

**S**afety nets are often deployed to protect tight-rope walkers and trapeze artists during performances. If a performer falls and slams to the ground through a ripped portion of the net, more needs to be done than mending broken bones and ruptured organs—the rip in the safety net needs to be fixed. It is simply unacceptable to tolerate a rip just because performers seldom need a safety net.

The U.S. Nuclear Regulatory Commission (NRC) is tolerating the intolerable: a ripped nuclear safety net. Granted, nuclear reactors do not fall into the net every day. And so far the United States has been lucky—with limited and notable exceptions, reactors that have fallen have avoided the ripped portion of the safety net. The more often the net is used and the more

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the net itself is abused, however, the more likely it becomes that someday workers or the public will be harmed by a nuclear reactor accident.

In 2012, the NRC reported 14 “near-misses” at nuclear plants. Just to be clear about the gravity of



NRC Chairman Allison Macfarlane (center) and Commissioner William Ostendorff (left) listen to staff describe security exercises at the International Regulators Conference on Nuclear Security in Rockville, MD.

the situation, a near-miss is an event that increases the chance of core meltdown by at least a factor of 10, thus prompting the NRC to dispatch some level of special inspection team to investigate the event. Over the past three years, 40 of the nation's 104 nuclear reactors experienced one or more near-misses. That is a rate greater than one near-miss per month. The NRC must take two steps to reduce the frequency of near-misses before some reactor falls through the ripped section of the net.

First, the NRC already investigates each near-miss to determine what happened and why. The NRC should formally evaluate all safety violations identified during its near-miss inspections to determine whether the agency's baseline inspections could have, and should have, found these safety problems sooner. Such insights from the near-misses may enable the NRC to make adjustments in what its inspectors examine, how they examine it, and how often they examine it, so no violation can go undetected.

Second, the NRC must require that individual plant owners find and fix problems in their testing and inspection procedures. Many of the near-misses last year involved design and operational problems that had already existed for years—sometimes even decades—prior to the incidents in question. The plants' tests and inspections are supposed to find and fix such problems, yet failed to do so. Plant owners must be formally required to evaluate why their testing

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and inspection failed to find and fix longstanding problems.

Within the NRC itself, rips in the safety net must also be fixed. Regulations *are* the safety net. The simplest repair available is for the NRC to enforce existing regulations, using its ability to impose fines on owners and shut down reactors that violate safety regulations.

Unfortunately, the NRC has repeatedly failed to enforce essential safety regulations. Last year, for example, the NRC approved an additional delay in compliance with fire protection regulations at the Browns Ferry Nuclear Power Plant near Decatur, AL. The NRC adopted the fire protection regulations in 1980 after a disastrous 1975 fire at—of all places—the Browns Ferry nuclear plant. If the latest schedule is met, Browns Ferry will have operated for fully 35 years out of compliance with fire protection regulations that its own fire inspired. Another key NRC safety regulation prohibits a reactor from operating longer than six hours if it suffers a leak of cooling water. In 2012, however, the NRC did nothing when the Palisades Nuclear Power Plant in Michigan operated for nearly a month despite cooling water leaks.

These examples of tolerating the intolerable should be case studies for regulatory ineptitude. Failing to enforce existing safety regulations is literally a gamble that places lives at stake. The NRC must enforce its own regulations.

Tolerating the intolerable reflects a poor safety culture. Last November, the NRC met to discuss the results of the latest in a series of triennial surveys conducted by a consultant of its safety culture and climate. The NRC's discussion of the 2012 survey was held behind closed doors—about as plain an indicator of a poor safety culture as the sordid results themselves. A poor safety culture and unwillingness to openly discuss working conditions go hand in hand.

Among other disconnects, the 2012 survey revealed that half of the NRC's work force had heard about co-workers who received negative reactions from supervisors and senior managers after raising a concern. Only 41 percent of the work force felt that



Photo courtesy of Nuclear Regulatory Commission

Wolf Creek Generating Station, located in Burlington, KS.

## NUCLEAR NEAR-MISSES IN 2012

Reactor & Location	Owner	Highlights
<b>Brunswick Steam Electric Plant, Unit 2</b> Southport, NC	Progress Energy	Excessive leakage of cooling water from the reactor vessel, determined to have been caused by improper installation of the reactor vessel's head, led to an emergency being declared and the reactor being shut down.
<b>Byron Station, Unit 2</b> Byron, IL	Exelon Generation Co., LLC	Equipment failure in the switchyard triggered an automatic shutdown of the reactor. A design deficiency caused emergency equipment to be de-energized until workers took steps to isolate the problem and restore power from the emergency diesel generators.
<b>Catawba Nuclear Station, Unit 1</b> York, SC	Duke Energy Corp.	After an age-related problem caused one of four reactor coolant pumps to fail, the Unit 1 reactor and turbine automatically shut down as designed. Due to a design error in a recent modification, the decreasing voltage output by the main generator caused electrical breakers to open that disconnected Units 1 and 2 from the offsite power grid. One of the emergency diesel generators started but failed to supply electricity to safety equipment due to another design error when it was installed in 1984.
<b>Farley Nuclear Plant, Units 1 &amp; 2</b> Dothan, AL	Southern Nuclear Operating Company, Inc.	Security problems prompted the NRC to conduct a special inspection. Details of the problems, their causes, and their fixes are not publicly available.
<b>Fort Calhoun Station</b> Omaha, NE	Omaha Public Power District	The NRC investigated a fire that disabled half of the 4,160-volt and two-thirds of the 480-volt power supplies for emergency equipment at the plant and triggered the declaration of an Alert—the third most serious of the NRC's four emergency classifications.
<b>Monticello</b> Minneapolis, MN	Omaha Public Power District	Security problems prompted the NRC to conduct a special inspection. Details of the problems, their causes, and their fixes are not publicly available.
<b>Harris Nuclear Power Plant</b> Raleigh, NC	Progress Energy	As the reactor was being shut down for a scheduled refueling outage, workers tested the closing time of the three main steam isolation valves. These valves are designed to close within five seconds during an accident to limit the amount of radioactivity released to the atmosphere. The NRC dispatched a special inspection team (SIT) after it took one valve 37 minutes to close and another valve four hours and seven minutes.
<b>Palisades Nuclear Plant</b> South Haven, MI	Entergy Nuclear Operations, Inc.	Workers shut down the reactor about a month after they detected a small cooling water leak. The NRC sent an SIT to the site after the source of the leak was determined to be a location where any leakage required the plant to be shut down within six hours.
<b>Palo Verde Nuclear Generating Station, Units 1, 2, and 3</b> Wintersburg, AZ	Arizona Public Service Company	Security problems prompted the NRC to conduct a special inspection. Details of the problems, their causes, and their fixes are not publicly available.
<b>Perry Nuclear Power Plant</b> Perry, OH	FirstEnergy Nuclear Operating Company	Security problems involving failures to prevent unauthorized individuals from entering secure areas of the plant prompted the NRC to conduct a special inspection.
<b>River Bend Station</b> Francisville, LA	Entergy Operations, Inc.	The operators manually shut down the reactor on May 24 after an electrical fault on the motor of a feedwater pump caused it to stop running. A failed relay prevented the electrical breaker for the motor from opening to isolate the electrical fault. The fault propagated through the electrical distribution system, causing the breaker supplying power to the 13,800-volt electrical bus to open. Due to another electrical cable problem on May 21, all of the plant's circulating water pumps and non-emergency cooling water pumps were being powered from this single electrical bus. Its loss caused the plant's normal heat sink to be lost and stopped the supply of cooling water to equipment in the turbine building and to some emergency equipment.
<b>San Onofre Nuclear Generating Station, Units 2 &amp; 3</b> San Clemente, CA	Southern California Edison Company	Operators shut down the Unit 3 reactor following a leak inside a steam generator replaced less than a year earlier. The NRC dispatched an augmented inspection team (AIT) after eight steam generator tubes failed pressure testing and inspections identified extensive and unusual degradation in the steam generators of both units.
<b>Wolf Creek Generating Station</b> Burlington, KS	Wolf Creek Nuclear Operating Corporation	Erratic performance of an emergency diesel generator during a routine test prompted the NRC's special inspection. The SIT determined that an improper fix to another problem four months earlier impaired the emergency diesel generator's control system.
<b>Wolf Creek Generating Station</b> Burlington, KS	Wolf Creek Nuclear Operating Corporation	After one electrical fault in the switchyard caused the main generator to shut down automatically, a second electrical fault disconnected the plant from its offsite electrical grid.





Palisades Nuclear Plant, located near Covert, MI.

Photo courtesy of EntergyNuclear

the NRC had taken significant steps to address key issues identified in past surveys of the agency's safety culture. Yet, the survey revealed that the NRC's senior managers believe conditions are far better than the rest of the agency believes.

The 2012 survey suggests the underlying reason for the shortcomings in the NRC's safety culture: there is a large perception gap between how NRC senior managers view conditions within the agency and how the work force views them. NRC managers cannot fix problems they do not believe exist.

The U.S. Congress was instrumental in guiding the NRC into doing more about safety culture problems at nuclear plants a decade ago. Now once again, Congress must compel the NRC to take the same medicine for the same affliction.

The good news is that the NRC already knows how to fix such shortcomings and regain the proper safety focus—it has been working to do so at individual

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nuclear power plants over the past decade. Now the NRC needs to internalize those lessons and practices to heal itself.

It should not take a disaster at a U.S. nuclear power plant to undertake the necessary reforms at the NRC.

Step one: stop tolerating the intolerable.

**The full text of this report is available on the UCS website at [www.ucsusa.org/nuclear\\_power](http://www.ucsusa.org/nuclear_power).**

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*The NRC and Nuclear Power Plant Safety in 2012: Tolerating the Intolerable* was authored by David Lochbaum, director of the UCS Nuclear Safety Program.

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