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Two Accidents at Idaho Nuclear Site: Workers Exposed to Radiation

November 8, 2011 Idaho National Laboratory Materials Fuels Complex

Seventeen employees at U.S. nuclear research lab in Idaho exposed to low-level plutonium radiation

Reported by *Reuters and U.S. News and World Report* 11/9/11; SALMON, Idaho; "At least six workers were contaminated by low-level plutonium radiation and 11 others were exposed on Tuesday [11/8/11] at a U.S. nuclear research lab in Idaho, but the public was not at risk, the government said.

" The mishap at the Idaho National Laboratory occurred inside a deactivated reactor housed in a facility used for remotely handling, processing and examining spent nuclear fuel, radioactive waste and other irradiated materials, the lab said in a series of statements. The so-called Materials and Fuels Complex is located near the edge of the U.S. Energy Department's sprawling 890-square-mile laboratory site in the high desert in eastern Idaho about 38 miles from the city of Idaho Falls.

"But lab bulletins on the mishap, believed to be the most serious accident at the site in at least four years, said there was no evidence of a release of radiation outside the facility, and "there is no risk to the public or environment." A total of 17 technicians, all employees of lab contractor Battelle Energy Alliance, were working inside the decommissioned research reactor when "a container was opened for normal, scheduled work, resulting in low-level worker exposure to plutonium," the lab said.

"There were no immediate details from the lab on the precise cause or nature of the radiation release, such as whether it resulted from an equipment malfunction or human error. Lab spokesman Earl Johnson said the exposed workers were engaged in an activity and were in an area that required no special protective shielding. "We certainly didn't expect this to happen," he said, adding that radiation-control technicians monitoring the area detected the low-level release.

"The contamination was confined to the room where it was detected, and the room was evacuated and sealed. Workers elsewhere in the reactor building were also evacuated as a precaution, officials said.

Full Extent of Exposure to Be Determined

"The exposed workers underwent initial decontamination procedures at the complex before they were taken to a medical facility elsewhere on lab grounds for further evaluation, the lab said. Six of those exposed initially tested positive for low levels of contamination detected on their skin and clothing, Johnson said. All 17 were undergoing full-body scans to determine how much of a radiation dose they may have received, the lab said.

"The workers were offered treatments designed to speed their bodies' elimination of any contaminants ingested or inhaled, including intravenous fluids with calcium or zinc to bind radioactive particles before expelling them from the body. Details about the condition of the workers were not immediately available and the lab said it may be weeks before the full extent of exposure and contamination is known. The effects of radiation worsen the longer radioactive material remains in the body. "If it is trapped -- for example in the lungs -- it has the potential to lead to damage to the body's cells," the lab said.

"Johnson said the "zero power physics reactor" where the accident occurred was decommissioned in 1992 and had been used to study and test technology for space and commercial nuclear reactors. The plutonium at issue in the accident was contained in leftover reactor fuel, he said.

"Some 6,000 employees and contractors work at the Idaho National Laboratory, the Energy Department's leading facility for nuclear reactor technology. It opened in 1949 as a national reactor testing station. According to lab records, Tuesday's incident appeared to be the most serious accident at the lab since June 2007, when a worker was treated for minor burns and smoke inhalation from a small laboratory fire, though no radiation release was reported in connection with that mishap."

DOE/INL Notices Give Details of Reactor Accident

"At approximately 1 p.m. today [11/8/11] Idaho National Laboratory emergency began responding to a radiological contamination event involving at least 17 employees at the Materials and Fuels Complex (MFC) - formerly called Argonne-West - on the INL site. The employees were conducting work inside the decommissioned Zero Power Physics Reactor (ZPPR) when a container was opened for normal scheduled work resulting in low-level worker exposure to plutonium.

"They explained how routine work to examine and package legacy nuclear fuel plates for shipment resulted in an unexpected release of radioactive material, which was safely contained within the facility but may have exposed employees.

"They clarified that 16 employees who were working in the area at the time were immediately evaluated to determine whether they had been exposed. Seven employees showed external skin contamination and were immediately decontaminated; six of them had positive nasal swipes.

"Based on results of the initial lung scans, three employees received follow-up lung scans. One of them had anomalous results in the first scan that needed checking. Scans for the **two** other employees revealed presence of Americium-241, an isotope that indicates that the employees may have inhaled plutonium. A second test Wednesday did not find Am-241 in **one** of the employees.

"All 16 employees were offered precautionary treatment for internal radiation exposure — four of them accepted the treatment. INL health professionals will continue to monitor all 16 employees through the use of bioassays to determine the extent of individual doses. The results of this monitoring won't be known for several weeks.

"In summary:

16 employees working in the area were potentially exposed and evaluated.

7 employees received external skin exposures and were decontaminated.

16 employees received lung scans and were offered precautionary treatment for internal

exposure.
4 employees accepted treatment for internal exposure.
3 employees received follow-up lung scans based on initial scan results.
16 employees are receiving continued monitoring to determine individual doses.

"Officials at the news conference incorrectly stated that the nuclear fuel that led to the exposure was heading to a Nevada facility. However, INL can confirm that the nuclear fuel plate was being prepared for potential shipment to another Department of Energy facility.

"They also confirmed that the nuclear fuel plate had been used to support civilian nuclear energy research at the Zero Power Physics Reactor (ZPPR). The ZPPR supported fast reactor core design research before it was decommissioned in 1992.

Health Impacts

* "Health impacts of inhaling and/or ingesting plutonium vary depending on the elemental type (isotope) and whether the contaminant becomes trapped in the body.
* If the plutonium goes in and out of the body within a short period of time, it is unlikely to cause harm. If it is trapped — for example in the lungs — it has the potential to lead to damage to the body's cells. [See plutonium study below]
* For this event, it has been determined by multiple medical and scientific experts that the best course of action is to offer the potentially exposed employees treatments that will expedite the elimination of the substances from the body to limit potential harm.
* The employees will be offered treatment with intravenous fluids with calcium or zinc to bind the plutonium for elimination (chelation) from the body.
* They will also be offered antacids to elevate the pH in the body to assist in the elimination process.
* A determination on the amount of the exposure will not be available until the body scans are complete. It may be weeks until the extent of the exposure is known.

Background:

- "The Zero Power Physics Reactor (ZPPR) was a low-power reactor used to mock up cores for experimental purposes.
- It was decommissioned in 1992.
- The facility is one of the many nuclear material storage locations on the site.
- Workers occasionally enter the facility to inventory special nuclear materials or to prepare them for transfer to other DOE facilities.
- The Materials and Fuels Complex is located 38 miles from Idaho Falls and conducts nuclear fuels research. Approximately 800 employees work at the facility." [1]

[1] DOE/INL Joint Information Center, email notices (1 through 6) to Environmental Defense Institute/Broscious, November 8-9 2011

Variability in PuO_2 Intake by Inhalation: Implications for Worker Protection at the US Department of Energy

By B.R Scott and A.F Fencl, Published the Oxford Journal

This paper describes the stochastic exposure (SE) paradigm where, at most, small numbers of airborne toxic particles are presented for inhalation. The focus is on alpha-emitting plutonium dioxide (PuO_2) particles that may be inhaled by Department of Energy (DOE) workers. Consideration of the SE paradigm is important because intake of only a few highly radioactive PuO_2 particles such as $^{238}PuO_2$, could greatly exceed the annual limit on intake (ALI) used to control worker exposure. For the SE paradigm, credible intake distributions evaluated over the population at risk are needed, rather than unreliable point estimates of intake. Credible distributions of radiation doses and health risks are also needed. Because there are limited data on humans who inhaled PuO_2, these distributions must be calculated. Calculated distributions are presented that relate to the intake of radioactivity via inhaling polydisperse PuO_2 particles. The results indicate that a large variability in radioactivity intake is expected when relatively small numbers of PuO_2 particles are inhaled. For the SE paradigm, one cannot know how many PuO_2 particles were inhaled by an individual involved in a given inhalation exposure scenario. Thus, rather than addressing questions such as 'Did the calculated worker's intake of $^{238}PuO_2$ exceed the ALI?', it is better to address questions such as 'What is the probability that $^{238}PuO_2$ intake by a given worker occurred and exceeded the ALI?' Mathematical tools for addressing the latter question are presented, and examples of their applications are provided, with emphasis on possible DOE worker exposures at the Rocky Flats facility near Denver, Colorado. The alpha-emitting isotopes ^{238}Pu, ^{239}Pu, ^{240}Pu and ^{242}Pu are found at Rocky Flats. Although ^{238}Pu is thought to be present in relatively small amounts there, intake via inhalation of only a few $^{238}PuO_2$ particles could greatly exceed the ALI. [2]

November 11, 2011 Sodium fire at INL Materials Fuels Complex

INL Emergency Response Notices state: "Emergency personnel continue to respond to a sodium fire on the INL site. One Idaho Cleanup Project employee was transported to Eastern Idaho Regional Medical Center for evaluation of burns. Ten other employees have been evaluated on scene by medical personnel and released. The fire may have been caused by a sodium reaction. Right now there is no evidence of continued reaction or fire.

"The building involved is the Sodium Boiler Building (766). Employees that were working in the building and immediate vicinity have been evacuated. All other employees at the MFC have been told to remain inside buildings. The Idaho Cleanup Project process for the treatment of sodium involves the intentional reaction with moisture which is done in a controlled configuration as part of normal operations for this project.

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[2] See; Oxford Journals, Radiation Protection Dosimetry, http://rpd.oxfordjournals.org/
EDI thanks Peter Rickards for posting this research.

"Emergency response personnel responded to Friday's event at the INL. It is believed that a sodium reaction resulted in a sudden pressure increase which compromised the integrity. The compromise set off fire alarms in the vicinity. Sodium was used as a coolant for the Experimental Breeder Reactor-II until the 1990's. When the reactor was shut down, the sodium coolant was drained; however CWI was tasked with removing residual sodium from the Sodium Boiler Building before dismantling the facility."

"One Idaho Cleanup Project employee was transported to Eastern Idaho Regional Medical Center for evaluation of burns. Ten other employees have been evaluated on scene by medical personnel and released. The fire may have been caused by a sodium reaction. Right now, there is no evidence of continued reaction or fire. The building involved is the Sodium Boiler Building (766). Employees that were working in the building and immediate vicinity have been evacuated. All other employees in the MFC complex have been told to remain inside the buildings." [3]

Although INL above claims that this event was "not radiological" it defies credibility due to the fact that this sodium ERB-II reactor coolant will by definition contain radioisotopes.

November 14, 2011: While personnel were treating passivated [sic] sodium in building MFC-766, a pressure excursion in the piping occurred. The area was evacuated; on-scene command personnel surveyed the areas outside the building and found no signs of a fire. A release of asbestos occurred during the excursion that exceeded reportable quantities, but there were no injuries or other releases from the incident. An investigation is under way. (EM-ID—CWI-BIC-2011-0009). [4]

It is unclear if this is a delayed posting (DOE/INL Bi-Weekly Summary) of the two previous MFC accidents reported above; however if – as reported above - there was a release of asbestos – it is a credible assumption that there was also a release of radioactivity that DOE is not acknowledging.

Hanford's Waste Treatment White Elephant

Tom Carpenter, Director of Hanford Challenge reports; "Hanford's Waste Treatment Plant has become known mostly for its cost overruns, design problems, and delays. Hanford Challenge is concerned that insufficient quality control could make the plant prone to disastrous accidents and is promoting the exploration of new technologies to stabilize Hanford's tank waste.

The Waste Treatment Plant is over 60% constructed, despite serious design concerns.

The Waste Treatment Plant (WTP), also known as the "Vit Plant," is the largest, most expensive environmental remediation project in the world. Still under construction, the job of the WTP is to stabilize the large inventory of high-level nuclear waste from Hanford's Tank Farms in glass logs, a process called vitrification. WTP is a one-of-a-kind facility built to solve an incredibly complicated problem and has encountered several setbacks – both foreseeable and unforeseeable.

In 2000, DOE awarded Bechtel National, Inc. a $4.3 billion, 11 year contract to design and construct a plant to treat the entire 53 million gallon radioactive and hazardous tank waste

[3] DOE/INL Joint Information Center, email notices (1 through 4) to EDI/Broscious, November 11, 2011
[4] DOE-ID Bi-Weekly Summary for the period November 8 – November 28, 2011

inventory, to be operational in 2007. Nine years later, the cost estimate has nearly tripled to $12.3 billion while performance expectations have dwindled. Now, only half of the underground tank waste will be vitrified in the WTP, due to issues with the chemistry of the waste. The plant is now scheduled to open in 2019 (an optimistic assessment) and will cost $45 – $60 billion to operate over its 28 year expected lifespan.

Our Concerns

Setbacks aside, Hanford Challenge is most concerned with safety and quality issues at the Vit Plant and DOE and Bechtel's lack of transparency in resolving them. Throughout WTP's design and construction many avoidable flaws have been exposed. There is no doubt that the stabilization of Hanford's tank waste is a complex challenge that presents design and construction challenges. While some corrective actions have been taken, uncertainty about the quality of the materials and an overly complex design has created a complicated mess that seems to be spinning out of control. Some examples:

* Quality Assurance is the overall system required by the government to ensure a nuclear facility meets exacting material and design standards to ensure safe operation. The failure of even one component in a nuclear setting can be a very serious matter. In 2008, an independent engineering firm (Dana Engineering) conducted a review of the WTP on behalf of Washington State's Department of Ecology. They concluded that Bechtel is failing to fully meet critical aspects of the Quality Assurance criteria. This leads Quality Assurance experts we've consulted to declare the WTP "quality indeterminate."
* Some processes at WTP will take place in so-called "black cells", which, once made operational, can never again be entered by because of the intense radiation. The equipment in black cells – the valves, piping, electrical switches, etc. – is expected to last the lifetime of the WTP without any maintenance or replacement. Because of the extremely high temperatures required the reality that nuclear waste is among the most toxic materials on Earth, the integrity of the facility must meet exacting standards for equipment, parts, and quality of work to prevent catastrophe. Unfortunately, there is a high degree of uncertainty about Bechtel's Quality Assurance regime – see above.
* In a now-famous example of a foreseeable design flaw (see video at right), the Vit Plant was built to an insufficient seismic standard, costing billions to correct and adding years of delay.
* Chemistry issues unique to Hanford's tank waste, high levels of chromium, aluminum and sulfate, make it more difficult to vitrify. Overcoming these issues necessitate diluting the waste and the addition of more chemicals – sodium hydroxide. These measures will increase the quantity of vitrified "product" but decrease the amount of tank waste that can be stabilized in the glass.
* Delays in construction can actually harm the WTP equipment. As parts await installation, they are exposed to weather and may become corroded to the point that they present maintenance challenges and safety risks.
* Design flaws have led to construction workarounds that can change how waste will be transported. In some cases it is uncertain if the thick waste – often described as having the consistency of peanut butter – will be able to travel through the designed pathways due to improvised sharp curves in piping.

New Ideas Needed!

Hanford Challenge is very concerned about the state of the Waste Treatment Plant. The DOE needs to rethink its goals for this troubled facility and seek alternative methods to stabilize the 53

million gallons of waste before more of it leaks from aging underground tanks, contaminates the groundwater and really becomes a problem.

Russian engineers have developed a formulation of glass for their nuclear waste vitrification program that may be helpful at Hanford. An American process engineer has concluded that the iron phosphate glass used in Russia is robust enough that it can stabilize Hanford's waste without needing the most complicated part of WTP, the Pretreatment Facility, with its complex chemical processes and ultrafiltration systems.

There are methods of stabilizing the waste while it remains in the tanks. Crystal fractionalization and Spin Tech filtration both hold out some promise to reduce the risk to our groundwater, Columbia River and wider region posed by Hanford's tank waste."

For more information see; www.hanfordchallenge.org

Hanford Downwinder Litigation November 2011 Update

According to Downwinders attorneys: "The mediation tracks established by the Court have ended. Within our client group, some settlements have occurred, but most claims have not been resolved. The Court has now established two new trial tracks, one for a group of thyroid cancer claims and another for those with thyroid nodules claims. The Court has randomly selected 23 plaintiffs from the *Everson* group and 14 from our *Berg/Lumpkin* group to participate in the thyroid cancer trial. Fifty randomly selected plaintiffs will participate in the thyroid nodule trial, 8 of which are from our *Berg/Lumpkin*. The attorneys from the Engstrom Lipscomb & Lack law firm have contacted all those selected to participate in these trials, and are working with them to collect updated medical records and to update each plaintiff's discovery responses. A proposed schedule for these cases will be presented at the next Status Conference. If approved, pre-trial discovery and motions will occur in 2012 and trial will be set in early 2013.

The parties continue to discuss how to proceed with the non-thyroid claims, but no plan has been developed. The next Status Conference will be held on December 6, 2011, at 8:30 a.m. PDT, at the U.S. District Court in Spokane.

General Information

The Hanford Downwinders Litigation website is a general information resource for our clients in the In re Berg (CY-96-3151-WFN) and Lumpkin, et al. v. DuPont, et al. (CT-00-5052-WFN) cases. The lawsuits arise from the environmental radiation releases caused by operation of the Hanford Nuclear Facility. Located in south central Washington State, Hanford produced plutonium for U.S. nuclear weapons from 1944 until 1990. All of the Hanford downwinder cases have been consolidated. The consolidated case is known as In re Hanford Nuclear Reservation Litigation (CV-91-3015-WFN).

Thousands of people who were exposed to Hanford's radiation filed suit in 1990 against former contractors, such as DuPont and GE, which operated Hanford for the U.S. government. DuPont operated Hanford from 1943 to 1946. General Electric ran Hanford from 1946 to 1965.

Summary of Hanford Downwinder Trials During 2005

Judge Wm. Fremming Nielsen presided over the trial that began on April 25, 2005, and went to the jury on May 13. It was a bellwether trial, comprised of 6 plaintiffs with thyroid disease and lasted 3 weeks.

After deliberating more than three days, a 12-member jury returned verdicts for two of the six bellwether plaintiffs in the first Hanford downwinder trial. Gloria Wise was awarded $317,251 and Steve Stanton $227,508 for their thyroid cancers. The jury failed to reach a verdict for the third thyroid cancer plaintiff, Shannon Rhodes. Judge Nielsen declared a mistrial in her case and a retrial was held during November 2005.

The first jury also returned defense verdicts for the three plaintiffs with hypothyroidism. In June 2005, the plaintiffs appealed these three verdicts to the U.S. Court of Appeals for the Ninth Circuit. In August 2005, the defendants appealed the verdict for Mr. Stanton and Ms.Wise.

A different jury sat through a two-week retrial for Ms. Rhodes in November 2005. The 12-member jury deliberated a little more than a day before deciding 11-1 in favor of DuPont and General Electric. In early 2006, Ms. Rhodes' case joined the others on appeal.

Court of Appeals Issues Important Rulings

On August 14, 2007, the United States Court of Appeals for the Ninth Circuit issued an opinion on the appeals of the bellwether decisions in 2005. Generally, the Court of Appeals affirmed the trial judge's instructions to the jury regarding the law of the case. This means that the court made important decisions agreeing with the Downwinder Plaintiffs that the government contractor defense did not apply and that principles of strict liability did apply.

The Court of Appeals also agreed with the trial court that the "but for" standard of causation would be applied. This was a setback because it sets a higher standard than the "substantial factor" test that the Downwinder Plaintiffs had proposed. If it stands, it will limit the number of Downwinder Plaintiffs who may recover in the case.

The court considered questions specific to the individual cases that were on appeal. The Court of Appeals reversed the decisions in three cases that were decided against Downwinder Plaintiffs on the grounds that the jury was improperly instructed about specific issues raised in those cases. These cases must now be retried.

The Court of Appeals affirmed the trial court decision against Shannon Rhodes, rejecting her challenges to certain evidentiary rulings and claims of juror misconduct. In its amended opinion, the Ninth Circuit panel reconsidered its decision that plaintiffs who had filed individual suits while the class action suit was pending did not have the benefit of the tolling of the statute of limitations while the class action claim was pending. The court elected to follow a decision from the United States Court of Appeals for the Second Circuit and concluded that tolling principles did apply to individuals who filed individual suits while the class action suit was pending. Thus, the court's earlier comments on this question no longer apply and tolling principles will be available. In its amended opinion, the court denied all the parties' motions for rehearing and advised that the Ninth Circuit had denied the request for *en banc* review by a larger panel of judges.

Earthquake Threat to U.S. Nuclear Reactors Far Higher Than Realized

Dina Cappiello and Jeff Donn report in the *Associated Press*: "The risk that an earthquake would cause a severe accident at a U.S. nuclear plant is greater than previously thought, 24 times as high in one case, according to an AP analysis of preliminary government data.

"A tree farm in North Perry, Ohio, near the two cooling towers of the Perry Nuclear Power

Plant looming in the background. The risk of an earthquake causing a severe accident at a nuclear power plant is up to 24 times greater than previously believed, according to an AP analysis of preliminary government data. (photo: Amy Sancetta / AP) The nation's nuclear regulator believes a quarter of America's reactors may need modifications to make them safer.

"The threat came into sharp focus last week, when shaking from the largest earthquake to hit Virginia in 117 years appeared to exceed what the North Anna nuclear power plant northwest of Richmond was built to sustain. The two North Anna reactors are among 27 in the eastern and central U.S. that a preliminary Nuclear Regulatory Commission review has said may need upgrades. That's because those plants are more likely to get hit with an earthquake larger than the one their design was based on.

"Just how many nuclear power plants are more vulnerable won't be determined until all operators recalculate their own seismic risk based on new assessments by geologists, something the agency plans to request later this year. The NRC on Thursday issued a draft of that request for public comment. The review, launched well before the East Coast quake and the Japan nuclear disaster in March, marks the first complete update to seismic risk in years for the nation's 104 existing reactors, despite research showing greater hazards.

"The NRC and the industry say reactors are safe as they are, for now. But emails obtained in a more than 11,000-page records request by The Associated Press show that NRC experts were worried privately this year that plants needed stronger safeguards to account for the higher risk assessments. The nuclear industry says last week's quake proved reactors are robust. When the rumbling knocked out off-site power to the North Anna plant in Mineral, Va., the reactors shut down and cooled successfully, and the plant's four locomotive-sized diesel generators turned on.

Spent fuel containers shifted

"The quake also shifted about two dozen spent fuel containers, but Dominion Virginia Power said Thursday that all were intact. Still, based on the AP analysis of NRC data, the plant is 38 percent more likely to suffer core damage from a rare, massive earthquake than it appeared in an analysis 20 years ago.

"That increased risk is based on an even bigger earthquake than the one last week. Richard Zuercher, a spokesman for Dominion, the plant operator, says the earlier estimate "remains sound because additional safety margin was built into the design when the station was built." The safety cushion would shrink, though, if the plant's risk is found to be greater.

"Federal scientists update seismic assessments every five to six years to revise building codes for some structures. But no similar system is in place for all but two of the nation's 104 reactors — even though improving earthquake science has revealed greater risks than previously realized.

"The exception is Diablo Canyon in earthquake-prone California, which has been required to review the risk of an earthquake routinely since 1985. The NRC does not require plants to re-examine their seismic risks to renew operating licenses for 20 years.

"After the March earthquake in Japan that caused the biggest nuclear crisis since Chernobyl, NRC staffers fretted in emails that the agency's understanding of earthquake risk for existing reactors was out of date. In a March 15 email, for example, an NRC earthquake expert questioned releasing data to the public showing how strong an earthquake each plant was designed to withstand.

"The seismologist, Annie Kammerer, acknowledged that recent science showed stronger quakes could happen. "Frankly, it is not a good story for us," she wrote to agency colleagues. Kammerer's boss, Brian Sheron, who heads the NRC's Office of Nuclear Regulatory Research,

wrote in a March 14 email that updated numbers showed the government "didn't know everything about the seismicity" in the central and the eastern part of the country. "And isn't there a prediction that the West Coast is likely to get hit with some huge earthquake in the next 30 years or so? Yet we relicense their plants," he wrote.

"The NRC flagged the 27 plants for possible upgrades by calculating the likelihood of a severe accident based on 2008 hazard maps from the U.S. Geological Survey and comparing it to the seismic risk estimated in 1989 or 1994. Those data were used the last time existing reactors evaluated their earthquake hazards.

"The NRC identified the 27 reactors with the greatest risk increase but did not provide the risk numbers. The AP used the NRC's data and methodology to calculate the risk increase for each reactor.

US nuke industry not ready?

"The Perry 1 reactor in Ohio tops the list with the steepest rise in the chance of core damage: 24 times as high as thought in 1989. The four other plants with the largest increases include River Bend 1 in Louisiana, up nine times; Dresden 2-3 in Illinois, eight times; Farley 1-2 in Alabama, seven times, and Wolf Creek 1 in Kansas, also seven times. The smallest increase was the 38 percent at North Anna.

"Todd Schneider, a spokesman for First Energy Corp., which operates the Perry plant, said the increase in its seismic risk estimated by the NRC is misleading. He said Perry is capable of withstanding an even larger earthquake than is typical for the region.

"Personnel at a handful of other plants, including Indian Point outside New York City and Oconee in South Carolina, have already redone the NRC's calculations, and they show a much lower risk of core damage from earthquakes. Those calculations have not yet been reviewed by the agency, which along with other federal agencies is developing a baseline earthquake risk for every nuclear power plant to use.

"The average risk to U.S. reactors of core damage from a quake remains low, at one accident every 500 years, according to the AP analysis of NRC data. But predicting earthquake probability and damage is dicey; the Japanese nuclear industry was taken by surprise in March when a quake-driven tsunami far surpassed predictions and swamped the Fukushima Dai-ichi site.

"The U.S. nuclear industry may not be fully ready, either. Current regulations don't require the NRC to make sure nuclear reactors are still capable of dealing with a new understanding of the threats. It's not just earthquakes. It is all types of events, including floods, tornadoes and hurricanes, said an NRC official, who spoke on condition of anonymity because he was not authorized to speak about the agency's recent seismic work.

"The worry about earthquakes is not so much direct damage to the reactor vessel, the hardened enclosure where the nuclear reaction takes place, but to water tanks and mechanical and electrical equipment needed when disaster strikes. The failure of those systems could disable cooling needed to prevent meltdowns of radioactive fuel. In some of the emails obtained by the AP, NRC staffers worried that U.S. reactors had not thoroughly evaluated the effects of aftershocks and the combined impact of a tsunami and earthquake. They suggested plants might need more durable piping as well as better flood barriers and waterproof storage of essential equipment.

"Staffers talked of a need for bigger supplies of fuel and batteries for extended losses of all electrical power. One email expressed concern about some key pumps at Dresden that might fail

in an earthquake. In a separate problem reported last month, GE Hitachi Nuclear Energy acknowledged that its older control rods could get stuck if an earthquake struck when reactors were running at low power. Control rods are needed to stop the nuclear reaction. The manufacturer has alerted the operators of 35 U.S. reactors at 24 sites, who are checking whether replacements are needed.

"The AP documented scores of instances of such wear and tear in a range of equipment in a June investigative series showing that safety standards have been relaxed to keep aging reactors within the rules.

'We had no idea'

"When the NRC ran preliminary calculations of quake risk last year, it was the first time the agency had reassessed the threat since most plants were built. "The plants were more vulnerable than they realized, but they weren't unsafe. We look at rare, rare events," said Kammerer, the NRC seismologist.

"Plants built a generation ago were designed to withstand an earthquake larger than any known to have occurred in the area. But since then, scientists have been able to better estimate the earthquakes that are possible. And in some cases, those rare quakes could be larger and more frequent than those the plants were designed for. "If they met a certain level, they didn't look any further," Gregory Hardy, an industry consultant at Simpson, Gumpertz and Hegger in Newport Beach, Calif., said of some of the industry's earlier assessments. "Forty years ago, when some of these plants were started, the hazard — we had no idea. No one did."

"Seismologists inside the agency didn't recognize that increasing earthquake risk was an issue until operators started applying to build new reactors at existing plant sites in the central and eastern United States in 2003. Those applications included a thorough analysis of the risk posed by earthquakes, which is required for all new nuclear power plants. In some cases, the result was much higher than risk calculations performed by the industry in the early 1990s as part of a broader assessment of worst-case disasters. "We did have some idea that the hazard was going up" in the period between the late 1990s analysis and the applications for new reactors, said Clifford Munson, a senior technical adviser in the NRC's Office of Nuclear Reactors. But Munson said some of the research indicated that there was disagreement on whether the ground motion predicted would damage nuclear power plants.

"Kamal Manoly, another NRC senior technical adviser, said, "There was nothing alarming (enough) for us to take quick action." But a task force requested by President Barack Obama to make U.S. safety recommendations after the Japanese accident has questioned that. Its three-month review concluded that existing reactors should re-examine their earthquake risk more often.

"Some operators are expressing caution about the NRC's initial analysis, and say their own early calculations show that their facilities are at much lower risk. The differences between the calculations of government and industry have prompted some to call for a third-party review. "It sort of defies logic to ask the regulated entity to do the seismic analysis to determine whether upgrades are necessary or relicensing is appropriate," said California Sen. Sam Blakeslee, a geophysicist who pushed a bill through the Legislature giving the California Energy Commission a role in assessing seismic risk, particularly at Diablo Canyon. "There needs to be a more arm's length relationship in getting this technical information."

"There will always be uncertainties, experts say. "If all these plants were subjected to large earthquakes, that's the only way anybody can say for sure. But the only ones we know of are in

Japan," said Hardy, referring to the quake that struck in March and another in 2007 that damaged the Kashiwazaki-Kariwa nuclear power plant. "There is a pretty good technical feeling that U.S. plants are going to be safe," Hardy said, "but there is just a question of how much work it will take to show it."

Fukushima Radiation Risks "Severely Underestimated": Greenpeace

TOKYO -- Greenpeace renewed its demand for the Japanese government to keep its nuclear reactors offline as simulation maps of potential accidents at Japan's nuclear plants - used in the development of nuclear emergency response efforts - "are completely inadequate, and have not been updated since the Fukushima disaster."

Following a Greenpeace freedom of information request on November 25, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) released SPEEDI simulations of the radioactive contamination spread from all nuclear plants in Japan. Greenpeace said these maps show only extremely low releases of radioactivity over a 10km area around the plants in the event of meltdown, making any emergency response plan based on them totally insufficient should another severe disaster like the Fukushima Daiichi crisis occur. The simulations released under FOI to Greenpeace were made to support emergency preparedness drills of local and central government authorities. They calculate the concentration of radioactivity in the air, contamination on the ground and dose to the population within a range of 10km. Based on these maps, drills on evacuation or sheltering of the population, or distribution of iodine pills are organized.

"The simulation of radioactive releases from the Ohio reactor for example, is scandalously inadequate. It foresees a radiation release in the order of 10,000 times less severe than what could happen during a major incident," said Jan Vande Putte, Greenpeace International Nuclear Campaigner. "Similar over-optimistic scenarios have been used for reactors all over Japan. Hoping for the best is absolutely the wrong way to devise an emergency response plan."

A major incident in this case is based on a 15% release of iodine from the core of the reactor, which is still not a worst-case scenario. Nuclear safety authorities from the United States (NRC, Nureg-1150, 1990) and Germany (SSK, Heft 37, 2003) have calculated that under the worst-case conditions, even a release between 50% and 90% of all iodine is possible, though with a lower probability.

Greenpeace met with officials from MEXT and the SPEEDI program today, and they confirmed that the current simulations are limited to low-level releases, and that the system needed upgrading to cover larger releases and wider areas beyond 10km from the plants.

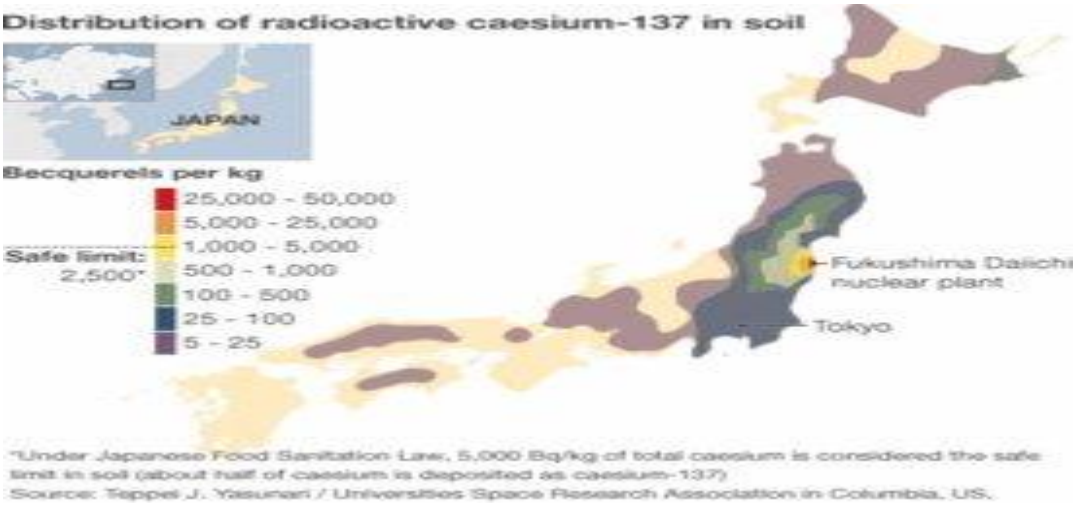
"The Fukushima Daiichi emergency response effort was slow, chaotic and insufficient, and it appears the Government has learned nothing from it so far," said Junichi Sato, Greenpeace Japan Executive Director.

"These maps show that there is a strong risk of reactor restarts being pushed through without a proper, science-based assessment on the real risks being conducted, and without proper precautions being taken to protect the communities around the plants."

Greenpeace is demanding that the Japanese government uses SPEEDI for what it was developed for, and run worst-case scenario simulations for all nuclear plants in Japan so there is a clear understand what effect a Fukushima Daiichi-type incident at other plants around Japan could have."

Fukushima Fallout Fears Over Japan Farms

Jennifer Carpenter reports for BBC News 11/15/11; "New research has found that radioactive material in parts of north-eastern Japan exceeds levels considered safe for farming.



"The findings provide the first comprehensive estimates of contamination across Japan following the nuclear accident in 2011. Food production is likely to be affected, the researchers suggest. The results are reported in the Proceedings of National Academy of Sciences (PNAS) journal.

"In the wake of the accident at Japan's Fukushima nuclear power plant, radioactive isotopes were blown over Japan and its coastal waters. Fears that agricultural land would be contaminated prompted research into whether Japanese vegetables and meat were safe to eat. An early study suggested that harvests contained levels of radiation well under the safety limit for human consumption.

Contaminated crops

"Now, an international team of researchers suggests this result deserves a second look. To estimate contamination levels, Teppei Yasunari, from the Universities Space Research Association in the US state of Maryland, and his colleagues, took measurements of the radioactive element caesium-137 in soil and grass from all but one of Japan's 47 regions and combined these results with simulations based on weather patterns following the meltdown.

"Cesium-137 lingers in the environment for decades, and so is more of a concern than other radioactive elements released in the cloud of steam when the reactors' cooling systems failed, leading to explosions. The team found that the area of eastern Fukushima had levels of the radioactive element that exceeded official government limits for arable land. Under Japanese Food Sanitation Law, 5,000 becquerel per kg (Bq/kg) of cesium is considered the safe limit in soil (caesium-137 makes up about half of total radioactive cesium, and therefore its safe limit is 2,500 Bq/kg).

"The researchers estimate that caesium-137 levels close to the nuclear plant were eight times

the safety limit, while neighboring regions were just under this limit. The study showed that most of Japan was well below (average about 25 Bq/kg) the safety limit. Relatively low contamination levels in western Japan could be explained by mountain ranges sheltering those regions from the dispersal of radioactive material, the authors said.

"Food production in the most contaminated regions, the researchers write, is likely to be "severely impaired", and that Fukishima's neighboring regions, such as, Iwate, Miyagi, Yamagata, Niigata, Tochigi, Ibaraki, and Chiba are likely to also be affected. "Some neighboring prefectures... are partially close to the limit under our upper bound estimate and, therefore, local-scale exceedance is likely given the strong spatial variability of [caesium-137] deposition," the researchers explained in PNAS. They urge the Japanese government to carry out a more thorough assessment of radioactive contamination across Japan before considering future decontamination plans.

"A second study, published in the same edition of PNAS, collected over a hundred soil samples from within 70km of the Fukishima plant, and found similarly high caesium-137 levels across the Fukishima prefecture, and its neighboring regions. Radioecologist Nick Beresford from Centre of Ecology and Hydrology in Lancaster explained that once in soil, cesium will become bound to mineral components, which limits its uptake into plants.

"However, this process depends on the soil type. Cesium stays mobile for longer in organic soils, hence why England and Wales still have some post-Chernobyl restrictions in upland areas," he told BBC News. Ploughing, and some fertilizers can help farmers reduce plants' uptake of the dangerous elements, and binding agents can be added to animal feed to reduce their uptake from the gut, he added.

Local recordings

"New figures on background radiation levels recorded 60km northwest of the Daiichi power plant have also been released this week by Japanese physicist Tsuneo Konayashi from Fukushima Medical University. Dr. Konayashi saw an initial spike reaching over nine times the usual levels hours after the explosions at the plant; five months later levels have dropped to one and a half times those expected. He continues to monitor radiation levels and distribute his data around campus."