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**Review and Comments on Draft Legislation to Amend  
Nuclear Policy Act**

**By Robert Alvarez**

Nuclear reactors in this country are no longer just about generating electricity. More and more, these facilities are becoming major radioactive waste management operations involving some of the largest concentrations of artificial radioactivity in the country. Unfortunately, reactor operators and its regulator, the Nuclear Regulatory Commission (NRC), are motivated more by economics than the growing necessity of more secure and safe radioactive waste storage. The economics of an aging U.S. reactor fleet, in this marketplace of abundant and cheap natural gas, weigh heavily on merchant operators that have no captive rate base to recover growing expenses.

Overall the draft tracks the recommendations of President Obama's Blue Ribbon Commission on America's Nuclear Future (BRC) issued last year; and the Energy Department's January 2013 strategic plan to implement the BRC's recommendations.

Major elements of the DOE's strategic plan include:

- Establishment of a pilot interim storage facility by 2021 for spent nuclear fuel from closed reactors. Currently, there are 17 closed commercial power reactors with spent fuel stored onsite.<sup>1</sup> Announcements were recently made to close two more reactors in Wisconsin and Florida. By the 2021 there may be additional closed reactors.
- Establishment of a larger interim storage spent nuclear fuel storage facility by the year 2025. The option of expanding the pilot interim storage facility is not ruled out; and
- To make a permanent geologic repository for permanent disposal available by 2048.

A pilot consolidated SNF storage site would likely involve approximately 5,000 metric tons of SNF from 17 reactors and a failed reprocessing plant in Illinois.<sup>2</sup> If this quantity of commercial spent power reactor fuel is sent by rail to a pilot facility it would result in an estimated 280 to 500 rail shipments.<sup>3</sup> Upgrading long-distance rail lines to accommodate transport of several 100+ ton transport casks at a time remains an unresolved issue. If sent by truck, this could result in approximately 2,500 shipments.<sup>4</sup> If a pilot storage facility were expanded to accommodate 20,000 metric tons of spent fuel this could result in as many as 2,000 shipments by rail or 10,000 shipments by truck.<sup>5</sup>

The draft bill does not deal with the issue of high-density spent fuel pools, operating reactors, or the likelihood of long onsite spent fuel storage times, even under the most optimistic assumptions regarding the opening of consolidated storage and disposal sites. The timelines for consolidated storage, much less, a geological repository, contain strong elements of speculation. In effect, the bill does not address

the failed default policy of onsite SNF storage at operating reactors, based on a fundamentally flawed premise of timely removal and disposal offsite.

Adding uncertainty is the matter of safe transport of high burnup spent fuel<sup>6</sup>, generated for the past 20 years. In 2012, experts at the National Academy of Sciences raised concerns stating, “the technical basis for the spent fuel currently being discharged (high utilization, burnup fuels) is not well established... the NRC has not yet granted a license for the transport of the higher burnup fuels that are now commonly discharged from reactors. In addition, spent fuel that may have degraded after extended storage may present new obstacles to safe transport.”<sup>7</sup>

Nor does the draft explicitly address the prospects of reactor closures with prolonged SAFSTOR timelines, where SNF could remain in wet storage for decades. Nearly all U.S. reactors utilize high-density storage in pools originally intended to hold spent fuel for 3-5 years and will run out of wet storage space by 2015. The draft bill provides no incentives to reduce spent fuel pool densities and to expand inherently safer onsite dry cask storage. The Electric Power Research Institute estimates that it would cost approximately \$3.5 billion to thin out the pools at all U.S. reactors.

Last year the Federal Court of Appeals the Court for the District of Columbia struck down the Nuclear Regulatory Commission’s Waste Confidence Rule allowing for high density pool storage. According to the court: “We conclude that the Commission’s EA [Environmental Assessment] and resulting FONSI [Finding of No Significant Impact] are not supported by substantial evidence on the record because the Commission failed to properly examine the risk of leaks in a forward-looking fashion and failed to examine the potential consequences of pool fires.”

The draft bill retains the existing definition of high-level radioactive waste in the 1982 Act. In 2005, Congress authorized DOE to deviate from this definition and to self-regulate onsite disposal of HLW at the Savannah River Site and the Idaho National Engineering Laboratory. Because of opposition by the Pacific Northwest Congressional delegation, the Hanford site was excluded. The draft also addresses concerns of states with DOE sites storing defense high-level wastes by requiring their removal under existing compliance agreements.

The bill attempts to jump-start the site selection process by requiring the new Nuclear Waste Authority to establish a mission statement and storage and disposal guidelines within a year of enactment.

The consent process involves the governor, local government and/or Indian tribe. It is a double-tier consent process, which explicitly supports preference for co-location of a consolidated storage with disposal. Funds from user fees, now placed in Working Capital Fund can be used for compensation to host communities, economic development and other sweeteners.

The bottom line is that this draft does not address the likely prospects that spent nuclear fuel and defense HLW will remain at the generating sites for decades to come. A safe containment strategy for defense HLW, particularly at the Hanford site ( with 60% of its aged 177 tanks experiencing leaks), should be mandated in the proposed legislation.

Finally, the bill does not address the impacts of reactor closures on the economies of communities and states left stranded with spent nuclear fuel for an indefinite period. At the minimum, states and communities hosting closed reactors should be provided with funds from the user fees collected under the NWPA for safer dry onsite storage and “payment in lieu of taxes,” until the wastes are removed.

*Robert Alvarez is a senior fellow at the Institute for Policy Studies and an EDI Board member. To see Alvarez’s full detailed and referenced report go to; [www.ips-dc.org](http://www.ips-dc.org) or EDI’s website.*

## Fukushima Meltdown Driving Increased Abnormalities Among US Infants

**In wake of disaster, children on the west coast almost one-third more likely to suffer from thyroid abnormalities**

Lauren McCauley, reports Tuesday April 2, 2013 in [Common Dreams](#) ; “Infants on the West Coast of the United States are showing increased incidents of thyroid abnormalities, which researchers are attributing to radiation released following the March 2011 meltdown at the Fukushima Daiichi nuclear power plant.

An omniscient sign at an anti-nuclear protest in Kouenji, Japan. (Photo: SandoCap via Flickr) According to a [new study](#) (.pdf) published in the [Open Journal of Pediatrics](#), children born in Alaska, California, Hawaii, Oregon and Washington between one week and 16 weeks after the meltdown began are 28 percent more likely to suffer from congenital hypothyroidism (CH) than were kids born in those states during the same period one year earlier.

CH results from a build up of radioactive iodine in our thyroids and can result in stunted growth, lowered intelligence, deafness, and neurological abnormalities—though can be treated if detected early.

Because their small bodies are more vulnerable and their cells grow faster than adults', infants serve as the proverbial 'canary in the coal mine' for injurious environmental effects.

"With the embryo and fetus, there can never be a 'safe' dose of radiation," [writes](#) nukefree.org founder Harvey Wasserman. "NO dose of radiation is too small to have a human impact."

According to researchers from the [Radiation and Public Health Project](#) who performed the study, “Fukushima fallout appeared to affect all areas of the US, and was especially large in some, mostly in the western part of the nation.” They add that CH can provide an early measure to "assess any potential changes in US fetal and infant health status after Fukushima because official data was available relatively promptly."

Health researcher Joe Mangano similarly [cautioned](#), "Reports of rising numbers of West Coast infants with under-active thyroid glands after Fukushima suggest that Americans may have been harmed by Fukushima fallout. Studies, especially of the youngest, must proceed immediately."

Earlier this year, the Fukushima Prefecture Health Management Survey found that more than 40 percent of the Japanese children studied showed evidence of thyroid abnormalities, which Wasserman says signifies a "horrifying plague." He continues: The ultimate death toll among Fukushima's victims may be inescapable. But the industry that's harming them is not. Those thyroid-damaged children bring us yet another tragic warning: There's just one atomic reactor from which our energy can safely come. Two years after Fukushima, it is still 93 million miles away—but more ready than ever to safely, cleanly and cheaply power our planet.”

## **Fukushima Disaster Continues: Third Radioactive Water Leak Found**

**"We cannot deny the fact that our faith in the underwater tanks is being lost."**

Andrea Germanos, reports April 9, 2013 in [Common Dreams](#): "Yet another radioactive water leak has been detected at the Fukushima Daiichi nuclear power plant, officials announced Tuesday, as the nuclear catastrophe continues to unfold more than two years after a massive earthquake and tsunami caused meltdowns at the plant.

A third leak has been detected at an underground radioactive water pool at the Fukushima nuclear power plant. The new leak marks the third of seven underground radioactive water pools that are leaking since [Saturday](#), and follows two [failures](#) of the plant's cooling system in a month.

The [New York Times](#) reports: ' The operator of Japan's crippled nuclear plant halted an emergency operation Tuesday to pump thousands of gallons of radioactive water from a leaking underground storage pool after workers discovered that a similar pool, to which the water was being transferred, was also leaking.

At least three of seven underground chambers at the site are now seeping radioactive water, leaving the Tokyo Electric Power Company [TEPCO] with few options on where to store the huge amounts of contaminated runoff from the makeshift cooling systems at the Fukushima Daiichi nuclear power plant.

"We cannot deny the fact that our faith in the underwater tanks is being lost." —Masayuki Ono, TEPCO general manager.

Storage for the radioactive waste is no finite problem; it continues to pile up at the plant, as it is needed for its cooling system. Prime Minister Shinzo Abe has said TEPCO is not allowed to release any more of the radioactive water into the ocean.

Also, the [Associated Press](#) reported Monday that critics accuse TEPCO of trying to save money by building shoddy storage pools for the radioactive water waste instead of safer steel tanks.

"We cannot deny the fact that our faith in the underwater tanks is being lost," Masayuki Ono, TEPCO general manager, told a news conference.

"We admit that the underground tanks are not reliable," Ono said. "But we must keep using some of them that are relatively in good shape while monitoring them closely. We just don't have enough tanks on the ground that can accommodate the water."

## **Hanford Nuclear Waste Site at Risk of Hydrogen Explosion, Report Warns**

**Following report of leaks, nuclear safety board finds dangerous hydrogen build up in waste holding tanks**

Lauren McCauley, reports, April 3, 2013 in [Common Dreams](#) ; "Tanks at the Hanford Nuclear Reservation, which sits on the Columbia River in Benton County, Washington face dangerous risk of hydrogen build up which could trigger an explosion of radioactive materials, a nuclear safety board announced on Monday.

Storage tanks at Hanford Nuclear Reservation (Photo: Philo Nordlund via Flickr) The Defense Nuclear Facilities Safety Board expressed these concerns in a briefing letter to Sen. Ron Wyden (D-Ore.), chairman of the Senate Energy and Natural Resources Committee, who sought the board's review ahead of next week's confirmation hearing for President Obama's Energy Secretary nominee Ernest J. Moniz—a known nuclear-hawk.

The board expressed concern over the potential for hydrogen gas buildup within the underground tanks, particularly those "double wall" tanks which contain the highly radioactive material that was previously pumped out of leaking single-shell tanks.

"All the double-shell tanks contain waste that continuously generates some flammable gas," the board [said](#). "This gas will eventually reach flammable conditions if adequate ventilation is not provided."

Earlier this year, investigators found [six single-shelled underground storage tanks](#) leaking up to [1,000 gallons of radioactive sludge](#) each year—a situation that noted theoretical physicist Michio Kaku called a "ticking time bomb."

[According](#) to the *Associated Press*, officials have known about the explosive potential of the hydrogen gas build up and last fall the Defense Nuclear Facilities Safety Board recommended additional monitoring and ventilation of the tanks, which federal officials have been working to implement.

Federal officials have thus far evaded any long term, sustainable clean up of the 56 million gallons of highly radioactive material currently held at the former Manhattan Project site.

During their review, the board also noted that the waste treatment plant, which is currently being constructed for long-term waste disposal, faces serious technical problems which could lead to "chemical explosions, inadvertent nuclear reactions and mechanical breakdowns," the *New York Times* [reports](#).

[In](#) an interview Tuesday, Wyden [said](#) that the board's experts had raised "a serious question as to whether this plant is going to work at all."

"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 [added](#).

*Editors' note: DOE has known for decades that the Hanford high-level waste tanks were and explosive hazard. DOE euphemistically called the tank emissions as "burps." These problems were covered by Spokane, WA Spokesman Review.*

## **Nuclear Dump in Washington Leaking Radioactive Waste**

### **Repeated calls to address problems at facility 'met with silence' by state and federal officials**

[Common Dreams](#) reports , February 16, 2013 that a storage tank for nuclear waste at the Hanford Nuclear facility in Washington state--one of the most contaminated nuclear waste sites in the country--is leaking radioactive waste were confirmed that state's governor Friday.

The Environmental Restoration Disposal Facility is seen at the Hanford Nuclear Reservation - As the Associated Press reports:

The news raises concerns about the integrity of similar tanks at south-central Washington's Hanford nuclear reservation and puts added pressure on the federal government to resolve construction problems with the plant being built to alleviate environmental and safety risks from the waste.

The tanks, which are already long past their intended 20-year life span, hold millions of gallons of a highly radioactive stew left from decades of plutonium production for nuclear weapons.

On 2/15/13, the U.S. Department of Energy said liquid levels are decreasing in one of 177 underground tanks at the site. Monitoring wells near the tank have not detected higher radiation levels, but Inslee said the leak could be in the range of 150 gallons to 300 gallons over the course of a year and poses a potential long-term threat to groundwater and rivers.

The *Northwest News Network*, in an [interview](#) with Tom Carpenter, head of the Seattle-based watchdog group Hanford Challenge, found that Friday's news highlights the fact that problems have been endemic to the site for years and there's not even a place to transfer the contained waste or a place to return any that may be recovered from spills or leaks.

"If you have another leak, what do you do?," ask Carpenter. "You don't have any strategy for that. And the Hanford Advisory Board and the state of Washington and Hanford Challenge and others have been calling upon the Department of Energy to build new tanks. That call has been met with silence."

And the *Chicago Tribune* [adds](#):

Though more than a third of the 149 old single-shell tanks at the site are suspected to have leaked up to 1 million gallons of nuclear waste over the years, this is the first confirmed leak since federal authorities completed a so-called stabilization program in 2005 that was supposed to have removed most liquids from the vulnerable single-shell tanks.

The new leak calls into question the effectiveness of that program, and state officials said it increased the urgency of ending roadblocks to a permanent storage solution for the 53 million gallons of waste housed at the sprawling site that was a center for atomic bomb-making material after World War II.

## **News Reports are Grim and Tanks at Hanford are Leaking: Where Do We Go From Here?**

**H**anford Challenge reports 4/5/13; "The news reports about Hanford are grim. The U.S. Department of Energy (DOE) has announced that six of Hanford's single-shell high-level nuclear waste tanks are [actively leaking](#), another 14 may be leaking, and this is in addition to the leaking double-shell tank announced back in August 2012. The new leaks – and Governor Jay Inslee's very [public reaction](#) to them – have thrown a much needed national spotlight on Hanford.

Most of Hanford's tanks were built when Harry Truman was President. Sixty-seven of the single-shell tanks have *already leaked* an estimated one million gallons of deadly radioactive stew into the soil and groundwater beneath the tanks. Now add to that a game-changing leaking double-shell tank, six new leaking single-shell tanks, the likelihood that this is just the beginning of more yet to be discovered leaks, and [risks of tank explosions](#). It is clear that Han-ford's tanks are in trouble.

This is a huge problem. The only active strategy for dealing with a leaking tank is to move its contents to a tank that is not leaking. Unfortunately Hanford is running out of tank space, and the leaking double-shell tank crushes the assumption that the double-shell tanks would remain stable until the troubled Waste Treatment Plant goes on line and starts immobilizing the tank waste in glass.

One idea for fixing this problem so far include building new tanks for which Washington State, Oregon, the Hanford Advisory Board, and groups like Hanford Challenge are advocating.

New double-shell tank space is needed to provide a secure place to contain waste until the Waste Treatment Plant gets its ducks in a row and is able to start immobilizing the high-level nuclear waste.

Another plan, [announced as a preferred alternative](#) by DOE on March 11, 2013 is to characterize some of the tank waste as Transuranic (TRU waste), treat it, and ship it to the Waste Isolation Pilot Plant (WIPP) in New Mexico. The number of tanks that actually meet the criteria to be considered TRU waste is unknown (some say only 2-11 tanks are possible to characterize as TRU), though DOE has said it is looking at up to 20 tanks. The prospect of getting rid of Hanford tank waste is appealing. Unfortunately, the “preferred alter-native” to retrieve, treat, package, characterize, and certify certain Hanford tank wastes for disposal at WIPP is unlawful, time consuming, fraught with technical problems, and directs money away from more practical solutions like building new tanks and fixing the Waste Treatment Plant. Hanford Challenge, in coalition with other environmental groups [sent a letter](#) to the Secretary of Energy outlining problems with shipping tank waste to WIPP.

An interim measure that does have promise includes [building barriers](#) over some of the tank farms to slow down the spread of contaminants through the soil and groundwater until the contents of those tanks can be removed and immobilized. We must do all we can to slow the flow of radioactive waste to the Columbia River.

Apart from moving the waste around, there are no commitments to clean up the waste that has leaked into the soil and groundwater un-der the tanks, despite regional stakeholders calling for this waste to be remediated. With inevitable future delays to the startup of the WTP, budget cuts in place from sequestration, questionable tank integrity, and no contingency plan in place in the event of multiple tank failures, it is critical that the tank leaks be controlled and stabilized as soon as possible to ensure no further harm to the environment. Looked at one way, there are still 56 million gallons of high-level radioactive wastes in the 177 decaying Hanford tanks left to leak.

The leaking tanks may be releasing up to 1,000 gallons/year of high-level nuclear waste into the environment. The leaking single-shell tanks include T-111, T-203, T-204, TY-105, B-203, and B-204. In late Feb 2013, Senator Wyden asked the Government Accountability Office to investigate when DOE knew of leaks at Hanford, whether the issue was immediately reported, and if changes need to be made to the tank monitoring program. Assumptions about tank integrity have been tested and found to be incorrect. More rigor needs to be introduced into the monitoring program.

The leaks add additional pressure to the troubled Waste Treatment Plant which may be unworkable, unsafe and is certainly over-budget and behind-schedule. The original cost estimate of \$4.6 billion seems reasonable compared to the most recent estimate of \$13.4 billion. Nobody believes the price tag or delays will stop there.

**Here are a few modest first steps to recovery:**

- Immediately empty any tank identified as actively leaking.**
- Build new environmentally compliant tanks** as soon as possible. Recovering leaked waste is much more expensive and complicated than removing waste from tanks.

- Develop a plan to **remove, treat, and dispose of waste that has leaked into the soil and groundwater** beneath the tanks.
- Immediately **begin an external, independent, licensing review that determines how to salvage the WTP**, and in the meantime cease all design and construction work until problems are re-solved.
- **Give authority to the Nuclear Regulatory Commission or the Defense Nuclear Facilities Safety Board** to certify whether and when the WTP can operate from a nuclear safety standpoint.
- **Make harassment and reprisal against whistleblowers a civil and criminal offense.** The safety of the public hinges on the safety of the nuclear facility, which relies on a protected flow of safety information.
- **Create a cleanup agency whose only mission is remediation** of retired government nuclear and toxic facilities, and subject that agency to independent regulatory oversight.

**H**anford is in crisis. Nuclear waste is leaking into the soil and groundwater, and new leaks are being discovered in tanks that were assumed to be stable. Safety culture is struggling from a lack of meaningful reforms. Congress needs to get its act together and fully fund a compliant cleanup to ensure that new double-shell tanks may be built and newly discovered waste sites may be remediated, in addition to all of the cleanup work underway.

The elections are over, and there are numerous changes in the air that affect Hanford. These transitions pose both challenges and opportunities for the future. [Kevin Smith](#) took over in early January 2013 as the Site Manager for Office of River Protection (ORP), which oversees the tank farms and Waste Treatment Plant (WTP, vit plant). We hope Smith, a former military officer in the Air Force, will meet with the scientists and engineers who have raised concerns about safety of the Waste Treatment Plant's design, and make efforts to address the safety culture problems that have plagued the facility for years. He had a challenging start, faced with an onslaught of bad press, including a [new whistleblower complaint in Federal Court](#), news of new tank leaks, and the aftermath of [allegations of an assault](#) against a DOE engineer by a manager in late December.

We have a new Governor, [Jay Inslee](#), who quickly [endorsed the demand for building new waste storage tanks](#) at Hanford – a move that Hanford Challenge called for back in August.

Days after he made that call, on Friday, February 15, Governor Inslee held a press conference denouncing a new leaking tank at the Hanford site, stating that the State has “zero tolerance for radioactive leaks.” We have high hopes for a more hands-on approach by Governor Inslee and his staff on Hanford issues. We have met with Congressman Inslee on Hanford issues on many occasions in the past 15 years.

Maia Bellon is Washington Department of Ecology's new director. We recently had a great meeting with Director Bellon. We appreciated her direct questions and willingness to hear our policy concerns. The State has a very important role as regulator, enforcer, and protector of the public trust and we have faith that Director Bellon and Governor Inslee will embrace this role and get Hanford cleanup on track. We look forward to working with the State of Washington to transition Hanford into an effective model of cleanup.

One change we are hoping to see in an Inslee administration is to strengthen the Department of Ecology and the [Nuclear Waste Pro-gram](#), so it is able to provide strong and effective oversight and regulation of the most toxic, contaminated facility in the nation. We are eager to see the revision and reissuance of the Draft Hanford Site-wide Dangerous Waste Permit; fixing some of its major flaws and bolstering Ecology's ability to provide oversight. Hanford Challenge and other stakeholders in the region provided significant comments on the 16,000 page Draft Permit, which is eight years overdue.

[Dr. Ernie Moniz](#) was recently nominated as the incoming Secretary of Energy to replace Steven Chu, who has tendered his resignation and is moving on. Secretary Chu made gains in the area of encouraging renewable energy development to combat global climate change, yet did little to take on Hanford cleanup issues, apart from setting up a secretive expert panel to review WTP technical issues. His "expert" mode, lack of transparency, refusal to meet with stake-holders, and disdain for public process and participation were features of his tenure that we won't miss. Dr. Ernie Moniz, an MIT scientist, brings experience as a former DOE Assistant Secretary during the Clinton Administration.

The timing of his nomination is auspicious, as Moniz was Assistant Secretary when DOE announced that tank waste had reached the groundwater back in 1998. He will be entering the fray as new tank leaks raise big questions and bring national attention to Hanford cleanup. We are hopeful that his experience will bring urgency and agility to DOE's work on Hanford issues.

Another shift in the political landscape is that [Senator Ron Wyden](#) from Oregon has moved up to Chair the Senate Energy and Natural Resources Committee. As a Senate Committee Chairman, Wyden is able to call oversight hearings and influence the Energy Department's budget and authorizations much more effectively. Senator Wyden traveled to Hanford on February 18, to tour the tank farms and the vit plant. He is showing promising interest in supporting whistleblowers and bringing reform and accountability to Hanford cleanup.

These new shifts provide an opportunity for Congress to take a hard look at the WTP and ensure an independent assessment is made of the design that validates a path-forward.

This is an opportunity for these new leaders to bring a level of integrity and Getting the Waste Treatment Plant (WTP) back on track remains a big focus for us. We are helping several key whistleblowers, four major ones right now, and the collective impact of their disclosures and our success in getting their information out there to the right places has led to the suspension of work at the WTP, and a [Secretarial initiative](#) to "review" the technical and safety issues raised by the whistleblowers. The result of that initiative is an open discussion of redesign, including "working around" the need for the Pretreatment Facility altogether. This is a stunning reversal of the DOE's position from last winter. Hanford desperately needs a treatment option for its tank waste and fixing the WTP must be a top priority."

*For more information go to: <http://www.Hanford Challenge.org>*

## A Contaminated Teddy Bear

“**H**ow much contamination would you find acceptable on your daughter’s teddy bear? Would you let her snuggle up at night with a bear that had been decontaminated to the industry standard – with low, but detectable counts? Does the bear mean so much to her that you’d want to get it back even with higher levels of contamination? Or would you insist on cleaning up every little bit of detectable radioactivity? And if not a teddy bear, how about the kitchen her dinner is cooked in, the living room carpet she lies on to watch TV, the classroom where she spends her days, or the silverware she eats with?”

My guess is that virtually everyone reading this, no matter how where you stand on the biological effects of radiation exposure and no matter how cavalier you might be with your own radiation exposure, you’d hesitate to accept extra exposure to your kids. And it’s probably not a rational response; any more than any of our other concerns for our kids. I know I feel that way – if you’ve been reading this blog for any length of time you’ve most likely noticed that I am not overly concerned about low doses of radiation. At the same time, I have to admit that I’d have trouble telling my own daughter to snuggle up with her favorite (albeit lightly contaminated) Pooh bear.

This discrepancy is because there can be a disconnect between the head and the heart. I am utterly convinced that detectable contamination – say at the [limit of 1000 decays per minute](#) – would pose no threat to anyone; this is why it’s acceptable to release items with this level of contamination for unrestricted use. It would be good enough for me – but not for my girl.

So let’s think about the aftermath of a radiological emergency; one that’s spread contamination across a city, inside schools and businesses, and through homes and apartments. Cleanup will cost a fortune – maybe tens or hundreds of billions of dollars – and the more stringent the cleanup standards the more it’s going to cost. As a health physicist and a scientist I can crank out numbers to tell our elected and appointed officials how much radiation dose people will received from any level of contamination – and if they don’t believe me then I can run the numbers on a computer program such as [RESRAD](#) (for RESidual RADioactivity). But convincing an elected official – not to mention the workers, residents, and parents – to let people reoccupy an area that hasn’t been cleaned up to pre-emergency levels is going to be a hard sell.

So let’s think about the cost of every incremental bit of cleanup. Say that (in a hypothetical situation) contamination is evenly distributed and that contamination levels drop off proportionally with distance – doubling your distance from the center halves the contamination levels, tripling your distance reduces contamination by a factor of three, and so forth. Since the area of a circle is proportional to its radius this means that reducing contamination levels by a factor of two will increase the area to be cleaned up by a factor of four. So if the level of risk is directly proportional to the contamination levels, and if the cost of cleanup is proportional to the area cleaned up (both a bit on the simplistic side, but probably not too far off) then we can conclude that cutting your risk in half requires spending four times as much for remediation, and it’ll cost nine times as much to cut your risk by a factor of three. It’s not hard to see

that costs skyrocket as we try to clean up to ever-lower levels – at what point do we stop cleaning up and decide to simply live with a little bit more contamination?

Ask a radio-phobe and the answer is obvious – clean up until all contamination is gone. A regulator would likely tell you to clean up until you meet the appropriate regulatory limits, and a scientist might answer that cleanup should proceed until the marginal reduction in risk is balanced by the increased cost. Which way will the decision go in an actual emergency? I honestly don't know, and I don't envy those who have to make such a decision.”

*Federation of American Scientists Posted by [Dr. Y](#) on Mar 28, 2013 in [Featured](#), [Health](#), [Public Safety](#), [Radiation](#), [Risk](#) For more information go to: [www.fas.org](http://www.fas.org)*