

# Background

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## U.S. Nuclear Policy After Fukushima: Trust But Modify

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**Abstract:** *On March 11, 2011, a 9.0 magnitude earthquake and subsequent tsunami hit Japan, severely damaging and disabling the cooling systems at the Fukushima nuclear reactor. Radiation leaks have led to an evacuation zone, a no-go area, and traces of radiation ending up as far as the East Coast of the U.S. Information from the Japanese government has proven unreliable, and facts and developments reported in the media continue to change. While renewed attention to the safety of U.S. power plants is warranted, it is simply too early for policymakers to implement sweeping policy reforms. Until the full scope and implications of the Fukushima disaster are understood, it will be unclear which lessons the U.S. should learn. In the meantime, there is an issue that can, and should, be addressed immediately—disposal of nuclear waste. Heritage Foundation nuclear energy expert Jack Spencer explains when to trust, and when to modify, U.S. nuclear policy.*

As Japanese authorities continue their effort to stabilize the nuclear reactors at Fukushima Daiichi, questions are being raised about the future of nuclear energy in the United States. While a U.S. policy response is appropriate, it must be informed by lessons learned and by facts recognized—not assumptions and politics. Making broad policy decisions before the Fukushima crisis is fully understood risks enacting reforms that do little to advance safety and create unnecessary barriers or burdens to American nuclear power.

No one should diminish the potential impact of Fukushima, or attempt to predict the outcome at this point. Only two months after the earthquake and tsu-

### Talking Points

- Preparing nuclear power plants for natural disasters is not a new concept. The U.S. nuclear industry and regulators have spent much time developing specific protocols for just such events.
- U.S. policymakers should avoid sweeping regulatory reforms in the wake of Fukushima until the accident and its effects are better understood. The only policy changes that should take place in the near term are those that address specific, verified deficiencies at U.S. plants.
- U.S. reactors that share the same basic design as Fukushima's have been significantly modified to meet modern safety standards.
- U.S. nuclear policy relies on a combination of federal and private regulation to create a complementary regulatory system that promotes safety from the federal level to the individual plant employee.
- The problems with spent-fuel pools at the Fukushima plant draw attention to the fact that used-nuclear-fuel management in the U.S. remains largely unaddressed.

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nami, facts on the ground are ever changing and information streams can still be difficult to verify. U.S. authorities simply do not know enough about what happened in Japan to justify broad reform for America's domestic nuclear industry. The only policy changes that should take place in the near term are those that address specific, verified deficiencies that have specific impact on U.S. plants.

One of the problems with the emerging dialogue is that some commentators and U.S. policymakers have assumed that America's nuclear industry and regulatory bodies and policies mirror those of Japan. They do not. The United States has an effective, multifaceted regulatory regime that has already addressed many of the mistakes and weaknesses that Fukushima seems to have exposed, including earthquake and tsunami preparedness and the modification of older reactors to meet new and evolving safety standards. On the other hand, the accident should raise serious questions about America's lack of nuclear-waste disposal plans.

### Earthquakes and Tsunamis

While building nuclear plants to withstand earthquakes and tsunamis (and other severe natural phenomena) is a new issue for many Americans, the U.S. nuclear industry and U.S. nuclear regulators have spent a great deal of time developing specific protocols for just such events. American regulators mandate that all U.S. reactors be built not only to withstand the most powerful earthquake ever recorded for their respective sites, but also to withstand the strongest earthquakes that geologists think are possible for each site. Current earthquake, tsunami, and flooding regulations are now under review, as indicated by the Nuclear Regulatory Commission (NRC).

As these reviews are conducted, the NRC and policymakers must ensure that additional regulations promote true safety, not just the perception of safety. Further, policymakers must recognize that plant owners and operators are highly motivated

to maintain safe operations and are in many ways better prepared to ensure public health and safety than federal regulators. Under current U.S. policy, the plant operators are primarily responsible for plant safety. That is why the best approach will be for nuclear regulators to set and enforce high standards—and allow plant operators in the industry to determine how best to meet them.

### The Mark I Containment System

According to the Nuclear Energy Institute, 23 U.S. boiling-water reactors share the same basic containment design, the Mark I, as the Fukushima reactors.<sup>1</sup> At first glance, this is troubling, especially in light of past NRC studies that had identified problems with the containment systems of those reactors. Often ignored, however, are the significant safety modifications made to these designs as a result of ongoing assessments of reactor safety.

The history of the Mark I containment design in the U.S. is a testament to the effectiveness of the American system of nuclear regulation for maintaining public health and safety. Federal regulators identified a number of shortcomings with the original design that posed potential safety problems. The industry responded by forming a Mark I Owners Group to determine how to change the designs to address the safety concerns; the plants were then modified accordingly. Additional reviews led to further upgrades. For example, procedures to supply off-site power and water to reactors and fuel pools have been developed in the event that all on-site power and backup power is lost. Hardened containment venting has been added to every plant to ensure that pressure can be safely released from the containment should there be a system breakdown. Recent reports indicate that a similar modification may have been added to the Japanese reactors but could have malfunctioned.<sup>2</sup> Regardless, U.S. plants have the new venting and nuclear operators should ensure that they are working properly.

Other modifications have been made as well, such as piping and emergency core-cooling upgrades.

1. Nuclear Energy Institute, "Frequently Asked Questions: Japanese Nuclear Energy Situation," March 23, 2011, at [http://www.nei.org/filefolder/FAQs\\_Japanese\\_Nuclear\\_Situation\\_03232011\\_3.pdf](http://www.nei.org/filefolder/FAQs_Japanese_Nuclear_Situation_03232011_3.pdf) (May 16, 2011).

2. Hiroko Tabuchi, Keith Bradsher, and Matthew Wald, "In Japan Reactor Failings, Danger for U.S.," *The New York Times*, May 17, 2011, at [http://www.nytimes.com/2011/05/18/world/asia/18japan.html?\\_r=1&-exp=prod=mysahoo](http://www.nytimes.com/2011/05/18/world/asia/18japan.html?_r=1&-exp=prod=mysahoo) (May 18, 2011).

Though it is unclear exactly what happened at Fukushima or exactly which modifications had been made to those plants, the modifications made to U.S. plants would have made continuity of operations, or safe emergency shutdowns, much more likely.

### Spent Nuclear Fuel

The problems with the spent nuclear fuel pools at Fukushima highlight one area where U.S. policy needs to be reviewed and updated. Japan was insufficiently prepared to respond to a loss of water in the used-fuel pools. The loss of water allowed some of the used fuel rods to be exposed, which resulted in additional radioactive releases and additional severe challenges for plant operators. While the actual causes of the problems will be confirmed at a future point, it seems that some water may have been lost during the earthquake and that pool integrity was likely compromised during the hydrogen explosions. Radiation then spiked as a result of the rods being exposed, making emergency response very difficult.

It is unlikely that such a chain of events could occur at U.S. plants. Largely due to actions taken post-9/11, the U.S. nuclear industry has instituted additional safety precautions against explosions and fires. Nuclear plants in the U.S. have additional water and power sources, for example, to control just such a situation. Nonetheless, on-site spent-fuel management in the U.S. has shortcomings that must be addressed.

Whether in Japan, France, or the U.S., used nuclear fuel is removed from reactors once every 18 to 24 months. Once the fuel is removed, it is placed into used-fuel pools for further cooling. After about five years, most advanced nuclear nations remove the used fuel from the pools for additional processing or disposal. Not the U.S. The 1982 Nuclear Waste Policy Act, as amended, mandates that the federal government dispose of commercial nuclear waste by placing it in a repository at Yucca Mountain, Nevada. But the federal government has completely defaulted on this obligation. While col-

lecting approximately \$30 billion from taxpayers and ratepayers whose electricity is generated from nuclear power, and having spent more than \$10 billion on preparing the Yucca site to open, it has collected no nuclear waste. The Obama Administration exacerbated the situation by attempting to terminate the Yucca program without proposing any disposal plan to take its place.

The end result is that now U.S. power plants are being forced to collect more spent fuel in pools than they were ever engineered to hold. The NRC allows the process, called re-racking, and it can be done safely. However, should a plant ever face an emergency during which pool integrity was threatened, the additional spent fuel could increase the safety risk substantially. It is a completely unnecessary, federally imposed risk that could be mitigated by following federal statute, opening Yucca Mountain, and giving waste producers the authority and responsibility to manage their own waste.<sup>3</sup>

### Regulation in the Wake of Fukushima

U.S. policymakers should not assume that problems in Japan necessarily reflect deficiencies in the U.S. regulatory system, which consists of public and private regulatory entities. Working in tandem, the two entities provide constant oversight, assessment, and evaluation of commercial nuclear operations. There is no institutional bias that keeps any of these structures from raising questions or demanding action. In fact, such vigilance is encouraged. Further, U.S. nuclear plant operations are heavily influenced by the culture of safety instilled by the U.S. Navy's nuclear propulsion program. Many nuclear plant workers come from the Navy. While the system is far from perfect, it provides a strong foundation for safe operations.

The federal regulators at the Nuclear Regulatory Commission license commercial nuclear facilities and operators, develop regulations, and provide oversight and enforcement of those regulations. This process is supplemented by private self-regulation. After the Three Mile Island accident, the

3. Jack Spencer, "Introducing Market Forces into Nuclear Waste Management Policy," testimony before the Reactor and Fuel Cycle Technology Subcommittee of the Blue Ribbon Commission on America's Nuclear Future," August 30, 2010, at <http://www.heritage.org/research/testimony/introducing-market-forces-into-nuclear-waste-management-policy>.

nuclear industry created the Institute for Nuclear Power Operations (INPO), a non-profit, independent, private organization that promotes safety and reliability at America's nuclear plants. INPO evaluates plant operations; trains and accredits nuclear power employees; and collects and distributes information, lessons learned, and best practices gathered from plant audits and collaboration with plant owners. INPO also provides technical and management assistance to the nuclear industry. Finally, plant owners and operators promote safety on specific sites as well as among the industry more broadly, for example, by sharing information and installing on-site, employee-based safety programs.

Nonetheless, a comprehensive review by industry and federal regulators of U.S. nuclear safety procedures is necessary to identify any safety deficiencies or oversights. The following recommendations can help guide policymakers on near-term reform:

- **Trust but modify the American system of nuclear regulation.** Though lessons learned must be applied, policymakers would be mistaken to assume that the same problems facing the Japanese system of nuclear regulation necessarily hold true in the U.S. Though the Nuclear Regulatory Commission is responsible for setting and enforcing safety guidelines in the U.S., plant owners have primary responsibility for operations. Ultimately, plant owners benefit financially from safe operations. This combination of federal and private regulation creates a complementary regulatory system that promotes safety from the macro, federal level to the individual plant employee. For example, individual plants have safety programs in place to train employees. INPO regularly audits those programs to recommend improvements. This process helps ensure that federal safety guidelines are met. The results are extremely safe and efficient operations.

More important, however, a system in which private owners are responsible for safe operations with strict federal and private oversight allows a dynamic regulatory environment to grow that encourages questioning and demands responses.

Whether through employees, federal regulators, or external private safety auditors, the American system encourages constant oversight and safety evaluation. Although accidents do happen and safety lapses do occur, when irregularities emerge, they are identified and resolved quickly. As lessons are learned from Fukushima, plant operators, INPO, and the NRC will all work together to identify and address shortcomings.<sup>4</sup>

Though effective in promoting safe operations, the American system can be overly bureaucratic and suffers from federal micromanagement. Many industry-driven safety advances, such as those engineered into new reactor designs, must traverse the federal bureaucracy before they can be brought to market. This is just one more barrier that makes new plant construction difficult. Though fixing this problem is not something that should come as a response to Fukushima, it is something that should be addressed as a matter of general nuclear policy reform.

- **Be deliberative in implementing any new, near-term regulations.** Federal regulatory authorities have correctly begun reviewing operations at U.S. nuclear plants as an early lessons-learned exercise. Not only are they attempting to learn from the Japanese experience, they will also rethink the assumptions that underlie current safety standards. While this rethinking is entirely appropriate, the only policy changes that should take place in the near term are those that address specific, verified deficiencies that have specific impact on U.S. plants.

Thus far, the NRC and Administration officials have indicated that they would wait until they have a better understanding of what happened at Fukushima before implementing any broad regulatory reforms. This is the correct approach and should be sustained. The problem is that pressure could build from Congress and the anti-nuclear community to install broad reforms under the rubric of enhancing nuclear safety that, in reality, would only hinder the expansion of nuclear energy.

4. U.S. Nuclear Regulatory Commission, "Davis Besse Reactor Vessel Head Degradation," at <http://www.nrc.gov/reactors/operating/ops-experience/vessel-head-degradation.html> (May 10, 2011).



- **Fix used-fuel management.** The United States needs nuclear-waste-management policy reform. By placing the federal government in charge of waste management instead of leaving the responsibility to waste producers, the current system misaligns authorities and responsibilities. Waste producers have little incentive to develop an economically rational and sustainable nuclear waste management plan. And the federal government is not the proper entity to manage used nuclear fuel. The government does not respond to economic or market signals, but to political and bureaucratic ones. This system has led to an unpredictable, incoherent, and failed spent-fuel policy.

Significant reform is needed to resolve the issue of how to manage used nuclear fuel, but some near-term actions can help move things in the right direction.

1. The President and Congress must insist that the Nuclear Regulatory Commission finish its review of the Department of Energy's application to construct and operate the used-fuel repository at Yucca Mountain. Finishing the NRC review does not mean that the facility will be built. It simply leaves one option open.
2. Congress, working with industry, should establish a new body, outside the Department of Energy and with representation by stakeholders in the state of Nevada, to oversee the Yucca project. This new body could negotiate the terms under which the Yucca facility could be operated directly with the nuclear industry.
3. Congress should create a system that introduces price signals into waste-management decision making. Currently, the federal government collects a flat fee of one-tenth of 1 cent per kilowatt hour (about \$750 million annually) to dispose of used nuclear fuel in Yucca Mountain (in compliance with the Nuclear Waste Policy Act of 1982, as amended, and the Yucca Mountain Development Act of 2002). The problem is that this price is not attached to any specific service, so the marketplace has no way to determine

the economic rationality of one approach over another. Reforms need to be put into place that attach costs to services provided. This would create competition for used-fuel management services, drive innovation, and result in choices in the waste-management services market. For example, placing waste in Yucca would have one price, while recycling it might have another.

Ultimately, the responsibility for waste management needs to be removed from the federal government altogether. Not only has the Department of Energy failed, but it should never have been in charge from the beginning. Instead, waste producers should be responsible for managing the waste they created. A great benefit of such a system is that it will drive technology by creating a strong incentive to produce simple-to-manage waste streams and economically efficient waste-management techniques. The result will be a comprehensive approach to the nuclear business that includes fuel production, plant operations, and waste-management elements all working together. The role of the federal government will be to provide predictable regulations that allow the market to work efficiently while maintaining public health and safety.<sup>5</sup>

### Learning from Fukushima

Some lessons have already emerged from Fukushima that can help guide U.S. policymakers. Clearly, America's approach to nuclear-waste management needs to be updated. Simultaneously, an early comparison of U.S. and Japanese approaches to safety at commercial nuclear power plants demonstrates some of the benefits of the U.S. approach. Ultimately, however, U.S. policymakers should wait until a full accounting of the Fukushima accident can take place before they draw any broad conclusions for the domestic nuclear industry. It will be these lessons that can truly help to determine America's long-term response to Japan's nuclear disaster.

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5. Spencer, "Introducing Market Forces into Nuclear Waste Management Policy."