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Meltdowns Grow More Likely at the Fukushima Reactors

By, Robert Alvarez

A hydrogen explosion 3/12/11 at Unit 1 severely damaged the reactor building, blowing apart its roof.

Japan's government and nuclear industry, with assistance from the U.S. military, is in a desperate race to stave off multiple nuclear reactor meltdowns as well as potential fires in pools of spent fuel.

As of Sunday afternoon (3/13/11), more than 170,000 people have been evacuated near the reactor sites as radioactive releases have increased. The number of military emergency responders has jumped from 51,000 to 100,000. Officials now report a partial meltdown at Fukushima's Unit 1. Japanese media outlets are reporting that there may be a second one underway at Unit 3. People living nearby have been exposed to unknown levels of radiation, with some requiring medical attention.

Meanwhile, Unit 2 of the Tokai nuclear complex, which is near Kyodo and just 75 miles north of Tokyo, is reported to have a coolant pump failure. And Japan's nuclear safety agency has declared a state of emergency at the Onagawa nuclear power plant in northeastern Japan because of high radiation levels. Authorities are saying its three reactors are "under control."

The damage from the massive earthquake and the tsunamis that followed have profoundly damaged the reactor sites' infrastructure, leaving them without power and their electrical and piping systems destroyed. A hydrogen explosion yesterday at Unit 1 severely damaged the reactor building, blowing apart its roof.

The results of desperate efforts to divert seawater into the Unit 1 reactor are uncertain. A Japanese official reported that gauges don't appear to show the water level rising in the reactor vessel.

There remain a number of major uncertainties about the situation's stability and many questions about what might happen next. Along with the struggle to cool the reactors is the potential danger from an inability to cool Fukushima's spent nuclear fuel pools. They contain very large concentrations of radioactivity, can catch fire, and are in much more vulnerable buildings. The ponds, typically rectangular basins about 40 feet deep, are made of reinforced concrete walls four to five feet thick lined with stainless steel.

The boiling-water reactors at Fukushima 40 years old and designed by General Electric have spent fuel pools several stories above ground adjacent to the top of the reactor. The hydrogen explosion may have blown off the roof covering the pool, as it's not under containment. The pool requires water circulation to remove decay heat. If this doesn't happen, the water will evaporate and possibly boil off. If a pool wall or support is compromised, then drainage is a concern. Once the water drops to around 5-6 feet above the assemblies, dose rates could be life-threatening near the reactor building. If significant drainage occurs, after several hours the zirconium cladding around the irradiated uranium could ignite.
Then all bets are off.

On average, spent fuel ponds hold five-to-ten times more long-lived radioactivity than a reactor core. Particularly worrisome is the large amount of cesium-137 in fuel ponds, which contain anywhere from 20 to 50 million curies of this dangerous radioactive isotope. With a half-life of 30 years, cesium-137 gives off highly penetrating radiation and is absorbed in the food chain as if it were potassium.

In comparison, the 1986 Chernobyl accident released about 40 percent of the reactor core's 6 million curies. A 1997 report for the Nuclear Regulatory Commission (NRC) by Brookhaven National Laboratory also found that a severe pool fire could render about 188 square miles uninhabitable, cause as many as 28,000 cancer fatalities, and cost $59 billion in damage. A single spent fuel pond holds more cesium-137 than was deposited by all atmospheric nuclear weapons tests in the Northern Hemisphere combined. Earthquakes and acts of malice are considered to be the primary events that can cause a major loss of pool water.

In 2003, my colleagues and I published a study that indicated if a spent fuel pool were drained in the United States, a major release of cesium-137 from a pool fire could render an area uninhabitable greater than created by the Chernobyl accident. We recommended that spent fuel older than five years, about 75 percent of what's in U.S. spent fuel pools, be placed in dry hardened casks something Germany did 25 years ago. The NRC challenged our recommendation, which prompted Congress to request a review of this controversy by the National

Academy of Sciences. In 2004, the Academy reported that a "partially or completely drained a spent fuel pool could lead to a propagating zirconium cladding fire and release large quantities of radioactive materials to the environment."

Given what's happening at the Fukushima Daiichi nuclear complex, it's time for a serious review of what our nuclear safety authorities consider to be improbable, especially when it comes to reactors operating in earthquake zones.

NRC Chairman Jaczyco told Congress that the water in the pool at Unit #4 has drained . As Chair of the NRC, Jaczyco's statement is conveying not only the expert opinion of the NRC and its staff, but of the United States Government.

Tokyo Electric reported as of March 2010 that the total amount of spent fuel at all 4 units is 1,060. So, it's likely that Unit 4 has tens of metric tons in its pool. By comparison the pool at Vermont Yankee plant, A BWR Mark I similar to the Fukushima reactors, which started up in 1969 is estimated by DOE to be holding approximately 690 tons containing 75.6 million curies.

At this stage I think that heroic, last-ditch measures are being undertaken. It's likely that the dose rates coming off building 4 are life-threatening and that this is a major problem for restoring water, and repairing the pool.

The accident will not happen all at once and is likely to unfold, perhaps, over a period of weeks. The radioactive plumes will vary from the wind directions and will fluctuate. My concern is that very large inventories in plumes in the near future may arise.

Editor's postscripts on recent news reports.

The New York Times reports; "Even as workers race to prevent the radioactive cores of the damaged nuclear reactors in Japan from melting down, concerns are growing that nearby pools holding spent fuel rods could pose an even greater danger .The pools, which sit on the top level of the reactor buildings and keep spent fuel submerged in water, have lost their cooling systems and the Japanese have been unable to take emergency steps because of the multiplying crises.

Temperatures appeared to be rising in the spent fuel pools at two other reactors at the plant, No. 5 and No. 6, said Yukio Edano, the chief cabinet secretary." NYT

MyFoxDetroit reports; "The blaze at No. 4 reactor -- which was not in service at the time of the quake -- was put out, but water in the pool storing spent nuclear fuel may be boiling, causing the water level to drop and potentially exposing the rods, a spokesman for the Tokyo Electric Power Company (TEPCO) said." MyFoxDetroit

Japan's Reactor Unit 3 has 32 assemblies out of 514 assemblies which are MOX. Fabricated by AREVA in France. This was loaded last September. MOX is plutonium oxide fuel. Plutonium exposure would lead to more latent cancer fatalities. Dr. Ed Lyman at Union of Concerned Scientists is the one who has runs the MOX exposure models on that. MOX fuel is worse than uranium fuel from a radiation release standpoint.

Post Japan Thoughts on DOE's Advanced Test Reactor

By Tami Thatcher

As the recent tragedy in Japan unfolds, many people have been following the nuclear drama trying to understand the implications of statements about the loss of electric power for normal core cooling, problems keeping the reactor cores from overheating, and suspected partial melt of fuel. As we in southeast Idaho view pictures of hydrogen explosions at these troubled reactors so far away in Japan, we may feel that nothing like this could happen here. We don't live in such a seismically active region, we don't live near the ocean, and we have only one reactor nearby that is still operating.

I worked for years as a risk assessment analyst for DOE nuclear facilities. Leaving aside the Palisades Dam, let us just consider the 1 billion curies of hot nuclear fuel in the Advanced Test Reactor located 50 miles from Idaho Falls. With the same thinking that brought above ground nuclear weapons testing to Nevada, the ATR was sited remotely and thus did not need a containment or even need particular attention to emergency systems. Some were added, but mostly as an afterthought. According to DOE's own recent audits, the safety systems at the ATR are poorly designed and inadequately maintained and tested. But not to worry, this is accompanied by organizational weaknesses, poor conduct of operations and poor work control as documented in more DOE audit reports.

While the Japanese have gotten hammered in this recent massive seismic event, their attention to stringent seismic design standards has allowed many structures and many people to survive this and previous seismic events. It has been a very different culture at the DOE here is southeast Idaho. I watched a decade or two of foot-dragging to avoid the cost of seismic performance evaluation to determine how their various nuclear reactor and nonreactor facilities at the Idaho National Laboratory would perform in order to avoid subsequent upgrade costs where the nuclear risk would be too high to brush off. When seismic hazard curves were finally available that were specifically developed for the location-dependent seismic hazard for the ATR, I was able to write several deficiency reports regarding potential accidents of significant likelihood and radiological consequence for the ATR. Funny thing - as an aggressive analyst with outstanding and excellent performance reviews, I found myself not working there. The people who asked that I not report safety issues – they still are.

Carefully selected information is presented by the DOE in order to promote the idea that the ATR is safely and responsibly operated. Phrases like "low pressure and temperature," "multiple water reserves," "redundant power supplies" are emphasized. Funny they never seem to mention how different ATR fuel is from a commercial power reactor, or how much more complex its power distributions, both of which make it easier to overheat the fuel. They never mention the poor reliability performance of various backup power supplies, the poor seismic capability of the water delivery systems overall, the likelihood of a loss of coolant accident, or the accidents that will be so rapidly progressing as to not allow the various make-shift approaches to mitigate an accident. They never seem to say much about the potential radionuclide release and effects on our region. Like your potatoes fried or nuked?

You may never be interested to know how much DOE is keeping under its hat while it promotes this reactor as safe and benign. You may see propaganda as necessary to keep the gravy train rolling. But you must admit that DOE cannot responsibly provide oversight of a facility it must struggle to find the funding to fix the deficiencies. The DOE operates largely unscrutinized by the public under the veil of national security, and I can tell you that they avoid quite a bit of embarrassment this way and it helps alleviate the urgency to fix problems quickly.

We live a long way from Japan, but I would not be too surprised if some day, with or without a seismic event, we are straining to determine the extent of fuel damage and amount of release by measuring the radiation levels downwind of the ATR.

CAN IT HAPPEN HERE?

By David B. McCoy

As we watch the explosions at nuclear reactors in faraway Japan, we may feel that nothing like this could happen here. But New Mexicans have two nuclear reactors in their back yard, both at Sandia National Laboratories. One of the nuclear reactors is in a building that cannot be made safe should a large earthquake happen in Albuquerque. The reactor is located within the take-off and landing pattern used by both Kirtland and the Albuquerque Sunport.

Dense housing tracts, freeways, military housing, day care centers and schools are located within and along the boundaries of Kirtland AFB where the nuclear reactors are housed.

One of the Sandia reactors is decades old and has no containment that would keep its radiation from contaminating military personnel, their families and residents of Albuquerque. Ground rupture can occur at the location of the reactor that is in the southwest portion of Sandia Labs. The surrounding public has not been informed of any provisions for evacuation if they even exist.

Kirtland AFB and Sandia are riddled with earthquake faults. A major earthquake in the Albuquerque area has the potential for human injury and building damage throughout the region. Due to age and poor design, many Sandia buildings and structures cannot withstand a large earthquake and could release a chemical cloud exposing many thousands of persons, according to the 1999 Sandia Environmental Impact Statement.

One reactor is located in the same unsafe building with a hot cell facility that handles high level radioactive waste. The potential for the increased danger from failure of the building's shared safety systems in the event of a strong earthquake has not been analyzed.

The Defense Nuclear Facilities Safety Board found seven years ago that unexamined dangers for fire hazards, an airplane crash and equipment operations existed for Sandia's nuclear facilities. To this date, the Safety Board still has not made a decision to block approval for the operation of this dangerous nuclear reactor.

According to the Safety Board staff the ventilation system at the Sandia Nuclear reactor is not built to earthquake safety standards that could prevent a radioactive plume from escaping from the building and the hot cell facility into the community.

Sandia has stated that it would not be feasible to modify the building structure and ventilation system to act as a safety class confinement system, because the building is a decades old structure which does not meet earthquake safety criteria.

So the public is at put risk from continued operations of an unsafe nuclear reactor that is in a building too old to be upgraded for safety.

A January 24, 2005 Sandia analysis, *The Path Ahead to Improve the Nuclear Safety Basis Process at Sandia National Laboratories,* identified the root cause that "Sandia has failed to manage the nuclear safety basis program in a formal, systematic manner based on recognized management system standards." The report stated that "Nuclear safety basis activities have been a low priority for Sandia senior management."

By allowing the reactor and hot cell operations in a building that cannot be made safe for earthquakes, Sandia is violating federal laws that require protection for the workers, public and environment. (10 Code of Federal Regulations Section 830.204).

How do we protect ourselves from acts of nature when there is information we don't have? The Safety Board has no authority to enforce nuclear reactor safety standards. The Department of Energy allows operation of this reactor far short of the standards. According to DOE official,

Thomas D'Agostino, DOE does not plan to upgrade the nuclear reactor to protect the public. The public cannot watch a nuclear meltdown in Japan without having a sense of urgency to prevent a nuclear crisis here in New Mexico.

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How Safe Is Idaho Nuke Lab In Event of Quake?

Jim Stanford reports 3/16/11 *in Jackson Hole Underground* (jhunderground.com)

One of several explosions at the Fukushima Daiichi complex.

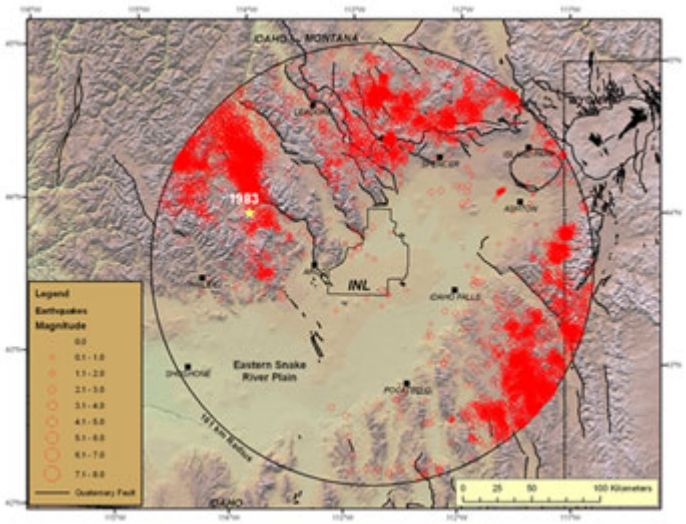
As reactors melt down and release radiation in the wake of a 9.0 earthquake in Japan, it's natural to wonder about the safety of the nuclear facility near Idaho Falls, 100 miles upwind of Jackson Hole.

The Idaho National Laboratory sits in the middle of a seismically active area where more than 9,300 quakes occurred between 1972 and 2007, according to its website. The largest of those quakes was the 7.3-magnitude Borah Peak temblor in 1983, which killed two children in Challis, caused an estimated $12.5 million in damage and lifted the state's highest peak by 7 feet.

Although there are fault lines in the surrounding ranges, the nuclear lab is located in the Snake River plain, where only minor quakes — less than 2.0 in magnitude — have been recorded since the monitoring system was installed, according to the facility's website.

But a watchdog group in Jackson Hole, Keep Yellowstone Nuclear Free, says the lab doesn't have enough safeguards. Of particular concern, says the group's executive director, **James Powell**, is the cooling system in the main reactor, where pipes run through unreinforced concrete and could rupture in a quake.

"All the backup systems in place would be useless if the pipes getting water to the reactor are broken," Powell says.

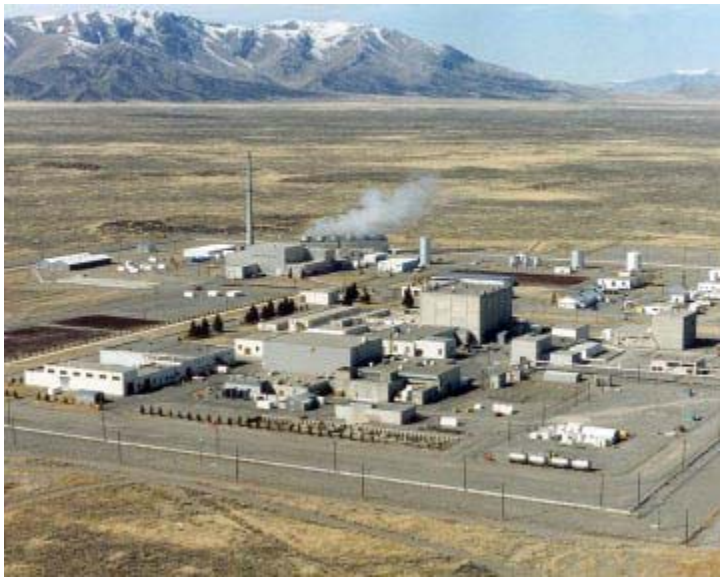


Seismic activity around the Idaho National Laboratory. The yellow star marks the epicenter of the 1983 Borah Peak earthquake, magnitude 7.3, about 50 miles from the compound.

Established in 1949 and formerly known by the euphemism Idaho National Engineering and Environmental Laboratory, or INEEL, the lab conducted landmark nuclear research, especially for Navy submarines, and once was home to the "largest concentration of reactors in the world," according to its website. Fifty-two reactors were built and operated at the site, although today only one main complex, the Advanced Test Reactor, still operates. The lab is run by Battelle Energy Alliance for the U.S. Department of Energy.

The Advanced Test Reactor, built in 1967, relies on the same backup power systems as Japan's Fukushima Daiichi complex, which has been rocked by explosions and fires following the March 11 earthquake and tsunami. The ongoing release of radiation from the crippled plant is the world's worst nuclear disaster since Chernobyl in 1986.

When the earthquake struck, the reactors at Fukushima Daiichi automatically shut down, as they would in a similar event at INL. But the fuel still needs to be cooled, and the tsunami knocked out the diesel generators that would have powered the cooling system, forcing operators to rely on batteries, which lasted only a few hours. Tokyo Electric Power Co. has been unable to cool the fuel, which is why the situation continues to spiral out of control.



The INL Advanced Test Reactor compound west of Idaho Falls. The reactor is the most powerful of its kind in the United States.

Amy Lientz, spokeswoman for INL, says the lab's reactor complex has diesel generators and batteries as backups, in the event power is lost. Battery power is sufficient to cool the reactor, she says. Staff at the lab are closely monitoring the disaster in Japan to see if lessons can be applied, she says.

The lab has a million gallons of water stored in "seismically sound, above-ground" tanks to cool the reactor in the event of an emergency, she says. The backup power systems would help pump the water. Also, an emergency team drills regularly, and the lab has an air monitoring system on and off site to warn the public of danger, she says.

Unlike the facility in Japan, the Advanced Test Reactor is not producing commercial power and thus operates at a lower temperature and pressure, Lientz says.

KYNF's Powell sees a problem with that reasoning. "The folks at INL have long stood behind the guise that because the ATR operates at a lower power level than commercial reactors, it doesn't require the same safeguards, which is scary," he says. "The ATR, much like the Japanese reactors, has inherent faults with its primary cooling system."

For more information and links go to; http://www.jhunderground.com

In a Perfect World, Fukushima Would Halt Nuclear Renaissance in Its Tracks

By Robert Alvarez

Japan's government and nuclear industry, with assistance from the U.S. military, is in a desperate race to stave off multiple nuclear reactor meltdowns.

Nuclear energy is high-risk technology with catastrophic potential. Given what's happening at the Fukushima Dai-Ichi nuclear complex, it's time for a serious review of what our nuclear safety authorities consider improbable: a nuclear accident at one of our facilities here in the U.S.

Despite massive subsidies and research-and-development investments, not one new American nuclear power plant has been built in decades. Two reactors are slated for construction in Georgia by Southern Co., but the company hasn't broken ground yet on that $14 billion project.

There are several reasons why Wall Street walked away from nuclear power:

* *Spiraling costs.* The average capital costs for nuclear power plants increased nearly three- to four-fold between the early 1970s and 1983.

* *Inadequate technology.* Even though the first nuclear reactors were deployed in the late 1950s and early 1960s, key aspects of the technology required further research and development. This was especially so for nuclear safety systems. Instead of addressing these emerging problems, the Atomic Energy Commission (which was later replaced by the Nuclear Regulatory Commission and an agency that became part of the Energy Department) ceased much of its research and development on light-water reactors. Since the early 1960s it has focused on the "next generation" of reactors that use plutonium as fuel.

* *Not enough standardization.* Despite generic design similarities, the nation's existing nuclear power complexes are comprised of one-of-kind facilities, each with many different characteristics.

* *The Three Mile Island accident.* This 1979 disaster dramatically demonstrated nuclear power's financial risks. The costs for constructing the failed reactor and the following clean-up of the accident were $2 billion.

* *Nuclear waste uncertainties.* The inability of industry or government to forge a credible disposal path for spent fuel from nuclear reactors resulted in a ban on new construction in California in 1976. It reverberated throughout the country.

America would be better off investing in conservation, fuel efficiency, renewable energy and carbon capture technologies than building a new wave of nuclear reactors.

Under the Obama administration, the Energy Department is being called on to usher in a new energy future for the U.S., but lacks the tools it needs to meet that challenge.

Critical Needs

The Obama administration should fundamentally restructure the Energy Department, starting by placing its nuclear weapons complex in the Department of Defense, where it belongs, and realigning the agency with our critical needs.

The Energy Department needs to ramp up our investment in green technology and mandate stringent clean-up procedures at our existing nuclear plants. We don't need yet another major nuclear power accident to wake up the public and decision-makers to the fact that there are better, safer and cheaper ways to generate electricity.

Published on Wednesday, March 16, 2011 by Focal Points Blog / Foreign Policy in Focus

Correction: According to a member of The Blue Ribbon Commission on America's Nuclear Future. "The BRC has NEVER spoken about INL becoming a long-term storage site. There was testimony once given to the commission by Tom Cochran from Natural Resources Defense Council who said he thought Idaho National Laboratory would be worth considering for this purpose, but never has then been a part of their conversations and I can attest to this. The BRC is not a siting commission and will give no recommendations on where the waste should go."

The Government's Nuclear Millstone

There's No Transforming Our Energy Future Without Completely Overhauling the Energy Department

Robert Alvarez reports 3/9/11 in the *Huffington Post*; "While we are investing in areas that are critical to our future, we are also rooting out programs that aren't needed and making hard choices to tighten our belt," Energy Secretary Steven Chu recently declared, when the Obama administration rolled out its budget.

Hold on. If truth in labeling were enforced, this agency should be called the Department of Nuclear Weapons. More than 60 percent of funding for the Energy department goes to propping up an antiquated nuclear infrastructure, naval reactors, maintaining thousands of nuclear warheads and cleaning up the agency's enormous environmental mess at its weapons sites in Washington, South Carolina and elsewhere. In fact, DOE spends more than 15 times on military nuclear activities than energy conservation.

Taking the perennial back seat are actual energy functions which make up less than 20 percent of the DOE's budget. Within that small slice, nuclear energy gets the most -- about a third of all energy research and development funds. Energy conservation, the one bright spot in this picture, gets about 23 percent. That's not going to change if Congress accepts Obama's budget plan, which would boost the department's spending by about 4 percent from 2011. Solar, wind, geothermal, and other authentically "clean" alternative energy sources each less than 10 percent of DOE's R&D funds.

Since its creation in 1977 by the Carter administration in response to a sharp rise in oil prices and supply disruptions, the Energy Department has done little to stem the country's burgeoning energy problems.

With about 4.5 percent of the world's population, the United States consumes more oil than any other nation and imports more than three-fifths of what it uses. As U.S. energy dependence has worsened, despite all the political instability and tyranny in many oil-rich nations, our greenhouse gas emissions have worsened as well. They've increased 17 percent since 1990 and are accelerating potentially disastrous climate disruptions.

Simply put, Obama can't uphold Chu's pledge to transform our energy future without completely overhauling the Energy Department.

Despite the rhetoric about reshaping America's energy future, the department's single largest expenditure ($7.6 billion) covers the maintenance of some 8,500 nuclear warheads. In seeking support for ratification of the recently enacted New Strategic Arms Reduction Treaty (New START) with Russia, Obama agreed to significantly increase funding to "modernize" our nuclear weapons stockpile and rebuild the nuclear weapons production complex. Specifically, annual nuclear weapons spending will rise between 2010 and 2015 by more than 18 percent, from $6.3 billion to $7.83 billion.

This is a down payment for the $167 billion the Energy Department plans to spend over the next 20 years. Even though the U.S. nuclear arsenal has been cut in half, and new weapons design and manufacture ended 20 years ago, spending on nuclear warheads has increased by more than 30 percent since the Cold War ended. And this doesn't even include an additional $100 billion the Pentagon plans to spend on new nuclear warheads.

Nuclear warheads are proving to cost many more bucks for the bang. Between 2003 and 2016 DOE estimates that it will cost about $15 billion to extend warhead lives. For instance, based on DOE budgets, the per-unit life extension cost for hundreds of the B-61 warheads deployed on bombers appears to be as much as $11 million.

Even nuclear weapons fans might be dismayed to learn that we taxpayers are footing an ever-larger bill to maintain a nuclear arsenal of which only 30 percent is currently deployed. The military has discarded about 40 percent of

these weapons, and we'll scrap about another thousand as part of New START. The remaining 2,500 weapons in the "war reserve" are mainly for retaliatory strikes against population centers.

Despite President Barack Obama's rhetoric about his aspirations for a world free of nuclear weapons, he's not making getting rid of our heap of defunct ones a big priority. Currently, warhead dismantlement has dwindled to the lowest level since the 1950s. According to the Energy Department's budget request dismantlement funding will be cut by more than 50 percent over the next five years. That would leave our nation with a 15-20 year backlog of discarded nukes.

The Energy Department is being called on to usher in a new energy future for the United States, but isn't equipped to meet that challenge.

The Obama administration should fundamentally restructure it, starting by jettisoning its nuclear weapons millstone, which should be the Pentagon's job."

Robert Alvarez is a Senior Scholar at Institute for Policy Studies, where he is currently focused on nuclear disarmament, environmental, and energy policies. Bob is also an Environmental Defense Institute board member. For more information and articles by Alvarez, go to www.ips-dc.org

Alvarez recently released "The U.S. Department of Energy's Fiscal Year 2012 Budget Request" that is a comprehensive analysis of where our tax dollars are going. This is a must read and available at IPS and EDI – http://environmental-defense-institute.org.

Photos of Japan's Fukushima Stricken Reactors

For more graphic photos and radiation releases of the Japan nuclear reactor disaster go to;
http://www.spiegel.de/wissenschaft/mensch/0,1518,751574,00.html

For additional credible Japan coverage, also see;
http://www.beyondnuclear.org