

# Insights from the Fukushima Daiichi accident: The NRC's Near-Term Task Force report

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THE REPORT OF the U.S. Nuclear Regulatory Commission's Near-Term Task Force on the Fukushima Daiichi accident was released on July 12. It is a document that is likely to have significant influence on the regulation and economics of existing and planned U.S. power reactors going forward, and it contains a number of recommendations for enhancing safety, based on the early study of the accident and the responses to it. Because the report is easily accessible, it can be studied without the filter of news reportage. Its importance to the nuclear power industry, however, requires that we provide a summary of the details in these pages.

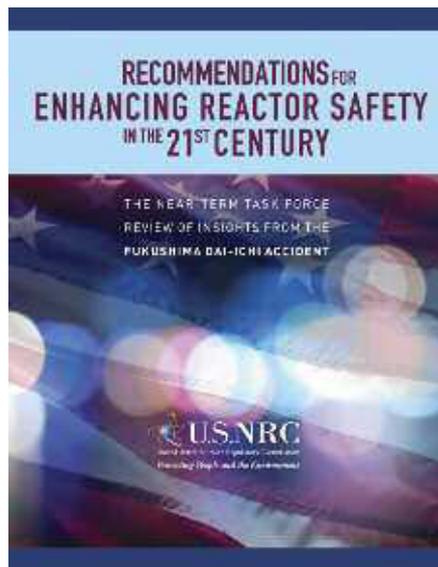
The report can be downloaded from the NRC Web site, at <[www.nrc.gov](http://www.nrc.gov)>. At this writing, it could be accessed from a link on the home page, but in case that changes by the time this issue goes to press, the full address is <<http://pbadupws.nrc.gov/docs/ML1118/ML111861807.pdf>>. The report can also be obtained through the ADAMS document retrieval system at the NRC site, with accession number ML111861807.

Also accessible via the NRC Web site are webcasts of a July 19 meeting during which the commissioners questioned task force members, and a July 28 meeting during which the task force members made a presentation to, and received questions and comments from, the public. The webcasts are archived at <<http://video.nrc.gov/>>.

The report, *Recommendations for Enhancing Reactor Safety in the 21st Century: The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident*, is the product of the task force that was established in late March as the first of two NRC groups to study the incident. The near-term group looked mainly at what was clearly understood about the initiating events and their effects on Fukushima Dai-ichi (the NRC hyphenates "Dai-ichi" and *Nuclear News* does not; because the name is a translation from Japanese characters to the Roman alphabet, there are a number of ways to present it).

The group was tasked with producing the report in roughly three months, with updates provided to the commissioners in public meetings about once a month. This was intended to allow the commissioners an opportunity to decide whether immediate actions should be taken at U.S. plants as a result of the accident. The NRC is also setting up a Long-Term Task Force that will await

*The Near-Term Task Force on the Fukushima Daiichi accident has concluded that changes should be made at the NRC, from the addition of licensee requirements to address specific issues to a revised philosophy of safety regulation.*



more definitive data from the accident, the gathering of which is expected to continue for at least the next several months. Because it is not clear when the Long-Term Task Force will be able to issue its own report, the report of the Near-Term Task Force may become one of the most important documents in the agency's history.

The Near-Term Task Force was chaired by Charles Miller, director of the NRC's Office of Federal and State Materials and Environmental Management Programs, who postponed his retirement in order to participate. The other task force members were Daniel Dorman, deputy director of the Office of Nuclear Material Safety and Safeguards; Jack Grobe, deputy director of the Office of Nuclear Reactor Regulation; Gary Holahan, deputy director of the Office of New Reactors; Nathan Sanfilippo, executive technical assistant in the Office of the Executive Director for Operations; and Amy Cabbage, team leader in the Office of New Reactors. They did their work in relative seclusion, examining information about the accident and the historical development of regulation by the agency. The NRC intended that the near-term report be done chiefly as an internal document, without input from

external stakeholders, but outside input will be accepted by the Long-Term Task Force.

The 12 recommendations, paraphrased somewhat here, call for the NRC to do the following:

1. Create a regulatory framework that "appropriately balances" defense-in-depth and risk considerations.
2. Require power reactors to reevaluate and, as needed, upgrade design-basis seismic and flooding protection of structures, systems, and components.
3. Evaluate (for the longer term) enhanced capability to prevent or mitigate seismically induced fires or floods.
4. Require that all operating and new reactors strengthen station blackout mitigation for design-basis and beyond-design-basis events.
5. Require hardened vents at all boiling water reactors with Mark I and Mark II containments.
6. Study (for the longer term) hydrogen control and mitigation in containments and other buildings.
7. Require enhanced spent fuel pool make-up capability and instrumentation.
8. Require strengthening and integration of on-site emergency response, including emergency operating procedures (EOP), severe accident management guidelines (SAMG), and extensive damage mitigation guidelines (EDMG).
9. Require that emergency plans address prolonged station blackout and events affecting multiple reactors.
10. Pursue (for the longer term) additional emergency preparedness topics related to multireactor events and prolonged station blackout.
11. Pursue (for the longer term) emergency preparedness topics related to decision-making, radiation monitoring, and public education.
12. Change the Reactor Oversight Process (ROP) to add emphasis to defense-in-depth, in keeping with the first recommendation.

In its progress report appearances before the commissioners in May and June, its presentations in July, and the printed report it-

self, the task force members state clearly that power reactors in the United States are operated safely and are expected to respond appropriately to emergencies. Despite this, the recommendations seek substantive changes to equipment and procedures—through orders by the NRC to licensees for issues seen as needing immediate attention, or through amendments to regulations for issues that can wait until the completion of a full rule-making process.

The task force also expressed a belief that the agency's body of regulations—developed over more than a third of a century as the nuclear power enterprise has itself developed and matured—has become something of a “patchwork,” which could benefit from the consistency of a new overarching vision. To guide that vision, the task force advised in its first recommendation an approach that—and again the phrase will be put in quotes, because it may be where future debate on this topic is focused—“appropriately balances” the risk consider-

additional equipment and systems, rather than through fundamental plant modifications that revise a design basis to cover events that had previously been considered “beyond.” On the whole, the task force believes that current regulations address design-basis events adequately, while the proposed changes generally aim at beyond-design-basis events.

Recommendation 8 also suggests an extension of NRC authority into a realm previously left to licensees. SAMGs were developed through an industry initiative, and were examined this spring by the NRC under a temporary instruction, but the agency currently has no authority over them. The integration with EOPs and EDMGs, which are NRC-regulated, indicates that SAMGs would also receive formal NRC oversight.

### Actions to be taken

In most cases, the task force provided specifics as to how the recommendations should be met. In addition to the request in

Recommendation 1 for a policy statement to revise regulatory philosophy, there are 34 listed actions for carrying out the recommendations. These actions are broken down by who should perform them, when they should be done, and what level of authority would be required. Of the most immediate potential concern to licensees

train of on-site emergency power to operate spent fuel pool makeup and instrumentation whenever there is irradiated fuel in the pool.

- Install a seismically qualified system to spray water into spent fuel pools, including an accessible connection to a supply source at grade level outside the building (such as a portable pump or pumper truck).

- Integrate EOPs, SAMGs, and EDMGs, specify command and control strategies to deploy them, and stipulate the qualifications and training of personnel who make decisions during emergencies.

- Modify technical specifications to use the EOP guidelines in the standard specifications for the reactor design.

- Until station blackout rulemaking is complete, decide and assign the staff required to respond to a multiunit event; train and drill for prolonged station blackout scenarios; ensure that there are sufficient facilities and equipment to deal with those scenarios; provide a power supply for on- and off-site communications during a prolonged station blackout; and maintain emergency response data system (ERDS) capability throughout such an event.

- Complete the ERDS modernizations initiative by June 2012 (to convert from modem to virtual private network).

Seven rulemaking initiatives were also recommended. The development of regulatory language and the notice-and-comment process will take time, which is why in some cases the task force asked for orders to put the requirements in place temporarily. The proposed rules would establish the risk-informed, defense-in-depth framework; require licensees to confirm seismic and flooding hazards every 10 years; set a minimum station blackout coping time of eight hours, with an extended coping time of 72 hours through the use of additional equipment assured to be available, even if there is a major loss of infrastructure; affirm the spent fuel pool makeup and instrumentation changes in the orders above; establish training and drills for SAMG and EDMG users; enhance multiunit emergency planning related to staffing, dose assessment, training, and equipment; and enhance station blackout emergency planning related to communications, ERDS, training, and equipment.

There are also five actions to be taken by the NRC staff, mainly to coordinate with the orders and rulemakings. Ten others, most of which involve further study, are to be pursued in the longer term. These are related to seismically induced fires and floods, hardened vents for types of containments other than Mark I and II, hydrogen control and mitigation, protective equipment for emergency responders, decision-maker qualifications, ERDS transmission alternatives that do not depend on hardwired infrastructure, additional emergency response resources, coordination with other agencies to study the

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ations that have been key to the agency's work in recent years, and a defense-in-depth philosophy, defined within the task force's review as protection from external events that could lead to fuel damage, mitigation of accident consequences, and emergency preparedness. Without taking a position on where the balance point should exist between risk and defense-in-depth, one of the task force's specific actions within the first recommendation is to “more effectively implement the defense-in-depth philosophy in balance with the current emphasis on risk-based guidelines.” This appears to indicate that the balance point would move closer to defense-in-depth.

Another theme that appears several times in the report is how licensees and the NRC should address beyond-design-basis events. The task force states that in the development of NRC regulations, there have already been instances in which licensees have been called upon to respond to potential hazards not included in power reactor design bases. These requirements have often been met through procedural changes or

of currently operating power reactors are 12 orders that would be issued by the commissioners, directing licensees to do the following:

- Reevaluate seismic and flooding hazards and, if necessary, update plant protection.

- Perform seismic and flood protection walkdowns to address vulnerabilities and verify the adequacy of monitoring and maintenance of features such as watertight barriers and seals until long-term actions are taken to update the design basis for external events.

- Protect equipment already in place to address multiunit events (including the loss of large plant areas to fires and explosions) while other requirements are revised.

- Install hardened vents in BWRs with Mark I and Mark II containment (if they are not already installed).

- Install safety-related instrumentation to monitor from the control room the condition of spent fuel pools (water level, temperature, radiation).

- Provide safety-related AC power for the spent fuel pool makeup system.

- Revise technical specifications for one

nuclear emergency decision-making framework, real-time radiation monitoring within emergency planning zones, and potassium iodide use.

With all of the things that the task force said should be done, it might be easy to overlook the things they said should not be done. It was stated that Level 3 probabilistic risk assessments (PRA) for accident dose and health effects are not necessary, because the metrics of core damage frequency and large early radioactive release are considered to be well documented and well understood. Some limited Level 3 analyses at a few plants, however, “could confirm that the selected frequency ranges for design-basis and beyond-design-basis requirements are consistent with the commission’s safety goals.”

The task force also advised a largely hands-off approach to many of the activities now ongoing for new reactors. For example, the report states that the design certification of GE Hitachi Nuclear Energy’s ESBWR and Westinghouse Electric Company’s amended AP1000 should be completed “without delay,” because their passive safety design aspects should give them 72-hour station blackout coping. In slides presented at the July 12 meeting, the task force went into more detail than in the published report, noting that Recommendations 4 and 7, on station blackout and spent

fuel pools, should be applied to the applications for combined construction and operating licenses (COL) for those reactor designs, and also for the Toshiba-design ABWRs planned for South Texas-3 and -4. The other reactor designs in the certification pipeline—Areva’s U.S. EPR and Mitsubishi Heavy Industries’ US-APWR, and the applications from Toshiba and GE Hitachi to renew the ABWR—would have to meet Recommendations 4 and 7 before certification rulemaking. All near-term COL applicants, regardless of reactor choice, would also have to apply Recommendations 8 and 9 (emergency procedures and planning) before COL issuance, and TVA’s unfinished reactor projects (Watts Bar-2 and Bellefonte-1 and -2) would apply Recommendations 2 (seismic and flooding design basis), 4, 7, 8, and 9 before operating license issuance.

### **The commissioners’ views**

During the July 19 meeting, it was clear that while the commissioners appreciated the task force’s effort, most of them were not eager to agree with all of the recommendations as presented or to act on them immediately. Kristine Svinicki said that Recommendation 1 seemed to counter the position that a Fukushima Daiichi event sequence is unlikely to occur at U.S. reactors, and William Ostendorff asked whether the

rest of the recommendations would be affected if Recommendation 1 were not accepted. (Task force member Gary Holahan said that they would, because the NRC then would not treat all reactors consistently.) Even Chairman Gregory Jaczko, who is generally in favor of many of the changes proposed by the task force, took some issue with the reference to the NRC’s body of regulations as “patchwork,” drawing an analogy with a patchwork quilt, which is effective at keeping a person warm, regardless of how it was assembled.

William Magwood pursued the issue of flooding, asking whether it wasn’t already known that flooding could adversely affect large areas of a plant. While Holahan said that flooding has not always been explored fully, Magwood asked if there was really new knowledge, and whether it redefines the concept of adequate protection. George Apostolakis, a longtime PRA researcher, asked why Level 3 PRA was considered unnecessary. (Miller said that the task force had expected that Apostolakis would bring this up.) Holahan agreed that health effects and land contamination would be important, but Level 3 was ultimately seen as unnecessary.

There were also questions on the call to rebalance defense-in-depth with risk. Svinicki asked if the ROP is not already based in defense-in-depth. Miller replied

that the task force advises a “focused, narrow” refinement of the ROP. Apostolakis said that he did not see the three realms of defense-in-depth in the report as either independent or redundant.

Over the next several days, four of the commissioners made public their votes on the issue. (Jaczko, who often releases his votes and comments sooner than the others, had not done so as of this writing.) None of the votes favored the immediate adoption of the task force’s recommendations. Indeed, as Svinicki noted, what the commissioners received (in SECY-11-0093, the material forwarded by the staff) included only the report, with no evaluation by the agency’s technical and programmatic staff. The notation votes issued thus far set forth positions from which a consensus might later emerge.

Svinicki had requested input from the

souri River, and said that he’d like to see station blackout coping capacity extended to 72 hours. He also mentioned points that were not in the task force report, calling for the emergency planning zone radius to be expanded to 20 kilometers (about 12 miles) and stating his concern over the spent fuel stored at the two closed reactors at the Zion plant in Illinois. He indicated that if the NRC did not act on his concerns on its own, Congress would mandate such action. Then he departed.

Jaczko then introduced the task force members and presented Miller with a token of the agency’s appreciation, a framed American flag that had flown over the Capitol. This was both for Miller’s service on the task force and his career at the NRC. Then Jaczko himself departed, leaving the meeting to the task force and facilitators who lined up speakers in the audience and commentators queued by

phone. The task force members then presented the report, and after a break the floor was opened to stakeholders.

Industry representatives and critics of nuclear power were present (probably more of the latter if phone callers are included), but people in both groups had something in com-

mon: They were dissatisfied that the task force had been closed to public access until then, and they wanted to ensure that there would be ample opportunity to participate if the NRC were considering a major re-vamping of reactor regulation.

Paul Gunter, of the citizen organization Beyond Nuclear, asked why hardened vents were recommended, given that General Design Criterion 16 calls for containment to be leak-tight. Holahan said that the vent would be used only in beyond-design-basis situations. When Gunter asked whether the vent would be filtered, Grobe said that these would be wetwell vents, with water providing filtration.

Maria Korsnick, chief nuclear officer for Constellation Energy Nuclear Group, said that the issuance of several orders could distract from operational safety and asked whether the recommendations were prioritized. Miller noted the phases of the recommendations, starting with orders, then rulemakings, then long-term study.

Grobe said that the agency has been conducting a study of the cumulative effects of regulation for about a year, and while this effort has focused mainly on rulemaking, he said that he expected that there would be public involvement in the study of the cumulative effects of the recommendations of the Near-Term Task Force, perhaps con-

ducted by the Long-Term Task Force. (As noted above, the staff has been asked to assign priorities to the recommendations.)

A caller from Southern Nuclear asked why there was so much concern about spent fuel, since at Fukushima Daiichi most of what happened in the pools was the in-fall of debris. Grobe, who did much of the talking from the task force side, noted that there is more spent fuel in pools in the United States, and there are no combined pools for partially cooled fuel.

Thomas Cochran, of the Natural Resources Defense Council, a citizen organization, stated that the production of hydrogen from the interaction of water and cladding was not given enough attention by the task force. He raised other points as well, but his argument in this area, and on whether the agency should be pushing for advanced fuels that don’t use zirconium, was picked up by other nuclear critics who spoke later. In later discussion on this topic, Grobe said that while the task force looked at zirconium reactions in water, it did not question whether zirconium should even be used at all.

A representative of the Nuclear Energy Institute asked whether later data from Fukushima Daiichi might make some of the proposed orders unnecessary. Holahan said that the task force has the same problems with incomplete Fukushima data as everyone else, but some facts are certain—for example, hydrogen explosions and station blackout did occur. The task force tempered its position on spent fuel pool actions because at the time, the members considered their knowledge insufficient to draw more precise conclusions.

After someone questioned the necessity of 72-hour station blackout coping, someone else looked at the issue from the other side and asked why the task force did not address a months-long outage from total loss of infrastructure. Holahan said that the task force had not considered complete reactor independence indefinitely. In such a case, the issue would not be just electricity, but the eventual need to obtain more water.

By the time this issue of *NV* has gone to press, it is possible that the Long-Term Task Force will have begun its work and that the commissioners will have decided what they want the agency staff to do next in connection with the near-term report. While few recommendations may be carried through and even orders may be months away from issuance, it is worth noting that even many industry officials who have criticized the report as a whole, accept that some post-Fukushima Daiichi changes would be appropriate, with station blackout-related and spent fuel pool upgrades often cited as worthwhile. Exactly what will be done, and when, may ultimately be worked out by another instance of what the task force might call “appropriate balancing.” **■**

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agency’s executive director for operations, William Borchardt. She said that he advised obtaining stakeholder input before taking action, so she called for the staff to produce a plan to this effect. Magwood requested that the staff rank the task force recommendations by priority. Ostendorff proposed that Recommendation 1 “be deferred for action and commence only after receiving future direction from the commission.” Apostolakis generally agreed with the others on setting priorities and on the preparation of a charter to update the structure of the long-term review of Fukushima Daiichi (for which the task force members had not been announced at this writing).

The general effect of all this is that whatever actions the NRC ultimately chooses (including on the proposed orders), none will affect licensees until the fall or later.

### Stakeholders speak out

The July 28 event was in the same location as the earlier one—the commissioners’ meeting room at the NRC’s Rockville, Md., headquarters—but this time, the commissioners’ side of the table was occupied at the outset by the task force members, Jaczko, and Sen. Mark Kirk (R., Ill.). Jaczko introduced Kirk, who delivered some prepared remarks. He touched on flooding issues, including the recent high levels of the Mis-