking and policy support. Zobler earned a bachelor's degree from Barnard College and a law degree from Brooklyn Law School.

David Lew, who has been serving as NRC's acting Region I administrator, has been appointed to that position on a permanent basis effective August 2, the agency said in a separate statement that day. Lew succeeds Daniel Dorman, who in December was named NRC's acting deputy executive director for materials, waste, research, state, tribal, compliance, administration, and human capital programs.

Lew joined NRC in 1987 and previously was the deputy regional administrator in Region I. Prior to that he served in the Office of Nuclear Regulatory Research at NRC headquarters in Rockville, Maryland.

Raymond Lorson, director of the division of reactor projects in the Region I office, will become the region's deputy administrator effective September 4, the statement said. Lorson joined NRC in 1991 and has served in various senior management positions. He also served in the Navy's nuclear power program.

Edward Shuttleworth has become director of the Office of Investigations, NRC said in a statement July 23. He most recently was acting assistant director for intelligence at US Immigration and Customs Enforcement, Department of Homeland Security Investigations and has worked in law enforcement for more than three decades. He succeeds Kimberly Howell, who left the agency earlier this year.

NRC's Office of Investigations, the agency said, "develops policy, procedures, and standards for conducting all NRC investigations of alleged wrongdoing by licensees and other entities," and "conducts and supervises investigations within the scope of NRC authority except those of NRC employees and contractors."

— *Staff*

ACRS affirms safety of Kepco's APR1400 power reactor design

Korea Electric Power Corp.'s APR1400 reactor can be built without undue risk to the public, NRC's Advisory Committee on Reactor Safeguards said in a letter report July 26.

The ACRS advises NRC commissioners on technical issues and conducts reviews independent of NRC staff of licensing and regulatory actions.

ACRS noted in its report that "the APR1400 includes advanced design features to enhance safety and operational flexibility. Enhancements include the combination of four trains of safety injection with direct vessel injection, and a unique safety injection tank fluidic device, which optimizes the safety injection flow rate during the initial blowdown and subsequent, long-term, core reflood phase. The performance of the fluidic device was verified via full scale testing."

However, the ACRS noted that the seismic probabilistic risk assessment accompanying the APR1400 application did not quantify seismic risks, saying that a more complete PRA for seismic issues would have to be completed before an APR1400 could load fuel.

Such seismic margin issues are often left for resolution on a site-specific basis in applications for a combined construction permit-operating license, NRC spokesman David McIntyre said in an email August 1.

NRC suggested in January that Korea Hydro & Nuclear Power remove an analysis of seismic margins from the design certification review because of concerns about the quality and completeness of company submittals in order to meet the 42-month published schedule for the design certification review.

This would still allow NRC to make the conclusion that the design provided reasonable assurance of adequate protection of the public as required in regulations, the agency said in a February 2 letter to KHNP.

However, KHNP officials declined to remove the seismic margin analysis, NRC said.

NRC expects to complete its final safety evaluation report of the design certification in September, according to a schedule on the agency website. Design certifications are handled as NRC rulemakings and the final rule is scheduled to be published in February, NRC said.

In the February 2018 letter and in a May licensing summary, NRC said there could be a delay to the published schedule depending on resolution of seismic issues.

However, McIntyre said staff still believes the schedule for September completion of the safety evaluation and a final rule next year can be met.

The APR1400 is a design owned by Kepco and its subsidiary KHNP. The design "evolved from" the Combustion Engineering System 80+ design that NRC certified in 1997, the ACRS said. Westinghouse eventually purchased Combustion Engineering and continues to provide services to CE-designed units.

The application for design certification was submitted in December 2014. The environmental review of the application was completed in 2015.

The agency has billed Kepco $57.3 million in fees in connection with the review, NRC said in a licensing update made public July 26.

There are no projects to build APR1400s in the US. However, KHNP officials have said NRC certification would be beneficial for sales of the reactor in other countries.

Four APR1400 units are being built at Barakah in the United Arab Emirates.

The ACRS said the APR1400 design "is mature and robust." While the main components remain the same as in the System 80+, upgrades were made to employ higher-strength materials and corrosion-resistant tubing to improve reliability, ACRS said.

The design adopts microprocessor-based digital instrumentation and controls, although a hardware-based timer produces a trip or alarm should key computer components fail, ACRS said. One-direction "data diodes" prevent access of external equipment to in-plant systems, boosting plant protection, ACRS said.

— *William Freebairn, Washington*

NRC returns Entergy's Grand Gulf-1 to normal oversight

NRC returned Entergy's 1,498-MW Grand Gulf-1 in Mississippi to the normal level of oversight effective August 1, after the company addressed issues that resulted in three unplanned reactor shutdowns in 2016, the agency said in an August 1 letter.

NRC in a November 8, 2016 letter said it would conduct a supplemental inspection because of a white performance indicator related to unplanned scrams. As a result of the performance indicator changing to white, NRC determined the unit should be moved from column 1 to column 2, retroactive to July 1, the start of the third quarter, the letter said (INRC, 14 Nov '16, 4).

A white performance indicator shows performance is outside an expected range, but that cornerstone objectives are still being met, according to NRC. It is the second-lowest level of performance indicators in NRC's color-coded reactor oversight process. The rankings, from lowest to highest performance significance, are green, white, yellow and red. Power reactors receive increased oversight as they move to higher numbered columns in NRC's five-column process.

The letter said Grand Gulf-1 scrammed March 29, 2016 "due to a turbine trip." It said a reactor scram that occurred June 17 was "due to power oscillations" and that a reactor scram that occurred June 25 was "due to a closure of turbine control valves."

NRC said in a December 6, 2017 letter that based on a supplemental inspection conducted at the plant that was concluded August 24 of that year, the agency "determined that the root-cause evaluation performed as a result of the March 29, 2016, reactor scram, did not generate corrective actions that were adequate to preclude repetition of the event."

NRC said it had also determined that the root-cause evaluation conducted as a result of the June 17, 2016, reactor scram "was not performed to a sufficient depth and breadth."

As a result, NRC issued a white inspection finding related to the performance indicator, allowing it to hold the matter open even after the indicator returns to normal.

The agency said in its August 1 letter that a follow-up inspection in June showed licensee actions were sufficient and closed the so-called parallel white inspection finding and returned Grand Gulf to normal oversight effective the date of the letter.

The three unplanned scrams caused the unit to exceed an NRC performance threshold for "unplanned scrams per 7,000 critical hours" of reactor operation, the agency said in an inspection report attached to the August 1 letter.

The letter noted that initial root cause evaluations by the licensee of issues that contributed to the scrams "did not generate corrective actions that were adequate to preclude repetition … which the licensee determined to be caused by inadequacies in supervision and work instruction use and adherence by supplemental personnel."

It said that a supplemental inspection concluded June 28 determined that Entergy had correctly identified root causes that caused the three scrams and implemented corrective actions, including "the procedure used to carry out the turbine testing" and a "weaknesses in safety culture."

NRC said Entergy had taken sufficient actions "to ensure existing maintenance fundamental training is analyzed and revised as appropriate" and to assure that all items identified in the corrective action program "have been closed with rigor and quality."

"We're proud of the work our team members have done to make Grand Gulf a solid nuclear operator, and we're pleased the NRC has recognized those effort," Entergy spokesman Michael Bowling said in an August 1 email.

Bowling added: "Our recent refueling outage included major improvements to the plant and its equipment, positioning us to operate safely and reliably for decades to come."

— *Jim Ostroff, Washington*

Fuel loading at Flamanville-3 delayed after EDF reports 33 defective welds

Fuel loading at the 1,650-MW Flamanville-3 EPR that is under construction in France has been delayed after EDF reported dozens of defective welds to France's nuclear regulator ASN.

The discovery of 33 defective welds, out of a total of 150 welds at Flamanville-3, had led to fuel loading being pushed back from mid-2019 to the fourth quarter of 2019, the company said in a statement July 25.

EDF has said the unit will start operation in 2020.

EDF said July 25 that the defective welds in the main secondary system of Flamanville-3 had "quality deficiencies and will be repaired." It did not provide technical details on the nature of the defects.

An EDF spokesman did not respond by press time to requests for comment.

The company said it had decided to "rework" an additional 20 welds at Flamanville-3 "even though they do not have any defects." EDF said that this was because these welds "do not comply with the high quality requirements defined by EDF during the EPR design phase."

Hinkley Point C on track

Flamanville-3 is the reference plant for the two-EPR, 3,200-MW Hinkley Point C plant under construction in western England. EDF said in its first-half 2018 financial results statement July 31 that despite the issue with the defective welds at Flamanville-3, the company was still on schedule to meet the mid-2019 scheduled date for the pouring of first nuclear concrete at Hinkley Point C.

Martyn Butlin, a spokesman for EDF Energy, said in an email July 31 that the "construction of Hinkley Point C remains on track. The project has already benefitted, and will continue to learn from the experience of other projects."

The first unit of Hinkley Point C is scheduled to start generating power during 2025. The company has not said when the second unit will be completed or start operation.

Alex Trueman, a spokesman for the UK's Office for Nuclear Regulation, said in an email July 31 that the welds at Hinkley Point C would not be made until "after the delivery of the Nuclear Steam Supply System to the site in 2021." Trueman added that that the type of weld with the defects at Flamanville-3 was known as a Main Steam Line, or MSL, weld.

UK regulatory requirements for welds in EPR power reactors contain "key differences" from France's regulatory requirements for such welds, Trueman said.

Two key differences in the UK and French regulatory approach to

such welds are the UK-specific requirements for qualified individual inspections of the welds, which is not the case in France, and also "representative fracture toughness testing" of the welds by ONR, Trueman. He did not provide further technical details.

ASN informed ONR of the issues at Flamanville-3, Trueman, said, adding that "ONR and ASN are liaising on this as part of our normal regulatory co-operation."

Trueman also noted that ONR needed to issue a specific consent for the pouring of first nuclear concrete for the Hinkley Point C nuclear island.

"This means that the licensee [EDF Energy] must receive this consent prior to commencement of pouring of structural concrete for the nuclear island. ONR is currently in the process of completing its assessment and inspection activities to support this decision," Trueman said.

— *Oliver Adelman, London*

UAE DOE issues generating license for Barakah nuclear plant

The United Arab Emirates Department of Energy has issued an electricity generating license to the Barakah One joint venture for its Barakah nuclear plants, the country's official Emirates News Agency said July 25.

The license is required before units at the plant can begin to generate electricity, the agency, known as WAM, said without citing any sources for the information. An operating license from the country's nuclear regulator is also needed before the first unit at Barakah can load fuel and start up.

The award of the license will help UAE "guarantee energy security and sufficient supplies of energy," the chairman of the department, Awaidha Murshed Al Marar, said in the WAM report.

Barakah One is the joint venture between Emirates Nuclear Energy Corp. and Korea Electric Power Co. that owns the four-unit Barakah station, the first nuclear plant in UAE.

The first APR1400 unit at the site is complete and entering the commissioning phase, although officials have said it is awaiting an operating license to start up. Three other units are in various stages of completion at Barakah.

The schedule when construction began called for the first unit to begin operating in 2018, with subsequent units to start operating every year after that.

Fuel loading at Barakah-1 has been delayed to late 2019 or early 2020, plant operator Nawah Energy said May 30, citing an ongoing operational readiness review needed before startup.

— *William Freebairn, Washington*

Committee on nuclear safety sees improved fuel cycle transparency

A report published July 27 by a committee on nuclear safety established by the French parliament has found that there is better regulation of used nuclear fuel and waste and more transparency in the French nuclear fuel cycle than in 2010, when the group last reported on the issue.

The report by the high committee on information and transparency of nuclear safety, or HCTISN, aims to provide information as part of a formal national debate on the handling of nuclear waste in France which State Secretary for Energy Sebastien Lecornu announced March 7 is scheduled to begin in the fall.

The committee, established under 2006 legislation, includes representatives of both houses of France's parliament as well as nuclear industry officials, regulators, workers, environmentalists and technical experts. The report was delivered to the country's environmental ministry and the Parliamentary Office for Scientific and Technological Assessment.

HCTISN praised the release by the French government of national plans for the management of nuclear material and waste as well as annual inventories of such materials.

Nevertheless, HCTISN noted that information and documents published by nuclear companies such as EDF and Orano are sometimes not detailed enough. HCTISN recommended that more feedback be provided on the state of used fuel and waste, including where the waste is in the fuel cycle. HCTISN also asked nuclear fuel cycle companies to give a timetable for the processing of material through the different stages of the nuclear fuel cycle.

HCTISN also said that the continued use of some forms of fuel, including mixed-oxide, or MOX, fuel made with uranium and plutonium from reprocessing, relies on the development of a series of Generation IV fast reactors. HCTISN in light of this asked nuclear facility operators and the government to communicate to the public its decision on continuation of the Astrid fast reactor project.

A decision on whether to go forward with Astrid, the Advanced Sodium Technology Reactor for Industrial Development, has been delayed until 2020, with the potential start of construction around 2022, government officials said last year.

HCTISN said that the 2018 budget law did not include financing for Astrid and said that government should make a decision by 2019. HCTISN added that without Astrid, the future of MOX fuel in France is in question.

France has had a long-standing policy to close the nuclear fuel cycle by reprocessing spent fuel and operating reactors to use the recovered nuclear material.

— *Joel Spaes, Paris*

Safety culture ... from page 1

inhibit employees from raising mission-related concerns and differing views and impact employee engagement. Although data does not conclusively identify that reprisal is pervasive at the agency or that there is a chilled work environment, it does indicate that there is room for improvement."

Some of the observations made in OE's report include that "employees may not be willing to report allegations of reprisal." The report noted: "Data from targeted surveys indicate that a large number of employees who used the NCP [non-concurrence process] or DPO [differing professional opinion] process believed that they had experienced some form of negative consequence. However, only a few complaints of reprisal have been reported for raising mission-related concerns or differing views or for using the differing views processes." Those processes provide options for NRC staffers to disagree with proposed agency actions or findings or express their non-concurrence with actions taken.

OE said: "The fear of retaliation (e.g., exclusion from work activities, failure to be selected, lowered performance rating) for reporting a reprisal concern may be particularly inhibiting in light of the agency's future, the impact of Project Aim, and emphasis on organizational effectiveness. Employees may also be concerned that our current processes for addressing reprisal may not be sufficiently independent to be considered credible … " Project Aim, an efficiency initiative to rebaseline the agency's anticipated workload and staff requirements, significantly reduced the number of full-time NRC staff (INRC, 2 Apr, 1).

OE's report also observed that "NRC does not have a specific process to prevent, identify, investigate, and address reprisal for raising mission-related concerns or differing views."

Lochbaum said in a July 2 post on the UCS blog that his group is appealing NRC's withholding of some of the redacted sections of the report.

However, Lochbaum said, analysis of the redacted report "make[s] it crystal clear that the NRC has a chilled work environment."

He noted that the OE report included results of a 2015 survey of NRC staff which found that "only 64% of employees said they believed that NRC 'has established a climate where truth can be taken up the chain of command without fear of reprisal.'"

That survey also found that "only 68% of employees said they 'can raise any concern without fear of retaliation'" and "only 77% said 'it is safe to speak up in the NRC."

Also, Lochbaum said, the 2015 survey found that "20% of the employees indicated 'they had heard of someone with[in] the last year who experienced a negative reaction for having raised a mission-related differing view.'"

Such findings, he said, "are totally unacceptable," noting that "the NRC has come down hard and heavy when nuclear plant sites have smaller segments of their work forces fearful of voicing safety concerns."

Agency response

Victor McCree, at the time NRC's executive director for operations, said in a June 19 memorandum that an NRC working group had reviewed the study's findings, concluding in June that the agency should take action on seven of nine "considerations" noted by OE.

He said that staff should by July 15 "establish appropriate due dates for the actions identified in this memorandum." Those due dates had not been publicly released by press time.

In response to the working group recommendations, NRC should among other things improve its training and communications on differing views, complete an assessment of the differing views programs, and "develop and implement a neutral fact-finding process to provide an avenue whereby employees can raise allegations of retaliations for submitting and/or participating in the Differing Professional Opinion/Non-Concurrence process," according to an attachment to McCree's memorandum.

"The NRC strongly believes maintaining an open collaborative work environment, in which all employees and contractors are encouraged to speak up and share concerns and differing views without fear of negative consequences, is critical to our success," NRC spokesman David McIntyre said in an email July 2.

OE's study "was developed as part of broader agency efforts to advance a climate of trust within the staff," McIntyre said. "The study and the working group that reviewed it concluded there were opportunities to improve the environment for raising issues at the NRC," he said, noting McCree's June 19 memorandum calling for actions on seven recommendations.

Regarding UCS's appeal of the redactions, McIntyre said: "Limited statistical information was redacted from the version of the report made publicly available to protect the personal privacy of respondents. Some of the questions were asked of a small group of staffers under expectation of confidentiality; since the participants might be identified through other means, that data was redacted. A qualitative discussion of the insights from the data remains in the publicly available report."

More action needed, says attorney

Billie Garde, a Washington-based attorney who has represented numerous whistleblowers from NRC and the nuclear power industry, said in an interview August 1 that she does believe there is "a chilled work environment at the NRC " that has "gotten continually worse over the last couple of years."

That chilled environment, Garde said, has "been exposed by a large number of high-profile internal dissenters" at the agency, some of whom she has represented.

Many of the recommendations in the OE report are commendable and represent "a new opportunity to do something different," Garde said.

However, based on NRC's planned actions, Garde said she was "disappointed in seeing that the recommendations coming out of this report seem to be at a minimum on the back burner if not kind of completely rejected."

McCree's memorandum suggests that implementation of some of the proposed actions in response to the recommendations could take years to complete, she noted. Also, some of the proposed responses are quite general and "the action plans don't have any real meat to them," Garde said.

Also, Garde said, the OE study's recommendation for "establishment of an administrative review board process" was not accepted for action by NRC.

NRC staff said in the attachment to McCree's memorandum that the OE report had recommended the agency establish "an Advisory Review Panel to review proposed employment actions on an as-needed basis before the actions are taken to determine whether any of the factors of retaliation are known to be present and to advise on mitigation strategies to address the potential for the actions to cause a chilling effect and, if already alleged, respond to concerns of chilling effect and chilled work environment." Staff said of that recommendation in the attachment: "Do not adopt; no further action."

"That recommendation is probably the most important one," Garde said, "because that's the only one that will give some sense that there's an independent review [of] personnel actions that may be taken … that somebody thinks may be retaliatory."

"That's the real meat of it," she said, because such a review process would be "where somebody could really get protection from retaliation."

— *Steven Dolley, Washington*

Emergency planning ... from page 1

high-temperature gas-cooled reactors to be set on a case-by-case basis.

The proposed rule would establish approved approaches for determining the smaller EPZ sizes for all SMRs and advanced reactors.

It defines a consequence-oriented approach in which the consequences of any credible radiological accident at a reactor site are used as the basis for determining the size of the EPZ.

In addition, the rule would set performance standards against which emergency response plans would measured. Drills and exercises would be used to assess performance.

"The performance-based regimen would provide the NRC with enhanced oversight of the actual competencies important to the protection of public health and safety while allowing licensees and applicants increased flexibility," staff said in the draft proposed rule.

The rule would require that the plume exposure pathway be set at a distance at which the public would be protected from a dose of more than 10 millisieverts over 96 hours from any accident. This dose level is similar to that required for LWRs, NRC said.

An analysis of the dose estimates for the plume exposure EPZ would be required from licensees, staff said in the draft proposed rule.

The draft does not include a specific ingestion pathway planning zone, allowing licensees to describe in their overall emergency plans ways to protect residents of the area from ingesting contaminated food or water.

SMR and advanced reactor licensees would be allowed to comply with either the new rule, if adopted, or existing emergency planning requirements, NRC said.

NRC has been engaging with industry representatives on an effort to modernize the licensing process for advanced reactors as vendors develop designs that differ significantly from operating light water reactors (INRC, 5 Feb, 1).

The agency has developed an implementation action plan comprising six strategies for streamlining its approach to such licensing actions.

Staff has explored the development of a performance-based emergency planning requirements, potentially as a voluntary alternative to existing more prescriptive rules, since the early 2000s, and those discussions merged with those around advanced reactor requirements at the end of that decade, NRC said in the draft Federal Register Notice.

The commission approved a staff plan in Secy-15-0077, dated May 29, 2015, to proceed with a rulemaking on emergency planning for SMRs and advanced reactors.

The Nuclear Energy Institute, in a June 2015 white paper, said small modular reactors, because of their higher safety margins and smaller potential for fission product release, should be allowed to operate with smaller emergency planning zones than larger LWRs.

The draft proposed rule noted that licensees adopting the alternate emergency planning requirements would also have to meet new performance indicators in the area of emergency planning, which would likely vary by design.

Drills and exercises to test the performance of the emergency plan would be conducted on an eight-year cycle, with the content of the exercises varying year-to-year, NRC said. Should a plant EPZ not extend beyond the plant boundary, local and regional law enforcement authorities would not need to be involved in the exercises, it said.

Other advanced reactor licensing developments

NRC in April issued a regulatory guide aimed at assisting designers of non-LWRs to develop principal design criteria setting fabrication, construction, testing and performance requirements for such units (INRC, 16 Apr, 1). A staff paper on consequence-based security requirements will be sent to commissioners in the next week or so, William Reckley, a senior project manager in NRC's Office of New Reactors, said during an agency meeting on advanced reactors July 26. This paper will ask commissioners to determine whether a rulemaking to set such more flexible security requirements based on the potential for accidents and radioactive releases, he said.

The consequence-based security rulemaking would be similar to that for emergency planning, he added.

Another paper, this one on so-called functional containment requirements, is also being prepared and should be sent to the commissioners shortly, Reckley said.

In a draft white paper last year, staff said regulations on structures and systems that control release of radionuclides in a high-temperature gas-cooled reactor might be different than for an LWR because of the potential role of fuel coatings and the reactor building in limiting such releases. High-temperature gas cooled reactors operate at lower pressures than LWRs, which require essentially leak-tight containment structures.

Staff proposed in the draft white paper November 30 that containment designs for some advanced reactors meet requirements under a series of accident events and that the containment designs meet set leak rate limits and prevent uncontrolled releases of radioactivity.

The question of whether advanced reactor designs can adopt containment structures not designed for high pressures of an LWR accident scenario has not been decided by NRC, Union of Concerned Scientist senior scientist Edwin Lyman said in an email in April. The issue is mentioned in the guidance on design criteria.

— *William Freebairn, Washington*