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on "The U.S. Government Response to the Nuclear Power Plant Incident in Japan"

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Summary

- The crisis underway at the Fukushima Daiichi nuclear plant has revealed serious nuclear safety shortcomings that have major implications for nuclear power plants in the United States and around the world.

- Although the events are still unfolding in Japan, it is not too soon to begin to learn lessons from the evidence available so far.

- The Nuclear Regulatory Commission is initiating comprehensive internal reviews of its regulations and practices, but stringent external oversight will be required to ensure that these reviews effectively challenge prior assumptions that the Fukushima crisis has called into question, and that any weaknesses identified by the reviews are promptly corrected.

- Steps that the NRC should take in the near term include

    - Strengthening requirements to cope with prolonged losses of electric power (station blackouts) in order to prevent damage to reactor cores and spent fuel.

    - Requiring the accelerated transfer of spent fuel from densely packed wet pools to dry casks.

    - Strengthening requirements for management of severe events that cause damage to reactor cores and spent fuel, and ensuring plans are realistic and workable.

    - Revising emergency planning requirements in the vicinity of U.S. nuclear plants to ensure that all populations at risk from excessive radiation exposure will be protected.

Good morning. On behalf of the Union of Concerned Scientists, I would like to thank Chairman Stearns, Ranking Member DeGette, and the other members of the Subcommittee on Oversight and Investigations for the opportunity to provide our views on the still unfolding accident at the Fukushima Daiichi plant and its implications for nuclear power in this country.

The Union of Concerned Scientists would like to extend its deepest sympathies to the people of Japan during this crisis. While the dire situation in Japan should remain a main focus of U.S attention, the U.S. also urgently needs to assess whether we are doing all that we can do to prevent a Fukushima-like nuclear disaster from happening here.

Before proceeding, I would like to say that the Union of Concerned Scientists is neither pro nor anti-nuclear power, but has served as a nuclear power safety and security watchdog for over 40 years.

Today, nearly four weeks after the catastrophic earthquake and subsequent tsunami that precipitated the Fukushima Daiichi crisis, there is still much that is uncertain, and it will be a long time before we learn all the lessons from this still-evolving accident. However, the severe and unacceptable consequences of this disaster for human health, the environment and the economy are already apparent. Hence lawmakers, regulators and the nuclear industry should not hesitate to take steps to help ensure that such a dire event will not happen here.

In the aftermath of the Chernobyl accident in 1986, many argued that such a large release of radioactivity could not happen in the United States or other countries with Western-designed reactors because those reactors had containment structures, unlike Chernobyl. However, it is now clear from Fukushima that significant releases of radioactivity can occur following a severe accident even without a catastrophic failure of containment. The Austrian Central Institute for Meteorology and Geodynamics has estimated that up to approximately 80 percent of the quantity of the long-lived isotope cesium-137 that was released after the Chernobyl accident was released from the Fukushima site in the first week after the accident. As large as this may sound, it only represents about one-tenth the total amount of cesium-137 in the three damaged reactor cores themselves. Further damage to the fuel, reactor vessel and containment could result in far greater releases. And the Fukushima Daiichi Units 1-3 boiling-water reactors have a type of containment structure, known as Mark I, which analysts have long known to be unusually vulnerable to breach in a severe accident. A 2006 study by Sandia National Laboratories estimated that in the event of a core melt, there was a nearly 36 percent chance that the molten core would melt through the containment wall ("Risk-Informed Assessment of Degraded Containment Vessels," NUREG/CR-6920, November 2006, Table 4.5, p. 76). This mode of containment failure would not be affected by the changes that the NRC ordered for the 23 Mark I containment boiling-water reactors in the United States to reduce the chance of containment failure by a hydrogen explosion. Perhaps even more serious is the risk of further damage to the irradiated fuel in four compromised spent fuel pools, which also contain massive quantities of radioactive material but are not enclosed in leak-tight containment structures.

The Nuclear Regulatory Commission has announced that it will conduct both short- and longer-term reviews of its regulations and procedures. To that end, it announced last week that it had formed an internal task force to conduct a 90-day comprehensive examination of issues raised by the Fukushima accident, including station blackout risks and emergency preparedness. We believe that the task force has identified many of the right issues for scrutiny. However, we question whether the NRC's review will be sufficiently thorough without stringent oversight by Congress and entities such as the National Academies of Science. The defensive public posture that the NRC has taken since March 11 raises concerns that the agency remains too complacent to conduct a critical self-examination of its past decisions and practices. The NRC must confront the overarching question of whether it has allowed safety margins to decline to unacceptably low levels, based on a perception that severe accidents resulting in core damage are so infrequent that they do not require a high level of regulatory attention. It must adjust this perception in light of Fukushima.

We are also concerned about whether the NRC can adapt quickly to changed circumstances. Following the 9/11 attacks, the NRC undertook what it called a "top to bottom" review of its regulations for protecting nuclear power plants against radiological sabotage. Although the review uncovered serious shortcomings in the NRC's security requirements, the process of fixing them has been so slow that even today—nearly ten years after 9/11—some nuclear plants still have not completed required security upgrades, including Diablo Canyon, H.B. Robinson, Shearon Harris and Farley.

The Fukushima accident has already revealed a number of apparent vulnerabilities that may also affect U.S. plants. Some early lessons include the following:

1. The accident was initiated by a massive earthquake and tsunami, but the direct cause was the loss of both off-site and on-site power supplies, a situation known as a station blackout. There are many other types of initiating events that could cause such a situation, including terrorist attacks. In the event of a station blackout, only battery power is available to operate systems needed to prevent core damage. The NRC requires U.S. plants to have sufficient battery capacity to cope with a station blackout for no more than either four or eight hours, as well as plans to restore AC power by the time the batteries run out. Ninety percent of U.S. reactors only have a four-hour capability. We need to re-evaluate the adequacy of these plans, and whether they can be realistically implemented. Fukushima has demonstrated the extreme challenges that can be encountered in trying to restore power supplies after a catastrophic event that causes great disruption to the surrounding infrastructure.
2. At least one of the spent fuel pools at the Fukushima plant is believed to have lost coolant and caught fire, causing fuel damage, a hydrogen explosion and the release of long-lived radioactive particles. The pools are on the upper floors of these Mark I boiling-water reactors. The United States has 33 boiling-water reactors with similarly situated spent fuel pools that are far more densely packed than those at Fukushima and hence could pose far higher risks if damaged because of higher heat loads, less space available for coolant flow and greater radionuclide inventories. The United States should act as quickly as practicable to remove older spent fuel from these pools and place them in dry storage casks to reduce the heat load and radioactive inventories of the pools, and allow

greater spacing between assemblies. While NRC should give priority to the elevated spent fuel pools, it should also address risks at those pools that are at or below ground level, which are also vulnerable to loss-of-cooling events.

The NRC and the industry continue to maintain that U.S. spent fuel pools do not pose unacceptable risks and there is no need to transfer any spent fuel into dry storage other than fuel exceeding licensed pool capacities. However, NRC and industry officials have recently testified that as part of the post-9/11 plans for coping with the aftermath of terrorist attacks, the NRC has required changes to the way spent fuel is arranged in the pools, so that hotter fuel is not bunched together (so-called "checkerboarding"), and has also imposed new requirements for providing makeup water to the pools. The NRC would not have made these changes if it were not concerned about spent fuel pool risks. But what the public doesn't know is whether these changes are sufficient to mitigate the risks, since further details are not publicly available. The difficulties and risks the Japanese have experienced in getting jury-rigged emergency cooling water supplies to the pools – using fire hoses, helicopters and concrete spraying pumps – raise questions about the workability of such plans.

3. Although the Japanese are engaged in truly heroic efforts to mitigate the worst effects of this accident and reduce radioactive releases that could harm the public, these efforts have only been partially effective, are already resulting in life-threatening conditions for the workers on site, and may ultimately fail. U.S. nuclear plants have severe accident management plans, but these plans are not required by regulations and are not evaluated by the NRC or tested for their effectiveness. In the case of aircraft attack on a nuclear

plant, the NRC does require plants to have plans to cope with the loss of large areas of the plant due to explosion and fire. The NRC now claims that these plans would also provide reactor operators with the capability to recover from a wide range of severe accidents, including natural disasters such as the events that triggered Fukushima.

However, these plans now must be re-evaluated to judge whether they can be realistically carried out in every circumstance under which the NRC takes credit for them, such as the extreme conditions now being encountered at Fukushima. For instance, a Nuclear Energy Institute official asserted in a Senate briefing on March 17 that the industry has pre-staged diesel-driven fire pumps and other equipment to enhance the capability of nuclear plant operators to mitigate severe events. But upon questioning, the official admitted that this equipment is not seismically qualified or otherwise "safety-related." Thus it is unclear if it would actually be available following an earthquake. And even if the equipment were available, it is far from assured that it could actually be used safely and effectively for the duration of a crisis.

Because the industry's post-9/11 plans are treated as "security-related information," members of the public cannot access them and are not able to judge for themselves whether the plans are credible. For instance, the public does not know if these plans address serious issues in post-accident response that have been revealed at Fukushima, from the ability to manage and contain the large volumes of highly contaminated water generated by manual injection of coolant to the ability to ensure an adequate supply of personal dosimeters for all workers required for emergency response actions.

Presumably these plans are supported by a whole host of pre-Fukushima assumptions that may need to be revisited. Independent oversight of these plans is critical to ensure that such plans are robust and realistic, and that licensees are fully in compliance with them.

The regulatory concept of "defense in depth" means that efforts must be made both to prevent accidents from occurring and to mitigate them should they occur. We believe that the Fukushima experience indicates that mitigation is extremely challenging and may be impossible in some circumstances. NRC should place a far greater emphasis on preventing accidents and terrorist attacks from disabling multiple safety systems and disrupting core cooling by increasing safety margins, rather than trying to control events after core damage has occurred.

4. Levels of radioactive contamination and radiation dose rates high enough to be of significant concern have already been detected more than twenty miles from the release site, well beyond the 12-mile evacuation zone established by Japan. Lower but still elevated levels have been detected more than one hundred miles away. At one site approximately 25 miles northwest, hot spots are causing dose rates about forty times background levels. Residents occupying these areas would receive the maximum annual dose limit from artificial sources recommended by the International Commission on Radiological Protection within a week. These measurements confirm the wisdom of the U.S. decision to evacuate all Americans within fifty miles of Fukushima Daiichi.

However, if there was a reactor accident in the United States, the emergency preparedness measures that would directly protect the public, including evacuation planning and potassium iodide distribution, are limited to a 10-mile radius. The federal government should seriously consider increasing this distance, and should reassess the workability of emergency plans in the context of natural disasters or terrorist attacks that could disrupt emergency response activities. The NRC is defending the apparent inconsistency between its domestic requirements and the recommendations it issued for Japan by suggesting that the U.S. could always expand the evacuation zone beyond 10 miles as the situation warrants. However, the key to emergency planning is planning. The notion that an orderly and quick spontaneous evacuation could be carried out for large areas downwind of some U.S. nuclear plants in densely populated regions, such as Indian Point near New York City, simply strains credulity. Some degree of advance planning should be required for all populations who may be at significant risk in the event of a severe reactor accident, based on the best technical assessment. In particular, potassium iodide should be made available to all children who may be at risk of exceeding recommended intervention levels due to exposure to radioactive iodine either through direct plume inhalation or consumption of contaminated food or water.

There are many other areas where we believe the NRC has allowed safety margins to decrease too far. Now, not after an accident, is the time to reconsider whether the NRC's position on "how safe is safe" is truly adequate to protect public health and safety. Thank you for your attention, and I would be happy to answer any questions you may have.