

## **The NRC and Nuclear Power Plant Safety in 2010: A Brighter Spotlight Needed**

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**March 17, 2011**

UCS was formed more than 40 years ago with nuclear power plant safety as one of the organization's first interests. Over the years, our efforts have consistently concluded that the Nuclear Regulatory Commission (NRC) has, with few exceptions, set the safety bar at the proper height, but has all too often allowed unsafe reactors to limbo beneath that bar.

Rather than crafting another report documenting yet another limbo exercise, we decided to initiate a series of annual reports on the NRC's performance. This report will be the first in that series.

We intentionally avoided a report card format, a best or worst listing, a top or bottom ten, and any other device that favored flash over substance. We are striving to provide reports that will help the NRC steadily improve its performance and thus better serve the American public.

Our report has three main chapters. One chapter summarizes the significant safety and security events at reactors that NRC reported on last year. When an event increased the chances of reactor core meltdown by a factor of 10 or more, the NRC dispatched a team out to investigate what happened and why. We reviewed the NRC's reports on these near-misses for any insights on how the NRC could revise its oversight efforts to lessen the frequency and/or severity of such events in the future.

I am a one-trick pony at UCS. My nearly exclusive focus is on safety levels at nuclear power reactors operating in the US. During a year, I review literally hundreds of documents exchanged between the NRC and plant owners. When I came across information about a particularly good or particularly bad safety outcome, I put it aside for this report. One of our report's chapters describes positive outcomes achieved by the NRC last year. Because we did not formally review all NRC outcomes last year and rate each one, we do not offer these outcomes as being the best. But they were very commendable outcomes that deserve recognition. More importantly, they provide insights on performance attributes and behavior patterns that NRC should emulate to rack up equally commendable outcomes in the future.

Our report also contains a chapter describing negative outcomes the NRC experienced last year. These outcomes are water under the bridge, so our point in highlighting them is to identify the process weaknesses that allowed them to occur. The NRC is a learning organization with an eye towards continuous improvement. It is our hope that by pointing out commendable performance attributes and flagging weak performance areas, we will help the NRC along its improvement path.

Beginning with next year's report, we will include a chapter detailing the actions taken by the NRC in response to our report. We hope that chapter will be longer than one page.

With this foundation on how and why we prepared this report, I'll turn to the more interesting part of what we found.

The NRC reported on 14 near-misses at reactors last year. 12 near-misses involved safety problems while 2 near-misses were for security problems. The most serious of these events occurred at the HB Robinson nuclear plant near Florence, South Carolina on the 31<sup>st</sup> anniversary of the Three Mile Island accident, March 28, 2010. This event began when a high voltage power cable failed and started a fire. Ensuing equipment failures and operator mistakes – quite a large number of operator mistakes – transformed a relatively routine event into a very serious near-miss. Illustrative of the unbelievably poor worker performance contributing to this near-miss is this fact: hours after the fire had been put out, workers re-energized the cable that had started it all. It was still failed and ignited a second fire.

The most costly event happened at the Crystal River 3 reactor in Florida. Workers there managed to break the containment wall that is several feet thick concrete. The reactor remained shut down all of last year and is still shut down today as workers attempt to fix their costly mistake.

If there is a common theme among last year's near-misses, it's that none would have happened had prior warning flags been heeded rather than discounted or ignored. For example, both of the nuclear reactors at the Calvert Cliffs nuclear plant in Maryland automatically shut down when rainwater leaked in through holes in the roof and dripped onto electrical equipment. Workers had noted numerous leaks across many, many months prior to this event, but management always deferred repairs. After all, the roof only leaked when it rained.

The Braidwood nuclear plant in Illinois also experienced an event during which both reactors shut down. That event began when an electrical problem forced one reactor to automatically shut down. A poorly designed safety system dumped lots of water onto the floor of the turbine building. This water rained down to lower floors of the building and onto electrical equipment. That equipment shorted out, causing the second reactor to automatically shut down. When previous events had also dumped lots of water onto the floor, management did not fix the design glitch. They only sent workers out to mop up the puddles.

The event at the Wolf Creek nuclear plant in Kansas could have been avoided even easier. In 2007, workers completed a study showing that the piping in a vital cooling system was prone to damage caused by rust that would result in leaks. Management did nothing. In 2008, that very piping developed leaks as had been predicted. Management only patched the leaks, doing little about the rusting that was causing the problem. In 2009, the piping developed more leaks. This time, workers failed to notice the water puddling on the floor until an NRC inspector found it 7 hours later. When you predict a safety problem and then have that prediction validated the following year, you have little excuse for continuing to ignore it. Yet this owner ignored it. If ignorance is bliss, this owner needs to go on a bliss diet.

Four of the 14 near-misses happened at reactors owned by Progress Energy. There are 104 nuclear power reactors operating in the US and Progress Energy only owns 5 of them. Progress Energy had more than its share of near-misses last year. Why? Was the company merely unlucky? Or did the corporate hand play a role in these safety problems? Did the company adequately fund preventative maintenance activities? Did the company establish high standards and effectively monitor against them? We recommend that the NRC formally evaluate the corporate role when any company experiences more

than one near-miss in a year. By never looking, the NRC will never detect flawed corporate policies and practices that undermine safety at its fleet of reactors.

Catastrophic nuclear reactor accidents involve three ingredients – an initiating event (like the rainfall at Calvert Cliffs) compounded by equipment failures and worker mistakes. It's like the spinning wheels on a slot machine. One ingredient showing up causes a puddle on the floor. Two ingredients yield a near-miss. All three ingredients showing up can cause nuclear reactor disaster. When a leaking roof or worker miscue is tolerated simply because the other ingredients didn't also show up, our luck at nuclear casino may run out.

The NRC only audits about 5 percent of activities at a nuclear reactor each year. Thus, each safety violation they identify could represent another 19 violations in the 95 percent not looked at. But the NRC only requires plant owners to fix the identified violation. The NRC must also make plant owners figure out why their testing and inspection regimes failed to find and fix the safety problem before the NRC found it. Federal regulations require owners to find and fix safety problems. In theory then, NRC inspectors should never find safety problems. So when NRC inspectors find a safety problem, it means either that the company's testing schedule was too infrequent or that the company's inspection methods were deficient. Only by fixing those testing and inspection regime shortcomings will the risks of nuclear plant accidents be properly managed.

Our report describes three outstanding catches the NRC made last year. After a vital safety system experienced a problem during a periodic test on the Unit 1 reactor at the Oconee nuclear plant in South Carolina, the plant owner contended that the same components on Units 2 and 3 were immune to the failure mode. When NRC inspectors found that the vendor said all three components were equally vulnerable, the plant owner argued that even if the component failed on Unit 2 or Unit 3, workers could arrange an alternate system. When NRC inspectors found that high radiation levels would prevent workers from taking those steps, the plant owner gave up and ran the tests on Units 2 and 3. The tests failed and the flawed components were replaced.

At the Browns Ferry nuclear plant in Alabama, an emergency system developed an oil leak in its hydraulic control system due to a defective gasket. The owner replaced the gasket to stop the leak, but concluded that the leak did not impair the ability of this system to perform its safety function. NRC inspectors pointed out that this emergency system may need to operate for many hours following an accident but the owner's evaluation had only considered a snapshot in time. When oil leakage over many hours was considered, the owner concluded that the leak would have disabled the system. As a result, vulnerable gaskets were replaced at nuclear plants across the country.

At the Kewaunee nuclear plant in Wisconsin, NRC inspectors discovered that the method used to test one half of a fully redundant emergency system (the system had two halves and safety would be maintained if either half worked) disabled the entire system. That testing method had been used for nearly 30 years, but is no longer being used thanks to the good catch by the NRC.

At Oconee, Browns Ferry, and Kewaunee, the NRC's inspectors asked questions. More importantly, they kept asking questions. My department head in college used to say "it's not enough to have all the right

answers until you've asked all the right questions." These NRC inspectors asked all the right questions. In doing so, they uncovered real safety problems. They served the American public very well. UCS applauds their stellar performance.

Our report also commends three things the NRC did last year to enhance the public's access to agency information. The NRC replaced the search engine for its online electronic library of documents (called ADAMS). The former system was more like electronic keep-away than a reliable search engine. Its replacement is really good and really works.

The NRC also improved its turn-around time for providing documents in response to Freedom of Information Act requests. Not too long ago, I waited more than a year for FOIA records. Now, the turnaround time is very reasonable.

And last year, NRC Chairman Jaczko and NRC Commissioner Magwood included face-to-face meetings with members of the public during their visits to the Vermont Yankee and Braidwood nuclear plants respectively. I heard from people attending these meetings how much they appreciated these opportunities for dialogue with senior agency officials.

There was another side to this NRC coin. After NRC inspectors at Indian Point Unit 2 in New York discovered that a steel liner whose only safety function is to prevent leakage should an earthquake occur was leaking and had been leaking since 1993, NRC management accepted this safety deficiency along the "no blood, no foul" line. There's no way the people living near this plant are protected should an earthquake occur. The safety equipment installed to protect them in that case is already broken. And the NRC knows it. NRC may want to fill the vacuum created when MMS imploded last year.

At the Peach Bottom nuclear plant in Pennsylvania (where NRC heard about security officers sleeping on duty but did nothing about it until months later when they saw a videotape of the sleeping guards on TV news), workers found that the control rods used to shut down the reactor in an emergency were moving too slowly to achieve that condition within the time assumed in the safety studies. Safety requirements dictated that the reactor be shut down if more than 13 control rods were slow. Workers found 21 slow control rods. But they deliberately kept the reactor operating despite known safety problems and a legal requirement to shut down. The NRC knew about both the safety problem and the deliberate violation of federal safety requirements, but took no actions. Perhaps they too were sleeping at Peach Bottom.

The owner of the Vermont Yankee nuclear plant informed the NRC last year about a leak of radioactively contaminated water. The owner didn't know where the water was leaking from or where it had gotten to. Federal safety requirements do not allow plant owners to release even a single drop of radioactively contaminated water to the environment except via controlled and monitored pathways. But the NRC did not enforce these regulations at Vermont Yankee.

Unlike the NRC inspectors at Oconee, Browns Ferry, and Kewaunee, the NRC stopped asking questions before all the right questions had been asked and answered. It's kind of like asking the owner of the Titanic if the ship has lifeboats. Yes. Unless one then asks if the Titanic has enough lifeboats for all the

passengers and all the crew, one won't discover that lots of people are going to die if the unsinkable ship sinks.

The positive examples show that the NRC can be an effective regulator. The negative examples show that the agency still has some homework to do to become the regulator of nuclear power the public expects and deserves. The 14 near-misses last year shows the NRC reforms are urgently needed.