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Digging Into The Details

While important progress has been made addressing seismic hazards at INL, much work remains

By Tami Thatcher [1]

Idaho National Laboratory Director John Grossenbacher stated in a letter to the editor that the INL has made post-Fukushima improvements to the emergency system for the Advanced Test Reactor (ATR) spent fuel canal and "has thoroughly analyzed the seismic hazards at the Advanced Test Reactor and prioritized upgrades."

That is important progress.

Recently, as I sought information about the level of safety at the ATR, I was funneled into submitting a Freedom of Information Act request. The initial request was responded to promptly, but the documents would cost me more than $8,000. Subsequently, the Post Register signed on to the FOIA and the fees were waived. But now, aside from two Power Point presentations, DOE's response was "we have located no responsive records." And in response to my request to verify specific seismic performance assessments of vulnerable equipment and structures that I had included in an INL plan in 2005, DOE's response was that such documents are the property of the contractor and are not subject to FOIA.

The few pages obtained from the FOIA did provide some insights. Previously unqualified primary piping was upgraded and heat-exchanger and primary-piping seismic supports were installed. But, these much-needed corrections were not publically reported as safety deficiencies because the long-awaited seismic hazard curves finalized in 2003 were deemed a "new" requirement.

"Buildings housing support equipment are seismically weak," but ATR's station blackout position was touted as a positive. With the problems there could be in recovering commercial power following a seismic event, coupled with existing seismically fragile diesel generators, their position was improved by the deep-well diesel installation that I pushed with a detailed assessment of seismic risk in 2005, back when thinking about seismic safety was very unpopular.

While Battelle Energy Alliance has made progress in addressing deficiencies at the ATR, including reviews of aging equipment yielding numerous expensive plans for equipment replacement, the progress over the past eight years may not have compensated for the loss of

[1] Tami Thatcher guest column in a Idaho Falls *Post Register* May 31, 2013

staff with decades of experience. BEA's internal audit team identified problems in 2010 including "continuing conduct of operations issues exacerbated ... by material condition deficiencies" and an "undersized qualified operational staff."

Errors continue at many levels as illustrated by two events that occurred in February involving incorrect experiment configuration and incorrect core loading at ATR. These events are still not posted in the DOE occurrence reporting system, normally posted within 45 days. Even with scant information about these two events, it would not appear that things have improved.

Why does this matter? Because despite the emphasis on ATR's low operating temperature and pressure and small size, it's the amount of releasable fission products that matters. And that amount, without including the spent fuel in the canal, is 65 percent of what Chernobyl, an accident causing widespread contamination with serious health, environmental and economic effects, released.

Thatcher is a former nuclear safety analyst at INL.

INL Advanced Test Reactor Shutdowns for Safety System Failures

The Advanced Test Reactor (ATR) is an aging 45 year-old INL nuclear reactor that is long past its original 20 year design life. Reactor scrams are unplanned automatic reactor shutdowns that occur when monitored parameters such as temperature, pressure, power level, etc. exceed set-point limits. Spurious signals or loss of power to certain portions of the scram system can also result in an automatic scram. At the end of a planned cycle, the reactor would normally be shutdown manually. An unscheduled manual reactor shutdown can occur for various reasons such as a condition arising that would be expected to produce an automatic scram, or discovering a condition outside the safety basis or technical specifications. Unscheduled reactor shutdowns are expensive and time consuming; so, a well run facility aims to maintain reliable equipment and minimize the discoveries of equipment or analysis deficiencies that require a manual scram occur, DOE's own operating records provide an indication of ATR's operations and safety problems.

According to DOE, the most recent shutdown occurred on April 15, 2013: "(Notification) The ATR was shut down manually due to an imminent loss of diesel power based on an alarm from the M-6 diesel generator. The supply breaker to the motor control center powering the auxiliary systems for the generator was tripped. Because the generator was not receiving adequate cooling and was starting to overheat, the M-6 diesel tripped and power was lost to 670-E-3 diesel bus. Emergency procedures were used, power was restored to the E-3 diesel bus from commercial power, and equipment lost due to the power outage was restored. [NE-ID--BEA-ATR-2013-0012]" [2]

[2] DOE/ID Operations Summary for period April 1 to May 16, 2013

Based on the cited reports below, there were at least the following unscheduled shutdowns, scrams, and/or reactor power level curtailed at the Advanced Test Reactor due to safety system failures. Scrams are designed to protect the reactor during upset conditions and the speed of actuation of reactor shutdown can be essential to protecting the core; unscheduled manual shutdowns are usually less time critical and indicate that it is not possible to stay within the approved safety basis and technical specifications. The number of reactor scrams and unscheduled reactor shutdowns provide an indication of equipment reliability problems, although equipment problems found during outages would not be reflected here. Reactor power level restrictions more restrictive than those nominally defined for the facility are put in place when the nominal limit does not provide sufficient protection to stay within acceptance criteria in the safety basis. The placement of more restrictive power limits provide an indication of continuing problematic safety basis discoveries.

Summary of ATR Shutdowns 2007 to Present

Year	Shutdown/ Scrams	Power Restricted	Total Shutdowns & Power Restrictions
2007	2	1	3
2008	11	2	13
2009	10	2	12
2010	7	3	10
2012	2	3	5
2013	1	-	1
Totals	33	11	44 [3]

DOE also acknowledged another ATR problem. "April 1, 2013: (Notification) A safety analysis package for a reactor experiment at the Advanced Test Reactor (ATR) was not verified adequately prior to reactor startup. This resulted from a failure to address thermal-hydraulic-calculated reactivity limits for the experiment. [NE-ID--BEA-ATR-2013-0010]" [4]

This is a significant problem and not new. Reactivity limits being exceeded could make a transient event (power spike) more likely to melt reactor fuel. Coupled with the February ATR loading errors and core package problems, there must be tremendous scrutiny on DOE's operating contractor, BEA, right now. In what had been touted a mature operation, the number of problems they are having indicate significant weaknesses in the ability of engineering, safety, experiment, and operations staff to adequately perform their roles. And add to this, additional funding cuts which means slowing down aging equipment replacements – which may make as many safety problems as they solve. These operational safety problems and the high cost of antiquated equipment replacement might be making closure of ATR a reality.

[3] "Advanced Test Reactor Unplanned Shutdowns, Slow Setbacks, Power Reductions for FY-2009 and FY-2010" Department of Energy, Idaho Operations, Freedom of Information Document # 18. DOE-ID Biweekly Summary, 3/28/12 citing; (NE-ID—BEA-ATR-2012-0013), https://orpspublic.hss.doe.gov/orps/reports/

[4] DOE/ID Operations Summary for period April 1 to May 16, 2013

INL Radioactive Emissions
2003 and 2010

Department of Energy (DOE) reports document significant changes in radioactive emissions from the Idaho National Laboratory (INL). These emission changes are due to individual INL facility operation changes. DOE's report states:

"An estimated total of 5,089 curies of radioactivity, primarily in the form of short-lived noble gas isotopes, was released as airborne effluents from Idaho National Laboratory (INL) Site facilities in 2010. The highest contributors to the total release were the Advanced Test Reactor Complex at 42 percent, the Idaho Nuclear Technology and Engineering Center at 38 percent, the Materials and Fuels Complex at 13 percent, and the Radioactive Waste Management Complex at percent of total." [5]

The below table compares two DOE reports – 2003 and 2010 – for the major INL facilities.

INL Facility	**Release 2003 Curies** [6]	**Release 2010 Curies** [7]	**Change Curies**
Advanced Test Reactor (RTC)	1,180	2,137	957 increase
Material Fuels Complex (MFC)	539	661.5	122.5 increase
Idaho Nuclear Technology and Environmental Center (INTEC)	6,020	1,934	4,086 decrease
Radioactive Waste Management Complex (RWMC)	365	-	-
Total	7,794	5,089	2,705 decrease

Emissions from the Advanced Test Reactor Complex [formerly the Test Reactor Area (TRA) and also known as the Reactor Technology Complex (RTC)] would vary due to the amount of time ATR is actually running vs. shutdown, power level, and experiment emissions.

The ATR pond, waste tanks and other remediation activities going on at the ATR Complex could also be factored into the numbers. The reporting of emissions in the Annual Site Reports and NESPHAPs reports for the ATR Complex do not allow scrutiny of which part of the facility the emissions are from or of how the emissions are estimated from the limited monitoring that is performed. Furthermore, the DOE Independent Oversight Assessment of Environmental

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[5] http://www.gsseser.com/annuals/2010/PDFS/Chapter4.pdf

[6] Draft Environmental Impact Statement for the Proposed Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems, June 2005. Page 3-26, DOE/EIS-0373D.

[7] DOE-Idaho 2010 Environmental Monitoring Program (Air) Chapter 4, Chapter Highlights. http://www.gsserer.com/annals/2010/PDFS/chapter4.pdf

Monitoring at the INL, recommended that INL "consider establishing formal criteria for preparation of technical basis documents for all aspects of environmental monitoring and surveillance activities. Ensure the technical basis for all monitoring activities (i.e., type, frequency, analytes) is clearly documented, justifiable to meet overall objectives for each media, and ensures minimum standards of consistency across different contractors. Include a mechanism for periodic review of monitoring and surveillance activities based on changes to INL Site mission and operations." [8]

The DOE Oversights report specifically pointed out that "At the Advanced Test Reactor (ATR) Complex, one of the most significant potential release points is a fugitive emission source, the recently constructed evaporation pond. However, the two existing ambient air monitors at ATR Complex were in place prior to construction of the pond and are not ideally situated downwind of the pond, which would be the best location for reliably detecting and quantifying the magnitude of fugitive emissions. Since the pond is considered a diffuse rather than point source, releases can be estimated via calculations, and there are no Federal requirements for effluent monitoring as with a point source (i.e., stack). Also, all ambient air sampling being performed at the site is considered low volume sampling. There are no high volume samplers being run for comparison and that may have better capability to detect contaminants during adverse meteorological conditions, such as high winds."

The reduction in radioactive emissions from INTEC is due to shutdown of old waste incinerators and the failure to get a new incinerator online – called the Integrated Waste Treatment Unit. DOE reports state:

"May 6: (Notification) A potential inadequacy in the safety analysis for the Idaho Waste Treatment Unit (IWTU) was declared due to the discovery of new information relative to the functional testing of the mercury adsorber [sic] inlet valves. The IWTU currently is shut down and has not processed any hazardous or radiological material. There was no potential for injury or release to the environment from this discovery. Related equipment has been tagged out of service until the required safety review is completed. [EM-ID--CWI-IWTU-2013-0003]"

"May 7: (Notification) A potential inadequacy in the safety analysis for the IWTU was declared due to the discovery of new information relative to the leakage of controlled steam block valves. The IWTU currently is shut down and has not processed any hazardous or radiological material. There was no potential for injury or release to the environment from this discovery. A review is underway. [EM-ID--CWI-IWTU-2013-0004]" [9]

[8] Independent Oversight Assessment of Environmental Monitoring at the Idaho National Laboratory Site, May 2010.
http://www.hss.doe.gov/IndepOversight/docs/reports/eshevals/2010/2010_INL_Environmental_Monitoring_final_May2010.pdf

[9] DOE/ID Operations Summary for period April 1 to May 16, 2013

Retaliation is Alleged by INL Workers

Alex Stuckey reports in the Idaho Falls *Post Register* 4/19/13; “Two Idaho National Laboratory employees exposed to plutonium contamination in 2011 have filed a complaint against Battelle Energy Alliance.

Ralph Stanton and Brian Simmons allege that the contractor in charge of INL created an unsafe work environment and then retaliated against them after they raised health and safety concerns regarding their exposure to plutonium in November 2011.

"It is not uncommon when a company has to pinch pennies and make their deadline so they get their bonuses to see this kind of behavior," Jack Sheridan, the Seattle attorney representing Stanton and Simmons, said during a Thursday news conference.

INL officials dispute the claims. "(BEA) disagrees with the filed complaint, and we will be strongly defending," INL spokeswoman Misty Benjamin said.

The whistleblower complaint was filed April 3 with the Occupational Safety and Health Administration.

Stanton and Simmons, in the complaint, said there was an unsafe culture at INL leading up to the event. In the months leading up to the event, Simmons told the manager he did not appreciate being put in a compromising position on a daily basis, according to the complaint.

He told the manager that "BEA 'will be fined by our government, and people will get hurt,' or words to that effect," according to the complaint.

On two occasions in 2011, BEA allegedly refused to allow Stanton and Simmons to use lead shielding to protect themselves when handling plutonium. The two workers "exercised their rights to stop the jobs," according to the complaint.

In October 2011, Stanton and Simmons allegedly were asked to "falsify 25 Type 1 safety procedures on a job that was done the day before." They refused, according to the complaint.

Then, on Nov. 8, 2011, 16 workers -- including Stanton and Simmons -- were exposed to plutonium radiation at the building that once housed the Zero Power Physics Reactor at the Materials and Fuels Complex.

In retaliation for the two workers' actions, the complaint alleges, BEA sent them to a psychologist for evaluation, gave them negative performance evaluations and withheld radiation dosage information.

The Department of Labor has a year to investigate the case and report a resolution, Sheridan said. The goal is for the company to change its processes, Sheridan said, and "engage in proper safety culture." "Our goal is to have the company follow its own safety practices because they're dealing with some of the most dangerous substances on the planet," Sheridan said.

The State of Nuclear Power in US: Bad and Worse

New report says NRC is ill-prepared for massive meltdown, which former NRC chair says is likely

Lauren McClauley reports 4/11/13 in Common Dreams: "As operators at the Fukushima Daiichi nuclear power plant announce yet another radiation leak, US officials turn to the state of domestic nuclear plants only to find dangerous and widespread safety issues and "antiquated" emergency planning, leaving the US population open to "potentially devastating human consequences."

A report by the Government Accountability Office released Wednesday found that the Nuclear Regulatory Commission is not adequately prepared for a real nuclear emergency and that they fail to account for mass "shadow" evacuations from beyond the NRC's accounted for 10 mile buffer zone, as demonstrated by the recent Fukushima and Chernobyl nuclear disasters.

After reviewing the report, nuclear watchdog agency the Nuclear Information and Resource Service, compounded the critical findings by adding that another flaw, overlooked by the GAO, is the NRC's failure to account for the impact of long-term exposure effects on American citizens.

"In a real radiation release, the American people will expect the government to act to protect them against exposures that could cause damaging health effects," said Michael Mariotte, executive director of the Nuclear Information and Resource Service. "This is especially important since the NRC's current antiquated rules are based on exposure effects to an average adult man—yet women and children are far more susceptible to radiation than men."

Current plans, he adds, are only designed to protect against the immediate health effects of high-level radiation exposure and fail to "prevent large-scale exposure to radiation levels that would cause chronic illness, including cancer."

A large scale nuclear failure in the US may not be so far off. According to the former chairman of the NRC, Gregory B. Jaczko, all of the 104 nuclear power reactors currently in operation in the US "have a safety problem that cannot be fixed and they should be replaced with newer technology," reports the *New York Times*. Jaczko made the statement while attending a session Monday about the Fukushima meltdown during the Carnegie International Nuclear Policy Conference.

Jaczko said he came to this conclusion after "watching as the industry and the regulators and the whole nuclear safety community continues to try to figure out how to address these very, very difficult problems." He added, "Continuing to put Band-Aid on Band-Aid is not going to fix the problem."

The GAO report follows the announcement last week of new EPA-backed radiation "clean-up" standards which essentially raise the permissible number of people expected to develop cancer from long-term radiation exposure.

"These standards would codify cancer and are completely at odds with civilized society," said Mariotte.

Mary Lampert, director of the Massachusetts-based Pilgrim Watch, called the report "criminal." The "only humane and sane approach," she said, would be for the report authors "to recommend measures to reduce the risk of nuclear disasters in light of the potentially real and potentially devastating economic and human consequences; and then to recommend policies and a framework to deal with short and long-term off-site consequences."

Ex-Regulator Says Reactors Are Flawed

Matthew L. Wald reports 4/8/13 in the *New York Times*: "WASHINGTON — All 104 nuclear power reactors now in operation in the United States have a safety problem that cannot be fixed and they should be replaced with newer technology, the former chairman of the Nuclear Regulatory Commission said on Monday. Shutting them all down at once is not practical, he said, but he supports phasing them out rather than trying to extend their lives.

The position of the former chairman, Gregory B. Jaczko, is not unusual in that various anti-nuclear groups take the same stance. But it is highly unusual for a former head of the nuclear commission to so bluntly criticize an industry whose safety he was previously in charge of ensuring.

Asked why he did not make these points when he was chairman, Dr. Jaczko said in an interview after his remarks, "I didn't really come to it until recently."

"I was just thinking about the issues more, and watching as the industry and the regulators and the whole nuclear safety community continues to try to figure out how to address these very, very difficult problems," which were made more evident by the 2011 Fukushima nuclear accident in Japan, he said. "Continuing to put Band-Aid on Band-Aid is not going to fix the problem."

Dr. Jaczko made his remarks at the Carnegie International Nuclear Policy Conference in Washington in a session about the Fukushima accident. Dr. Jaczko said that many American reactors that had received permission from the nuclear commission to operate for 20 years beyond their initial 40-year licenses probably would not last that long. He also rejected as unfeasible changes proposed by the commission that would allow reactor owners to apply for a second 20-year extension, meaning that some reactors would run for a total of 80 years.

Dr. Jaczko cited a well-known characteristic of nuclear reactor fuel to continue to generate copious amounts of heat after a chain reaction is shut down. That "decay heat" is what led to the Fukushima meltdowns. The solution, he said, was probably smaller reactors in which the heat could not push the temperature to the fuel's melting point.

The nuclear industry disagreed with Dr. Jaczko's assessment. "U.S. nuclear energy facilities are operating safely," said Marvin S. Fertel, the president and chief executive of the Nuclear Energy Institute, the industry's trade association. "That was the case prior to Greg Jaczko's tenure as Nuclear Regulatory Commission chairman. It was the case during his tenure as N.R.C. chairman, as acknowledged by the N.R.C.'s special Fukushima response task force and evidenced by a multitude of safety and performance indicators. It is still the case today."

Dr. Jaczko resigned as chairman last summer after months of conflict with his four colleagues on the commission. He often voted in the minority on various safety questions, advocated more vigorous safety improvements, and was regarded with deep suspicion by the nuclear industry. A former aide to the Senate majority leader, Harry Reid of Nevada, he was appointed at Mr. Reid's instigation and was instrumental in slowing progress on a proposed nuclear waste dump at Yucca Mountain, about 100 miles from Las Vegas.

Senator Wyden's Concerns Renewed Over Hanford Tank Waste Explosions

By Annette Cary, Tri-City Herald

Flammable gases in Hanford's underground tanks holding radioactive waste continue to pose a possible risk of an explosion, according to a letter from the Defense Nuclear Facilities Safety Board.

Sen. Ron Wyden, D-Oregon, asked the defense board for a rundown of current issues at Hanford as he prepares for a confirmation hearing Tuesday for Ernest Moniz, the energy secretary nominee. Wyden is the new chairman of the Senate Energy and Natural Resources Committee.

"The next secretary of energy -- Dr. Moniz -- needs to understand that a major part of his job is going to be to get the Hanford cleanup back on track, and I plan to stress that at his confirmation hearing next week," Wyden said in a statement.

Of particular concern to Wyden are the safety of Hanford's underground tanks, the technical issues plaguing the vitrification plant and the safety culture at the nuclear reservation.

Twenty years ago, the senator passed legislation creating the "Wyden watch list" of Hanford tanks that posed a risk of hydrogen explosions, and a plan to address them. Safety issues, which covered 56 tanks then, were resolved in 2001, and Wyden joined Hanford workers to celebrate.

"Now in this letter, the board says that the high-level waste tanks continue to present a risk of hydrogen explosions," Wyden said. [10]

In September, as reported in the Herald, the defense board issued a formal recommendation to the Department of Energy, saying DOE needed to do more to guard against a buildup of flammable gases in its 28 double-shell tanks.

"A significant flammable gas accident would have considerable radiological consequences, endanger personnel, contaminate portions of the tank farms and seriously disrupt the waste cleanup mission," the September report said.

DOE has a ventilation system installed in its double-shell tanks that blows air into the head space of each tank and then sucks it out with gases generated by the sludge-like radioactive waste.

In 2010, it began making improvements in the system, acknowledging its importance to safety.

When the defense board called for faster action in 2012, Energy Secretary Steven Chu responded with a plan for improvement. It includes installing instruments for real-time monitoring of the ventilation exhaust flow from each of Hanford's 28 double-shell tanks and making the monitoring data available remotely.

In February, DOE instituted an improved testing and monitoring system to allow for direct monitoring of the tank ventilation system, DOE said in a statement Tuesday.

"DOE is absolutely committed to ensuring the safety of Hanford's underground tanks," it said. The defense board letter to Wyden also reiterated the key technical challenges faced at the vitrification plant, which is being built at a cost of $12.2 billion to treat tank waste for disposal in

[10] Read more here: http://www.tri-cityherald.com/2013/04/02/2339343/wydens-concerns-renewed-over-hanford.html#storylink=cpy

a sturdy glass form starting in 2019.

Issues at the plant's Pretreatment Facility include keeping waste well mixed to prevent an uncontrolled nuclear reaction, preventing the buildup of flammable hydrogen in pipes, and reducing projected erosion and corrosion of piping and tanks within the plant. The resolution of the issues is complicated by the partial construction of the facility and a design that plans for no workers to enter highly radioactive areas for maintenance during the 40 years the plant will operate, the defense board letter said.

DOE is considering strategies to allow waste to bypass the Pretreatment Facility. But directly feeding the waste into the facilities that will treat it "will be a challenging undertaking that will involve resolving some of the same technical and safety issues associated with the design of the Pretreatment Facility," according to the defense board.

The board identified a substantial number of unresolved problems at the vitrification plant, Wyden said, indicating that the plant's schedule will be delayed further and the cost will rise more. "There is a real question as to whether the plant, as currently designed, will work at all," he said.

The defense board was somewhat more positive on improvements in the safety culture at Hanford. "The board believes that Secretary Chu has vigorously tackled this issue, but progress in changing any organizational culture is historically slow," the board's letter said.

Fundamental differences between officials designing the vitrification plant and those responsible for documenting that it will operate safely still must be resolved, the letter said. DOE has agreed to a review of the vitrification plant's safety culture within the next few months to evaluate the effectiveness of the changes made to improve safety culture, the letter said." [11]

[11] Read more here: http://www.tri-cityherald.com/2013/04/02/2339343/wydens-concerns-renewed-over-hanford.html#storylink=cpy