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MOX Fuel Fabrication Facility on November 19, 2007 (National Nuclear Security Administration)

By Donna Deedy, special to ProPublica with Michael Grabell, ProPublica May 5, 2011, 4:49 p.m.

In the late 1990s, U.S. policymakers approved a plan to turn plutonium from nuclear weapons into fuel for commercial reactors. The first-of-its kind plant [1], now being built in South Carolina, was intended to reduce the Cold War stockpile and the threat of nuclear material theft while supplying the country's energy needs.

More than a decade later, the mixed oxide fuel [2] (MOX) plant is running into mounting troubles [3], including long delays, soaring costs and the lack of utilities committed to use the new fuel in their reactors.

But there's another aspect of the story that has received little attention. Two of the Nuclear Regulatory Commission's safety reviewers for the project say the NRC has taken shortcuts on safety to avoid delaying the construction. Work on the facility was allowed to begin, they say, before some of the most essential questions were fully answered. They have been particularly concerned about the danger of chemical explosions, the adequacy of the ventilation and radioactive waste disposal systems and the way the plutonium will be tracked as it is processed.

Alex Murray, the lead chemical process engineer on the NRC review team, has said in public documents [4] that he was removed from the project in 2007, after he repeatedly warned that safety plans to prevent a chemical explosion risk specific to this type of plant were inadequate and could lead to a significant release of radioactive material.

After Murray was reassigned, the NRC hired Dan Tedder, a chemical engineering professor from the Georgia Institute of Technology who had participated in technical reviews for the Department of Energy since 1979. Tedder said he resigned less than a year later because he believed that the plant's chemical engineering plans were incomplete and felt that his concerns were brushed aside.

"I really don't feel that the NRC is doing the thorough type of analyses that I believe are appropriate," he said. "Their primary focus is staying on schedule and not doing anything to delay the applicant, rather than identifying dominant risks and safety issues."

The NRC said the reviewers' objections were considered and all outstanding issues resolved as part of the safety evaluation [5], which was finalized in December. Studying dissenting opinions is a built-in part of the licensing review, and there was no pressure to speed up the process, the agency said.

"We wouldn't allow or license a facility or a fuel if we didn't think it was safe," said NRC spokesman David McIntyre.

The MOX plant is the first new construction authorized by the NRC since the Three Mile Island accident [6] in 1979. It is located at the federal Savannah River Site [7], an old bomb-making complex near Aiken, S.C. Originally estimated at \$1.4 billion, it is now expected to cost taxpayers [8] nearly \$5 billion. It won't begin producing fuel until 2016 at the earliest, about a decade behind schedule.

The idea of using weapons-grade plutonium to fuel nuclear power plants surfaced after the end of the Cold War when the United States and Russia each agreed to dispose of 34 metric tons of plutonium, the core material of some atomic bombs.

Lawmakers, the nuclear industry and some scientists pushed the United States to follow a technique being used in Europe – the reprocessing of spent fuel to make MOX. France and Belgium have successfully operated MOX manufacturing plants since the 1970s using plutonium from commercial reactor waste. But the U.S. MOX plant will be the first to mass-produce fuel using weapons-grade plutonium.

The NRC and some experts say operations can be adjusted to accommodate the different characteristics of the weapons-grade material. But others note [9] that there has been a history of accidents in the United States when similar methods were used to process plutonium for military purposes.

At Savannah River, workers in a separate facility will extract plutonium from the weapons' cores. The plutonium will then be transferred to the MOX plant, where it will be purified, chemically processed,

blended with uranium and turned into pellets. The pellets will be loaded into fuel rods for commercial reactors.

The plant is being built and will be operated by Shaw Areva MOX Services, a partnership of the [Shaw Group](#) [10], a large engineering firm based in Louisiana, and [Areva](#) [11], a company primarily owned by the French government that has worldwide interests in all phases of the nuclear industry.

[In a blog post last month](#) [12], Areva Inc. CEO Jacques Besnainou criticized the news media for sensationalizing the dangers of MOX, saying the fuel is safe and has been rigorously tested. He said the company values transparency and encouraged readers to “learn the facts of this issue.”

But Areva declined to answer ProPublica’s questions about the plant, as did Shaw and a spokesman for their partnership. Instead, they referred questions to the U.S. Department of Energy, which declined requests to interview officials in charge of the program. A department spokesman sent a statement saying the DOE will review “all aspects of the safety of nuclear technology” in light of the crisis at Japan’s Fukushima Daiichi plant and that the MOX facility will comply with all requirements before going into operation.

The NRC set up a two-step licensing process for the Savannah River MOX plant. Construction would be authorized after it was determined that Shaw Areva’s design and safety plans provided reasonable protection against natural disasters and catastrophic accidents. The NRC would then verify that the plant was properly built before issuing an operating license.

But the NRC was under pressure from some lawmakers and the industry to streamline the regulatory process. It decided to defer some of the [safety decisions](#) [13] until the operating phase. Both Murray and Tedder were troubled by that approach.

The MOX plant’s licensing process has also been criticized by a judge for the Atomic Safety and Licensing Board, which settles disputes for the NRC. In a 2008 hearing involving a separate but related matter, Judge Michael Farrar, the panel’s chairman, [questioned](#) [14] whether “the constant pressure ... to ‘do it faster’ ” could have a “substantive impact” on the NRC’s review and its safety culture.

“In my judgment, this proceeding has exposed matters that might indicate that that culture is being undermined,” he wrote at one point in the case.

As far back as 2000, the [Nuclear Energy Institute](#) [15], which represents the nuclear industry, had [submitted comments](#) [16] saying the rules for the MOX plant safety review were “overly prescriptive.” Steven Kerekes, an institute spokesman, said in a phone interview that the industry was only encouraging the NRC to make its requirements more flexible.

Murray, the son of a prominent nuclear scientist, has worked at the NRC since 1997 and has a background in nuclear fuel reprocessing. He has been particularly concerned about the possibility of “red oil” explosions, an inherent risk in nuclear reprocessing. Red oil forms during chemical processes when an organic solution comes into contact with nitric acid. At high temperatures and concentrations, it can lead to runaway reactions and explosions.

Red oil incidents happened at the Savannah River bomb site and at the Hanford nuclear reservation in Washington in 1953 and again at Savannah River in 1975. One of the most serious accidents occurred in 1993 at a [plant in Tomsk, Russia](#) [17]. A red oil explosion destroyed the building’s walls and sent a radioactive plume into the surrounding communities.

The NRC referred Murray's concerns to a panel of agency staff and the federally funded Center for Nuclear Waste Regulatory Analyses [18], which both confirmed [19] in 2007 that the MOX plant's red oil safety strategies were inadequate. But they added that the matter could be deferred until the operating license review, and the NRC allowed construction to continue.

Murray has said in memos [20] and e-mails to management that he felt his safety concerns were dismissed. After raising them, he noted that he was removed from the MOX project and reassigned against his will to other NRC projects. He was also appointed to an NRC task force charged with reviewing the agency's safety culture.

"This redirection, isolation and ostracism have given the impression to some staff members that if one raises significant issues, there seems to be a potential for negative consequences," Murray said in a September 2010 letter [21] to NRC commissioners.

McIntyre of the NRC disputed that. "There has been no retaliation against anyone for raising safety issues," he said.

Several years after Murray raised his concerns, Shaw Areva modified its red oil safety strategy. An independent analysis [22] of the new plans by Brookhaven National Laboratory concluded in 2009 that red oil explosions would be "highly unlikely." However, the Brookhaven study didn't assess what might happen in the event of internal fires and outside events, such as earthquakes or power outages, which led to the crisis in Japan.

While the Savannah River Site is on a fault line [23], it's not on the edge of a tectonic plate, as Japan is. Japan has suffered 10 earthquakes of 7.0 or greater magnitude in the past decade, according to the U.S. Geological Survey. The last major earthquake to strike South Carolina occurred in 1886 in Charleston, about 110 miles east of the site, and was estimated to measure 7.3 on the Richter scale.

Vinod Mubayi, a nuclear physicist and one of the authors of the Brookhaven study, said in an interview that a red oil explosion would be unlikely even in the event of an earthquake or blackout. The plant has back-up generators and multiple layers of safeguards.

"I think they've taken a lot of precautions in making sure that the lessons have been learned" from previous accidents at other processing facilities, he said.

After Murray was reassigned in 2007, the NRC hired Tedder as a senior technical reviewer. A former researcher at Oak Ridge National Laboratory, Tedder had expertise in plutonium chemistry and fuel reprocessing.

The first step in safely designing any chemical project, Tedder said, is establishing the quantity, rate and flow of material as it is being processed. Those calculations determine the size of equipment and serve as the basis for the plant's configuration. The figures also are used for tracking plutonium. But Tedder said Shaw Areva hadn't fully developed that formula when construction began. He said he was told it would cost too much money.

The NRC said that information has since been provided and that it meets regulatory requirements.

Three local groups that oppose the plant have also challenged Shaw Areva's tracking plans for plutonium, and judges for the Atomic Safety and Licensing Board have agreed to hear [24] their complaints.

In September 2008, Tedder's allegations turned up in *tce*, a British trade journal for chemical engineers. The [article](#) [25] quoted him as saying that he was shocked when he began work and discovered that basic design information was incomplete.

"The NRC didn't want me to criticize the applicant and refused to forward my questions or request more information," he told *tce*. "They harassed me about my reports and wanted me to water them down."

The trade journal article led to an investigation by the NRC inspector general, who found no indication that agency management had "ignored" Tedder's concerns. The [report](#) [26] said a chemical engineering review team found that some of Tedder's concerns weren't relevant to the NRC's safety evaluation. Other issues he raised were sent to other reviewers for analysis. The inspector general made no recommendations for corrective actions.

Tedder told ProPublica that when he met with the inspectors at a Starbucks near his home, they told him they would be investigating only whether the NRC was following its procedures, not the merit of his concerns.

The NRC's jurisdiction, he noted, is narrow. The agency regulates hazardous chemicals produced from radioactive materials. But it does not identify and protect against all chemical hazards.

For instance, the chemical mixing and storage building that adjoins the MOX plant is regulated by the U.S. Occupational Safety and Health Administration. The NRC says it's responsible for any event that could affect the MOX plant, but safety reviewers said that dual setup could leave workers vulnerable if an accident occurred.

He said it's also unclear how all the radioactive waste from the plant will be tracked and stored. Waste issues fall under the jurisdiction of the Energy Department, which is building a new plant where liquid waste will be treated, mixed into cement and packed into 55-gallon drums. But it has not been decided yet where the waste will ultimately be disposed of.

Although the plant's operating license is still pending, the NRC finalized its safety assessment in December. Shaw Areva said it had spent \$80 million developing safety analyses. The NRC said it had held 70 meetings, conducted 100 in-office reviews and submitted more than 600 questions to Shaw Areva for revised or more detailed safety strategies. The plant, both say, will operate safely.

Tedder and Murray are less confident.

"We need congressional hearings on this," Tedder said. "The NRC review of MOX is not comprehensive. As a professional engineer, I find this position unacceptable and inconsistent with accepted engineering practices."

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1. <http://www.nrc.gov/materials/fuel-cycle-fac/mox/licensing.html>
 2. <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/mox-bg.html>
 3. <http://www.nytimes.com/2011/04/11/us/11mox.html>

4. <http://propublica.org/documents/item/88076-unresolved-safety-questions-on-red-oilalex-murray>
5. <https://www.propublica.org/documents/item/88077-operating-ser>
6. http://en.wikipedia.org/wiki/Three_Mile_Island_accident
7. <http://www.srs.gov/general/srs-home.html>
8. <http://www.gao.gov/new.items/d10378.pdf>
9. <http://www.propublica.org/documents/item/88086-nov-16-2001acrsmoxtranscript>
10. <http://www.shawgrp.com/>
11. <http://www.areva.com/>
12. <http://theenergycollective.com/dan-yurman/55817/stop-sensationalism-mox-fuel>
13. <http://www.propublica.org/documents/item/88078-acrsdec2004>
14. <http://www.propublica.org/documents/item/88070-legal-opinioncont4farrar>
15. <http://www.nei.org/>
16. <http://www.propublica.org/documents/item/88073-nei-comments-on-mox1718>
17. http://www-pub.iaea.org/MTCD/publications/PDF/P060_scr.pdf
18. <http://www.nrc.gov/waste/hlw-disposal/public-involvement/cnwra-desc.pdf>
19. <http://www.propublica.org/documents/item/88082-dpo-final-report>
20. <http://www.propublica.org/documents/item/88071-murray-letter-to-nrc-commissioner>
21. <http://www.propublica.org/documents/item/88072-murraymemoaugust-2010>
22. <http://www.propublica.org/documents/item/88079-bnl-2009>
23. <http://www.propublica.org/documents/item/89263-faults-on-srs>
24. <http://www.propublica.org/documents/item/88067-contention-9>
25. http://www.tcetoday.com/tce_home/Weapons-grade%20allegations%20relaunched.aspx
26. <http://www.propublica.org/documents/item/88083-inspector-general-report>

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