

# NUCLEAR MONITOR

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## One Rad Fits All? Not Anymore...Actually, Not Ever

If a flu epidemic were to selectively target men for fatalities over women, this would be big news; if a government sponsored vaccine against this flu selectively protected women more than men, I think that would trigger a pretty big firestorm of discussion, if not action.

(755.4276) It is with some puzzlement that I was faced, twenty years into this job at Nuclear Information and Resource Service, questions coming from women (only one or two) asking about radiation impacting women more than men. I asked back, "You mean pregnant women, right? In which case we are talking about the fetus..." To my amazement, came the reply, "No, women, not pregnant women." I was startled, but no, I did not know anything about that. These few women could not give me a source for where they had heard this idea. I was left with a niggle in my stomach, but I maintained my part of the ignorance and silence on this revolutionary news: gender matters when it comes to the Atomic Age.

It was not until 2011 and the triple melt-down at Fukushima, when the Executive Director of NIRS, Michael Mariotte asked me to write a letter on women and breast cancer in post-Fukushima Japan to the founder of the Komen for a Cure Foundation that I realized I had to track down my ignorance.

It is true that Institute for Energy and Environmental Research (IEER) had started a campaign in 2005 on disproportionate impact of radiation--but my understanding from a quick look at a couple of emails with the name "Healthy from the Start," was that this was focused on children. We have long known that due to body mass and rate of cell division in somatic growth children are more vulnerable to radiation impact. I had missed IEER's "memo" that women are too.

In 2011 as Fukushima was melting I was pretty determined to figure this out; it felt like a moral obligation to find out something as big as a gender difference in radiation impacts in honor of the horrendous suffering in Japan. So I looked. At first I found nothing. I decided to call one of the last remaining icons of the 20th Century radiation research pioneers--Dr. Rosalie Bertell.

Rosalie told me to look at a National Academy of Sciences (NAS) report that ended up being out of print. I called her back when I could not get access to that report. Rosalie said "look at the NAS BEIR VII; only it is not in the text, you will have to look at their numbers. You will find the difference there."

BEIR VII (the seventh report in a series called the Biological Effects of Ionizing Radiation) published in 2006 by the National Academy of Science --is on the one hand considered "the gold standard" on radiation by some, and by others a highly a controversial document. The nuclear industry hates it--it says that there is no safe dose of radiation. My coworker Diane D'Arrigo and a cohort of anti-nuclear activists also hate it since it leaves out so much: there is nothing directly based on Chernobyl data and it employs so many "fudge factors" that they point out how many ways it functions as a "front" for the Nuclear Regulatory Commission to keep saying some exposure to radiation is ok. It felt almost sacrilegious to spend many hours investigating the numbers published in that report, but I did. To my amazement, Rosalie, and the

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women who came out to my talks were right. Radiation is more harmful to women. The difference is not small. For every two adult men who get cancer, roughly three adult women will get cancer at the same level of exposure; the ratio holds for fatal cancer too. IEER is also right: little girls are the most vulnerable. They are twice as likely to get cancer at some point at their lives than little boys of the same age and exposure level.

Why, in 20 years as a professional in this field did I not know this? Why, now 18 months after I published a briefing paper and then toured the federal agencies to deliver the findings is this still news?

BEIR VII was published in 2006. Amazingly, the authors of this report are mute on this subject. I need to interview them, and plan to as I begin to move into campaign-mode on these issues in 2013. Did the BEIR scientists miss this trend in their own numbers? Were they unwilling to discuss it because there is (not yet) an explanation of causation? Were there women involved?

We cannot attribute the full difference between the genders to body mass or rate of cell division. Comparing the 0-5 years group, the boy and girls in that age group are about the same size (if anything girls are bigger) and ostensibly growing at roughly the same rate. Again, adult women compared to adult men may be somewhat smaller as a group, but that cannot explain a 50% difference.

What also cannot be explained are federal regulators in possession of the same data who persist in setting radiation standards based only on the

part of the human life-cycle that is most resistant to radiation's dangers. Some men get sick from radiation; some men die from cancer caused by radiation, but as a group, being more resistant to harm than all other parts of the life cycle means that they should be on a lower tier of consideration when it comes to radiation and protection. Women and children may be characterized as "more vulnerable"--but this implies that there is something wrong with us. There is nothing wrong with us. Dumping ionizing radioactivity into our air, our water, our food, and our bodies is a criminal act. Since our bodies are less resistant, we must resist this insanity more at the social level.

Once I had this information about disproportionate impact of radiation in hand it became incumbent upon me, and NIRS to share it. We now ask you to pick up this task. Women have a right to know; parents have a right to know; husbands, fathers, sons and brothers need to know. We provide to you a factsheet "Women and Children Require More Protection From Ionizing Radiation than Men" in this edition of the Monitor for your use in educating others. To put this bluntly: I am talking about all girls, all women, worldwide; and all ionizing radiation: natural, medical, commercial and military atomic industries, waste; you name it.

We know; and BEIR VII and many other studies, some of which are noted in this issue of the *Monitor* affirm that there is no safe dose of radiation. We must stand up to protect ALL of us.

The articles in this edition on the prospective deregulation and release of radioactive metals into commerce, recycling and ordinary garbage and the

changes in radiation standards are prime opportunities to act on this concern. These indiscriminate elevations of random radiation exposure to uninformed members of the civilian population and spread of radioactivity into all our systems are irreversible, as is the potential for destruction--twice as high risk for female children than male children--all children many times over adults--and fifty percent more for adult women than men. Again, there is no safe dose--so there should be no increase over natural radiation levels. Zero.

The National Geographic Daily News in 2011 reported that there have been millions fewer girl children born and posits that this may be due to radiation from atmospheric nuclear weapons tests and large nuclear reactor accidents. One of these years we will also admit that a big portion of the cancer epidemic comes from these radiation sources.

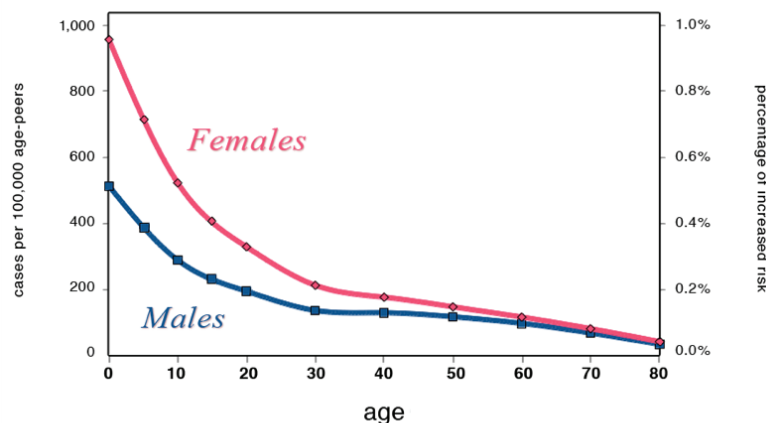
As the research as to why continues, we must not only stand, but rise. We need a healthy future together. It is time to base all policies in the public sector on the simple (and sane) assumption that the most vulnerable is the one exposed.

**Sources:**

NIRS Briefing Paper, fact sheet, graphic information and short videos by Ian Goddard are posted here: <http://www.nirs.org/radiation/radhealth/radhealth-home.htm>

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National Geographic report: <http://news.nationalgeographic.com/news/2011/06/110602-millions-fewer-girls-nuclear-radiation-births-science/>

**Increased Cancer Risk by Age at Exposure to 20mSv Radiation**



U.S. National Academy of Sciences BEIR VII Phase 2 Risk Model

# Low-Dose Radiation Impact -- New analysis takes "Radiation is good for you" head-on and says "No"

Anders Møller and Timothy Mousseau are a research team routinely looking at the impact of radiation from both Chernobyl and Fukushima on plants and animals (see Radiation Shorts in this issue for further coverage). Their considerable and growing body of work has turned up questions about variability in radiation impact on different species. This year, in part to provide baseline information on this issue of variability, the two turned their considerable quantitative skills to the question of whether 1000-fold differences in ambient levels of radiation around our planet, due to differences in elements in the soil and rocks at these locations have impacted evolutionary processes in plants and animals. In addition, the two squarely ask: if there is any impact, is it harmful or beneficial?

(755.4277) "The flipside of negative fitness consequences is evolutionary adaptation to radiation...Here we suggest that the documented consequences of naturally increased levels of background radiation have important implications for hormesis. In particular, we would expect that radiation hormetic effects should be found in areas with higher levels of natural background radiation because of adaptation to such enhanced levels of radiation, and we predict that on average radiation should have positive effects on the wellbeing of humans and other organisms if hormesis operates at naturally occurring low-dose radiation."

Since industry-paid experts persist in bringing forward hormesis (the notion that some radiation exposure can be good for you), this study provides a powerful reply not from cells in a dish in a laboratory, but from nature, and over the timescale where one would expect to be able to measure the benefits if they are there--evolutionary time.

Variations in natural background radiation result from variation in radioactivity in Earth's rocks and soils, either due to geological processes or, and in some cases, large extraterrestrial impacts. In this study the authors are explicitly not looking at sites with radioactivity from atomic military or industrial activity.

"*The effects of natural variation in background radioactivity on humans, animals and other organisms*" published in November 2012, is a "meta-analysis" in which Møller and Mousseau identified about 5000 previously published papers on this subject, and from these selected 46 to apply statistical analysis. Spanning multiple continents, many species

and a variety of focal points of research, the two conclude that natural low-level radioactivity is damaging, even in the long time frames in which adaptation is possible. This finding is important since contamination from human atomic activities (nearly all within the 20th and 21st centuries) has not had sufficient time to produce the long-term consequences that radiation-induced selection on the study sites, where evolutionary time frame has passed.

"...this review attempts to provide baseline information concerning the potential consequences of nuclear accidents like those at Chernobyl and Fukushima."

Møller and Mousseau expressly looked for, but did not find, positive effects from radiation in 46 studies that looked at a control population and a population exposed to elevated radiation where the levels of radiation were monitored in both groups. The studies varied in focal point but included including findings on rates of mutation, DNA repair, physiology, morphology, disease rates, shifts in immunological function, sex ratio and fecundity in human beings, other animals, plants and fungi. The statistical analysis made possible from aggregating the populations across 46 studies is very powerful and enabled very clear findings that were not due to "random chance" (i.e. statistically significant) in every dimension examined, and those findings are that radiation causes harm, even at very low levels, and even over very long periods of time when any adaptation that was going to happen would have happened.

Because claims of hormesis from industry employed experts are again becoming a drumbeat, we offer this lengthy

excerpt from Møller and Mousseau:

"Hormesis is defined as a beneficial effect of normal background radiation on life-history traits such as fecundity and longevity compared to levels achieved in the complete absence of radiation (reviews in Kondo, 1993; Luckey, 1991). If hormetic effects of radiation on fitness exist, we should expect that the optimal level of radiation should increase with background radiation level. If hormesis has evolved as a consequence of local adaptation to specific levels of radiation, we might even find that all populations should perform best at some local level of radiation; exceeding their performance in the absence of radiation. The latter scenario would suggest that fitness should be independent of level of natural background radiation. In either case we should not expect to find increased mutation rates, impaired immune function, increased incidence of disease and increased mortality in areas with higher levels of normal background radiation. Our findings are clearly inconsistent with a general role for hormesis in adaptation to elevated levels of natural background radiation."

Indeed, across the 46 studies included, the authors found elevated rates of deleterious mutation, aberrant morphology, and disease (including cancer in humans) resulting from multiple measurable impacts of radiation, including impaired immuno-function and reduced rates of DNA repair. The pair chose to exclude radon exposure, explaining that there is a large literature that could dilute the studies of other types of exposure, and radon studies are reviewed elsewhere. Interestingly, the authors do note cases of radiation resistance--reduced rates

of damage--which is differentiated from hormesis. The theory of hormesis is that radiation confers benefit. The discussion of resistance to radiation focuses on lower animal/bacteria and likely increased resistance to oxidation. Plants, where one might assume to see greater adaptation, actually show the highest level of harm from growing in more radioactive soils. The authors do note, however, that "there is no evidence of radio-tolerance or radioresistance in humans."

Paper reviewed here:

Anders P. Møller, Timothy A. Mousseau.

**The effects of natural variation in background radioactivity on humans, animals and other organisms.** *Biological Reviews*, 2012 <http://cricket.biol.sc.edu/chernobyl/papers/Moller-Mousseau-BRV-2012.pdf>

Other reporting on this study:

Science Daily reports

University of South Carolina. "Even low-level radioactivity is damaging, scientists conclude." *ScienceDaily*, 13 Nov. 2012. Web. 2 Dec. 2012.

<http://www.sciencedaily.com/releases/2012/11/121113134224.htm>

Archive of the studies underlying this paper:  
<http://cricket.biol.sc.edu/papers/natural/>

Archive of Møller and Mousseau (et al) papers on Chernobyl:  
[http://cricket.biol.sc.edu/chernobyl/Chernobyl\\_Research\\_Initiative/Publications.html](http://cricket.biol.sc.edu/chernobyl/Chernobyl_Research_Initiative/Publications.html)

Initial study of Fukushima by Møller and Mousseau  
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## U.S. EPA and NRC Reducing Radiation Protection Standards Parallels seen to Japanese Industry collusion with “Regulators” to Weaken Standards

**As Nuclear Monitor readers know, the International Commission on Radiological Protection (ICRP) is a self-appointed, self-perpetuating, nuclear power-promoting organization that set itself up to give the world the impression they are independent experts.**

**(755.4278)** In 2007, the ICRP published *103 Recommendations of the International Commission on Radiological Protection* with input from the nuclear establishment around the world. Since then, nuclear governments around the world have been adopting the parts that their own nuclear industry likes best. U.S. agencies are in the midst of this activity. Although it is much of the basis for the world's radiation standards, the report is not free to read. Only an excerpt is available for free on the web. (1)

It was recently revealed by Associated Press that Japanese nuclear utilities fund the Japanese representative to the ICRP. (2) This is routine procedure but not publicly known. Members of the ICRP are without exception strong nuclear advocates.

In 2004, NIRS recommended two public interest members (Dr Judith Johnsrud and Dennis Nelson, both from the U.S.) be added to the ICRP, specifically the committee making recommendations on allowable environmental releases and exposure to non-human species. We were told we have to raise our own money to send them to the meetings but even after we committed to that the ICRP refused

to acknowledge or consider nuclear critics.

In the U.S., the Nuclear Regulatory Commission (NRC) and Environmental Protection Agency (EPA) are undertaking major radiation regulation changes, both weakening radiation protection for the public and environment. The Department of Energy (DOE) already adopted changes to its internal orders, adopting some of the provisions that the public and metal industry strongly opposed in the late 1990s.

The same EPA offices that are pushing to weaken U.S. radiation standards, the Office of Radiation and Indoor Air and the Office of Emergency Management, are advising the Japanese on cleanup and allowable contamination levels. They seem to be using a new Protective Action Guide even though that Guide has not been adopted in the U.S. and ignoring the EPA's traditional risk range and advising higher exposures. These offices were part of the team with DOE, NRC and others that advised the Department of Homeland Security to adopt Dirty Bomb cleanup guidance (3) in 2008 that that would allow people to move back into areas that dosed them with up to 10

rads/year. National Academy of Sciences BEIR VII risk numbers show that allowing habitation in a radiation field of that level would cause cancer in 1 in 3 people living there for years.

The EPA may also be pushing to increase the allowable maximum contamination levels in drinking water above those currently allowed, radionuclide by radionuclide. In a previously proposed version of the Protective Action Guidance, which was pulled back in 2009, the allowable concentrations of radionuclides were increased hundreds to hundreds of thousands of times.

### NRC

The NRC staff is recommending to the five Commissioners that they selectively adopt the parts of the ICRP recommendations that the nuclear industry wants, rather than the whole thing.(4) There is no acknowledgement of the public interest and public health comments evident in their ongoing document preparation. The U.S. still allows workers to get 2 ½ times more exposure than ICRP recommends (5 rems/year vs 2 rems/year). ICRP recommends “clearance,” exemption and exclusion of some radioactive waste and materials so their doses are

not even considered and they can be released from controls. NRC wants to adopt this but the public opposition is still strong so they are finding other, more secretive ways of letting the waste out of controls. Watch for more on NRC rulemaking, ignoring the most vulnerable in future *Nuclear Monitors*.

## EPA

In 1970, when the EPA was created by Congress, one its responsibilities was protecting the public and the environment from ionizing radiation. Congress had not expressly ruled that it is legal to kill people from exposure to chemicals, radiation or other pollutants, but the EPA adopted an “acceptable risk range,” committing to keep contamination low enough to cause only 1 cancer in a million people exposed over their lifetime. If that is not possible, EPA can permit higher risks—1 in 100,000 or, at the worst, 1 in 10,000 people exposed to get cancer. This has been supported by the courts and has been the basis for Superfund cleanup levels, site decommissioning and the drinking water standards. Like all the other agencies, EPA uses risk numbers based on the “standard man” rather than protecting the most vulnerable—women, children, the fetus, those with reduced immunity or high accumulations of radiation in their bodies already and the elderly. So everyone other than the standard man or the averaged adult (average of men and women’s risk) is actually at even higher risk than 1 in 10,000. Regardless, EPA’s radiation standards for water are generally much more protective than other radiation standards in the U.S. Thus they are a target for the nuclear industry which needs ever higher allowable release levels to continue operating and to manage its waste.

During the years that George W. Bush was president, the EPA devised a plan to “update” —read gut—EPA’s Protective Action Guidance (PAG) for protection of the U.S. population from radiation. On his very last day in office the proposal was sent to the Federal Register to be published. To their credit, at that time, the-new EPA Director Lisa Jackson, under newly elected President Obama, pulled the PAGs back. Because the proposed contamination levels and subsequent risks were so high, a coalition of national organizations met with all of the EPA Deputy Administrators to ask that the Bush-era PAGs be completely withdrawn. But they appear to have lived on. Now, at the tail end of 2012, a version of these PAGs is at the Office of Management and Budget, which is the

last step before a public comment period and adoption by EPA. This is expected to be one of several radioactive 2012 holiday gifts to the U.S. public from the agencies charged with protecting us from radiation.

The following analysis comes from the presentation made to the EPA Administrators (5)

Although the specifics of the proposed Protective Action Guidance is not public as of this writing, indications are that it is very similar, possibly worse in some ways, than the one pulled back in 2009.

Keep in mind that 1 cancer in 10,000 ( $1 \times 10^{-4}$ ) is the EPA’s traditional highest allowable risk. A cumulative (not annual) dose of 100 millirems or 1 milliSievert gives a risk *higher* than 1 in 10,000. According to EPA’s own Blue Book, *EPA 402-R-11-001*, Radiogenic Cancer Risk Models & Projections for the U.S. Population, (6) 87 millirems or .87 milliSievert will cause ~1 in 10,000 over their lifetime to get cancer. [Calculation is  $0.087 \text{ rem} \times (1.16 \times 10^{-3} \text{ (the NAS BEIRVII risk)})$  cancers per rem =  $1 \times 10^{-4}$ ]. Again this is for standard men or averaged adults, not women, who get 50% more cancer than men from the same amount of radiation, nor for kids-- especially baby girls--who are at greatest risk. According to EPA’s own Blue Book data, exposures before age 30 produce ~1.8 times more cancers than to older people. To be within the risk range, no one should get more than a few millirems (or a few tens of microSieverts) per year exposure.

100 millirem/year for 30 years would, according to EPA’s own risk figures, result in cancer incidence about two orders of magnitude higher than the highest end of EPA’s risk range. NRC’s general limits are, in fact, 100 mrem/year. DOE’s are 100 to 500 mrem/year.

Radiation exposure to a female infant, according to EPA, will result in 4-5 times the cancer risk than the age- and gender-averaged risk used in the regulations. This doesn’t take into account that the same amount of radioactivity ingested or inhaled can result in a much higher dose in an infant because of the small body size.

So, exposure to 2000 mrem or 20mSv per year--the controversial Japanese emergency standard for kids during school hours, and the existing US level for the intermediate period after a dirty bomb or other radiation incident--would

result, according to EPA’s official risk figures, in a radiation-induced cancer risk of 2.3 in 1000 which is *about one in five hundred, an order of magnitude higher than EPA’s 1 in 10,000*.

The 2007 EPA draft Protective Action Guide would have allowed inadequate cleanup of a radiation event by permitting options from a range of benchmark cleanup levels:

0.1 rem (100 mr or 1 mSv),  
1 rem (1000mr or 10 mSv) 1 or  
10 rems/year (10,000 mr or 100 mSv).

It is believed that these benchmark levels are not expressly listed in the current EPA PAG proposal but that they are implied as options to be considered if and when needed.

Over 30 years of exposure at these rates, the risks are respectively, 7 in 1000, 7 in 100 and 7 in 10 people getting cancer over their lifetimes. Obviously these are much greater risks than EPA’s 1 in a million to 1 in 10,000 range.

The ICRP-recommended process of “Optimization” would still be used, but might not be stated as such. “Optimization” is a calculation done by the licensee or waste generator to keep exposures as low as reasonably achievable, taking economic and social factors into account. Differing, greater health impacts to various members of the population do not have to be considered when “optimizing” allowable exposures. NIRS has commented to ICRP against this manipulation from its inception. DOE has embraced it in its recent internal radiation orders.

Details of the Multi-group presentation to EPA re upcoming Protective Action Guides and inadequate response to Fukushima is at <http://www.nirs.org/radiation/radstds/10312011epapres.pdf>.

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- (4) <http://www.nrc.gov/about-nrc/regulatory/rulemaking/potential-rulemaking/opt-revise.html>
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- (6) <http://www.epa.gov/radiation/docs/bluebook/bbfinalversion.pdf>

# Fukushima Radioactive Fallout Confirmed in U.S. Food Chain

**The U.S. rainy season of 2011 extended to June, making it unusually long and troubling for many experts and citizens due to Fukushima Daiichi's triple nuclear meltdowns which began in March. These catastrophic events widely dispersed airborne dust contaminated with radioactive particles over much of the country. When inhaled or ingested these particles can have negative effects on human health that are different from those caused by external or uniform radiation fields, such as from cosmic radiation from air flights (although the Food and Drug Administration continues to pretend otherwise). Hawaii and the West Coast were the first states to receive radioactive fallout from Japan.**

**(755.4279)** While media and elected officials have remained mostly silent on the issue, concerned experts and citizens have continued to probe. Radiation from Fukushima has been found in U.S. topsoil, rainwater, groundwater, milk, fish, and several varieties of produce as reported by the University of California Berkeley School of Nuclear Engineers (UCBSNE) radiation testing team.

Cesium-137, Iodine-131, Strontium-90, Xenon have been detected at several sampling stations throughout the Bay Area beginning late March of 2011. In addition, California Bluefin tuna, almonds, pistachios and oranges have been found to contain measurable amounts of radiation from Fukushima. Cal State Long Beach researchers studied kelp beds spanning the state's coastline and sampled elevated levels of Iodine-131 at several sites tested (they are currently looking to expand funding to test for longer-lived Cesium-137). Though the levels of radioactive particles detected by the UCBSNE team in California food and water may appear to be low, chronic exposure to low levels of radiation can be as damaging, or more so, per unit dose, than a single exposure to a high level of radiation.

It has been reported that from March 21 to mid-July of 2011 that 27.1 peta becquerels of cesium 137 was dumped by Tokyo Electric and Power Company (TEPCO) from Fukushima Daiichi into the Pacific ocean. One peta becquerel is a million billion becquerels, or 10 to the power of 15. This is twenty times the amount originally estimated by TEPCO. Yet the FDA has not placed a ban on any north Pacific seafood, and continues to allow an open trade policy on Japanese food imports.

Exposure to these radionuclides is known to cause cancers, heart disease, and other serious illness. Transgenerational DNA damage is a long-term consequence of exposure to radiation from nuclear power production and accidents, with women and children being particularly at risk. When radioactive substances are absorbed in the body they tend to accumulate in specific organs by a process known as selective reuptake. Female children are up to seven times more likely to develop cancer from radioactive cesium than men due to radioactive Cesium-134 and 137 reuptake by the ovaries. Strontium-90 is mistaken for calcium and absorbed by bones and iodine 131 and 129 are attracted to the thyroid, to name but a few.

A second wave of humanitarian and environmental crisis is currently underway in Japan. The government there has undertaken a massive incineration plan involving tens of millions of tons of earthquake and tsunami wreckage. Their plan involves mulching debris, some of which is contaminated with radiation and much with industrial toxins, and burning it in municipal incinerators already established around the country. It is not known if special equipment and scrubbers are being used in the process. The burn is being carried by the jet stream across the northern hemisphere to the U.S. for the rainy season of 2012, posing a continued threat to the food supply. The California Central Valley grows more than 450 varieties of produce, dairy, wine and an estimated 80% of U.S. lettuce, spinach, and produce. Radionuclides are absorbed by topsoil as are potassium and magnesium and the food chain does not differentiate the healthy from the hazardous. The cycle continues for hundreds of years in some cases, which

is what has happened in Europe due to Chernobyl (sheep grazing land in parts of the United Kingdom are still off limits 26 years after that catastrophe began).

Concerned citizens are working in Southern California to ensure that another Fukushima does not happen. The San Onofre Nuclear Generating Station (SONGS) is currently closed as safe energy activists continue to monitor safety concerns. SONGS has one of the worst operating records in the U.S. and sits on a beach atop an active earthquake fault, within miles of the California Central Valley. California's other nuclear reactor nearby is Diablo Canyon. It returned to full operation on June 26, 2012 after a three-month emergency shutdown caused by a large jellyfish blocking an outfall pipe.

A petition asking for food monitoring of U.S. food and imports from Japan has been circulating since April 1, 2011. A second, more detailed petition is about to be launched which will address the amount of radioactive Cesium currently allowed in the U.S. food, milk and water supply: 1,200 becquerels per kilogram in the U.S., vs. Japan's limit set at 100. Under the existing regulation food and beverage unfit for human consumption in Japan can now be legally exported and consumed in the U.S.

The food monitoring and anti-incineration petitions, interviews and articles can be found at [www.silencedeafening.com](http://www.silencedeafening.com).

**Sources:** UC Berkeley School of Nuclear Engineering website, The French Nuclear Safety Institute, Institute for Radiological Protection and Nuclear Safety (IRSN), NIRS Mary Olson, *Diet for the Atomic Age*.

~ By Kimberly Roberson, [www.silencedeafening.com](http://www.silencedeafening.com); [ffan@sonic.net](mailto:ffan@sonic.net)

# Startling News for Reactor Communities: Radiation Spikes During Refueling

International Physicians for the Prevention of Nuclear War (IPPNW) reported in August 2012 on some sleuth work by its affiliate in Germany that turned up documentation of a short-term spike 200--500 higher amounts of radioactive gases being released from the Gundremmingen reactor site in Southern Germany. The investigators established that this rise was associated with the opening of the reactor vessel, as is routinely done for reactor refueling and inspections. Further, the group reported that the elevation of radioactive pollution persisted for the next week, well above usual levels during ongoing operations.

(755.4280) The numbers for concentrations of noble gases reported by IPPNW are: 3 Bq/m<sup>3</sup> for usual operations; the spikes were 700 Bq/m<sup>3</sup> increasing to a peak of 1470 Bq/m<sup>3</sup> in the initial hours after the vessel was opened, then tapering down to an average of 100 Bq/m<sup>3</sup> for the next week.

Every reactor generates radioactive gases during normal operation, including noble gases, tritium, carbon-14, iodine and small amounts of volatile cesium and strontium. Reactor vessels are not designed to capture the gases that are present in the core prior to opening for activities like refueling or maintenance and inspections. When the core is opened, these gases escape.

The IPPNW's Reinhold Theil points out that these airborne emissions are of particular risk for women and pregnant women in the vicinity since women are at elevated risk for cancer, and the embryo and fetus suffer the greatest impacts from radiation exposure during gestation; the female fetus is at the highest risk. Tritium has the potential to cross the placental barrier to enter the fetus directly. Gamma emissions from noble gases are also a threat since these inert elements, if inhaled, are likely to be stored in fat deposits of the mother, typically near to the abdomen.

This situation has remained secret, or at the least invisible for the last six decades of reactor operation worldwide

because the regulators allow self-reporting of emissions rather than publicly available real-time monitoring, and because regulations allow averaging over the reporting period. Since the NRC requires only annual reports, that allows the US reactor operators to hide these 500 times higher spikes above "usual" by leveling it in the typically lower levels of release.

**Source:**  
<http://www.ippnw-europe.org/print/en/nuclear-energy-and-security.html?expand=707&cHash=8752881e4a>

## Cancer: A Case of Being Out of Tune? Dr. Rosalie Bertell Applies String Theory to Our Bodies

Dr. Rosalie Bertell continued to cut the edge of understanding of our world to the very end of her life. Awarded a Doctorate at a very young age for a single mathematical equation, this exceptional woman specialized in being able to see and describe patterns where others see chaos. Her equation described (mathematically) the spiral motion of a torpedo moving in water; Bertell loved to share that the insight forming the basis of the equation came to her as she woke from a nap.

(755.4281) With a similar penetration of the apparent chaos of cancer, Bertell, in her final peer reviewed paper "A New Understanding of Breast Cancer and Alternatives to Mammography," describes a wholly new understanding of how exposure to radiation harms living tissue. Bertell focuses particularly on radioactive elements that get inside the body (via air, food and water and some medical procedures) that once inside emit particles (alpha and beta) directly to tissue. These particles cause

physical damage: alpha particles can break whole chromosomes and tear cell membranes. Beta particles can break DNA strands and physically damage other molecular structures. This physical damage is different than chemical "ionization" which, Bertell states, is the only mechanism currently "accounted for" in radiation harm.

Ionization is a chemical event where the energy and charge of the particles (alpha, beta, neutron) and waves (X and

gamma) are sufficient to knock an electron off of a stable atom or molecule, leaving it a charged, or ionic state.

Bertell goes on to describe a different (additional) physical basis for radiation's harmful impacts starting at the sub-sub-atomic level. She tracks back into the nucleus of the radioactive atom before the emission of the radioactive particle happens. She delves deeper than the protons and neutrons of that nucleus; she looks at the quarks that make up

those protons and neutrons. Ever the pioneer, and indeed Rosalie was one of the global String Theory pioneers, she applies that famed Theory to talk about the sub-quark level. In her view, the vibrational frequency of the string inside the quark inside the soon-to-be alpha or beta particle coming out of an unstable atomic nucleus is not the same as the matter of healthy, normal living tissue.

This difference in vibration she terms "electric field energy." Her theory is supported by experimental clinical work of a colleague, Robert Wood-Smith, and provides the basis for dramatic new recommendations for the treatment of breast cancer, and perhaps other types, with light (a specific wavelength of blue laser). Bertell characterizes cancer as cells that have a slower moving electric particle 'field energy.' Bertell's plea is that double blind research begin immediately to test these theories directly and rapidly since Wood-Smith has been saving lives.

To some, these ideas are confusing, and perhaps words like electric field

energy sound like "mumbo jumbo," however the disciplines of embryology, biophysics, genetics and epigenetics have long since established that the electric properties of living tissue generate an energy field, and that this field is not a "symptom" or a simple byproduct of life--it is a primary means by which information is transmitted across communities of cells and integral to the function of our bodies. Dr. Bertell is linking her work in physics to her extensive knowledge of the health consequences of radiation and pointing the way to a new frontier of understanding.

Given that radiation does cause physical harm as well as chemical, it is Bertell's view that the current estimate of the impact of radiation in terms of cancer induction seriously underestimates the amount of cancer due to radiation and internal radioactivity because it factors ionization only. Ionization is harmful, but in Bertell's view the amount of harm is relatively small. Looking only at this mechanism has lead to an enormous under-reporting of the amount of cancer that exposure to

radioactivity is causing. In Bertell's view, factoring mechanisms of physical damage as well would account for much of the cancer epidemic raging in much of the world exposed to the fallout of nuclear weapons tests as well as major reactor accidents and ongoing emissions from all nuclear factories and power generators.

According to Bertell, "Radiation Protection Standards, set on the assumption that the only radiation related cancers were those due to ionization will need to be updated to account for the inordinate effect of internal contamination with unstable atoms which emit particles with slower electric particle 'field energy' than that of normal living cells. This subatomic vibrational effect of radioactive alpha, beta and gamma particles was not foreseen by those who set the radiation standards in 1950!"

**Source:** Bertell, Rosalie, 2011. "A New Understanding of Breast Cancer and Alternatives to Mamography," Canadian Women's Studies, Vol 28: 2, 3

## IN JAPAN, A MOTHERS' MOVEMENT AGAINST NUCLEAR POWER

**The Fukushima disaster has brought a powerful new demographic to Japan's anti-nuclear movement: mothers.**

**On the one-year anniversary of the Fukushima nuclear disaster, Japanese women in New York City gathered for a rally they called Pregnant With Fear of Radiation.**

(755.4282) Protestors wore fake pregnant bellies, or carried posters with images of pregnant women wearing face masks.

Well aware that fetuses, children under five, and woman are at the greatest risk from radiation exposure, mothers have emerged as a powerful voice in Japan's growing anti-nuclear movement.

To call attention to their message, the mothers have organized marches, petitioned government officials, fasted, and held months-long sit-ins in public locations. They regularly wear symbols of maternity and motherhood in deliberately confrontational ways.

The mothers call for action on multiple fronts. Most immediately, they demand the evacuation of all the families of Fukushima, where radiation emissions

continue. They ask for tougher safety standards for food and drink in Japan, and an end to the practice of spreading and burning radioactive rubble from the contaminated zone throughout the country's various prefectures. And, to prevent future disasters, they call for the permanent closure of all nuclear power plants in Japan and throughout the world.

**"I couldn't wait anymore for someone else to take action."**

The rise of maternal anti-nuclear activism in Japan began shortly after the March 11, 2011 disaster, when the hundreds of thousands of residents of Fukushima living outside the 20-kilometer evacuation zone were told it was safe to stay. Soon after the plant failed, the Japanese government raised the maximum limit of radiation considered safe, from 1mSv (millisievert) prior to

March 11 to 20mSv. This new measure exposed (and exposes) the people of Fukushima to doses 20 times higher than is normally considered safe.

The families of Fukushima whom the government did not evacuate face a hard choice: leave of their own accord and abandon their homes and jobs (while continuing to be responsible to pay taxes, rents, and/or mortgages), or remain in Fukushima and expose their families to dangerous levels of radiation?

According to mother and activist Kaori Izumi, gender plays into responses to this precarious situation. Often, mothers and women want to leave Fukushima and protect their kids, while men tend to accept the line, from the government and the utility, Tepco, that "all is safe." This can lead to conflict in a culture



where women are taught not to challenge their husbands or government, figures of authority.

Many worried mothers leave Fukushima with their children while fathers remain behind. “Often husbands don’t want to support two households and they tell the wives to come back to Fukushima, or they’ll stop sending them money,” says Izumi. “As a result, we’re seeing an increase in divorce rates.”

Izumi recounts her own story as a mother-activist. “I was not an activist before Fukushima. I’m a social scientist by training. I kept waiting for someone else to do something, to act, to challenge the government and Tepco for these crimes. Then I couldn’t wait anymore for someone else to take action. I had to do something.”

So, Izumi hit the streets, and during protest rallies, met other mothers working for justice. She brought several lawsuits against the nuclear industry at her own expense. She also organized a vacation program to house Fukushima families during school breaks, so children can gain some relief from radiation exposure—even if only for short periods. Now, she heads up a group working to permanently shut down the Tomari nuclear plant.

### **Radiation, rubble, and relocation**

Tomoi Zeimer, a Japanese mother living in New York City, and her two sisters in Osaka (both of them also mothers), began anti-nuclear activism after Prime Minister Noda’s requirement that prefectures throughout Japan accept and incinerate radioactive rubble so that all of Japan would “share the pain” of Fukushima. In response to Noda’s decision, Zeimer began a petition campaign to stop the spreading of radioactive rubble. Mothers delivered this petition on November 2, 2011 to Japanese consulates across the globe.

As the spreading of rubble continues, more and more women throughout the world have joined the fight. There is a map showing the current status of the rubble spreading and burning (1)

Many activist mothers worry about their children’s health and feel they must leave the country. Ikuko Nitta left Fukushima the day after the disaster at her 12-year-old son’s insistence; they moved to Wakayama, believing it to be safe. When Wakayama agreed to accept rubble and incinerate it, Nitta began to make plans to move to Canada. When she recently tested her children’s radiation levels, her son tested positive for Cesium 137. Where the contamination came from, Nitta does not know, as they left Fukushima so quickly and she monitors the children’s food very carefully.

Cathy Iwane, a Wakayama mother who led the recent fight to stop the spreading of rubble to Wakayama, plans to immigrate to the United States. While she despairs about the Wakayama decision and worries about the children of Japan, she says the bonds she’s formed with women across the world, who support Japanese anti-nuclear activism, fill her with hope.

“I won’t give up,” Iwane says. “Not ever.”

### **An opportunity**

The movement isn’t confined to Japan’s borders. In September, 2011, a group of Japanese mothers, including Sachiko Sato, an organic farmer who traveled with her youngest two children) Kaori Izumi, and Aileen Mioko Smith came to New York City to protest Prime Minister Noda’s participation in the UN summit on nuclear safety. “How can you talk about safety?” Sachiko shouted to Noda outside the UN. “You don’t even take care of the children of Fukushima.”

Sachiko, Izumi, and Smith spoke at various anti-nuclear events throughout the New York City area during their visit, urging American citizens to learn a lesson from the disaster in Japan. At one event, Smith stated, “Many Americans live far too close to nuclear power plants that sit on earthquake fault lines (2), Indian Point in Buchanan, New York, only thirty or so miles from New York City, as well as those on the coast in California. Americans must learn from

the Fukushima disaster. You must shut down your own plants, 23 of which are the same design as the Fukushima reactors, GE Mark I. Yes, it can happen here.”

In October 2011, hundreds of mothers in Japan began a protest in Tokyo at the Ministry of Economy, Trade, and Industry. The protest lasted 10 months and 10 days (the length of time a pregnancy lasts under Japan’s traditional lunar calendar).

Smith, who is executive director of Green Action, an anti-nuclear NGO based in Kyoto, says the Fukushima accident offers a chance to put an end to nuclear power. Most of Japan’s nuclear reactors were taken offline after the disaster; as of this writing, only one nuclear power plant remains online.

Smith says, “For the first time in 30 years, we have a real opportunity” to shut down nuclear reactors in Japan for good.

Heidi Hutner wrote this article for YES! Magazine (3), a national, nonprofit media organization that fuses powerful ideas with practical actions. Heidi is a professor of sustainability, English, and women’s studies at Stony Brook University, where she writes, speaks, and teaches about the environment and gender. Her forthcoming book is entitled, *Polluting Mama: An Ecofeminist Cultural Memoir* (Demeter, 2012).

Reprinted, by author’s permission from: <http://www.yesmagazine.org/peace-justice/in-japan-a-mothers-movement-against-nuclear-power>

### **Sources:**

- (1) <http://one-world.happy-net.jp/ukeire/>
- (2) <http://www.treehugger.com/corporate-responsibility/nuclear-reactors-in-earthquake-zones-in-the-us-map.html>
- (3) <http://www.yesmagazine.org/>

# Profiles in Monitoring: a quick round-up in global leadership in gathering radiation data

## **(755.4283) M. Kaltofen -- Natick, MA, USA**

Mr. Kaltofen, a professional engineer, is president of Boston Chemical Data Corporation and participates as a technical expert for environmentally regulated activities and in legal actions, having arrived at this work as a natural progression from Project Coordinator for Greenpeace UK and founder and principal at Citizen's Environmental Laboratory that performed services for people, local governments and others impacted by contaminated sites.

Marco's work since Fukushima has displayed a rough-and-ready creativity that has made detection of radiation much easier and less costly and therefore more accessible. The air filter from an automobile offers a very good analog to respiration by lungs--and can be cut open and laid on photographic film for an immediate assessment of levels of "hot particles."

**Source:** <http://www.naticklabs.org/kaltofenJP.pdf>

## **S. Gavutis, C-10 Research and Education Foundation, Newburyport, MA, USA**

In the 1970's a large network of activists known as the Clamshell Alliance

opposed the construction of nuclear power reactors, with a primary focus of nonviolent direct action on the Seabrook site in New Hampshire. In 1986, as the construction of Seabrook moved forward, a group known as Citizens Within The 10-Mile Radius formed--and more than 5000 members challenged the evacuation plans for the site. In 1991 Sandy, supported by this strong community, founded C-10 as an ongoing nexus for a citizen monitoring network in Massachusetts and New Hampshire which continues to this day. <http://c-10.org/index.html>

## **D. Sythe -- International MedCom, Sebastapol, CA and one of the Safe-Cast team**

A globe trotter with a long history of creative innovation and service to the needs of humankind, Dan is the principle founder of the California-based International Medcom which provides the basic, relatively affordable "RadAlert" and also more sophisticated digital radiation monitors. When Fukushima melted down, Dan was, of course, mobilized to assist people in Japan with the daunting task of acquiring reliable information about radiation levels. There is a very interesting (long) "origin story" for Safecast, but suffice it to say, Dan's hardware genius was taken

hand by the digital kings and queens of the planet, and Safecast was born as a way to track radiation levels using sensors on the outside of a car or bike. This campaign has normalized the collection of data on ambient radioactivity to where, at long last, we have a large body of data available that is "apples being compared to apples" not that old "orange" problem. See: <http://blog.safecast.org/>.

## **C. Courbon and B. Chareyron -- CRIIRAD, Valence, France**

CRIIRAD, the "Commission for Independent Research and Information about Radiation" led by Christian and Bruno, have organized visits and measurements in areas located in the vicinity of uranium mines in Namibia; Chernobyl and its fallout across Europe; and now Fukushima. This team was one of the first publishing independent evaluations of radiation levels in Fukushima see: [http://www.criirad.org/actualites/dossier2011/japon\\_bis/en\\_anglais/11-07-07\\_cpcriirad\\_eng.pdf](http://www.criirad.org/actualites/dossier2011/japon_bis/en_anglais/11-07-07_cpcriirad_eng.pdf) They have an enormous catalog on YouTube, primarily in French, but this item (in English) on detecting radiation in food is a classic: <http://www.youtube.com/watch?v=MvBoQfN18zs>

## U.S, DOE, Studsvik, NewGreen Push Processing/Release of Radioactive Metal

**The nuclear establishment clearly has no real appreciation of the dangers of ionizing radiation, yet it is once again planning to disperse radioactive metal into commercial metal recycling to make items with which we and our children come into close, daily contact--be it Christmas toys, zippers on our pants, belt buckles, silverware, pots and pans, jewelry, cars---or maybe doggie bowls, tissue holders and bicycle baskets.**

**(755.4284)** The last three items were recently found to be so radioactive they had to be tracked down and recalled. This has happened in past years as well—a cheese grater (after years of use in a home kitchen), fences, La-Z-Boy recliner chairs and table legs were found to be radioactive. One Christmas in the UK a kids' Santa-land was found to be radioactive. Whether from deliberate release of nuclear metal into recycling or accidental melting of radioactive

material into the mix, the goal needs to be prevention. But government agencies around the world are moving in the other direction.

The US Department of Energy (DOE)'s mission is to promote nuclear technology. With over a dozen weapons complex sites to manage, DOE and its sister agency National Nuclear Security Administration (NNSA) handle enormous amounts radioactive materials and

wastes constantly. Their clean-up plans appear much cheaper if they can sell radioactive metal into recycling instead of pay for trying to isolate it from the environment for the decades to millennia it will remain radioactive.

In 2000, public attention was focused on several nuclear industry and regulatory to make it legal to let nuclear waste out of control and into everyday commercial recycling. Public opposition was

loud and clear in the U.S. and resulted in a victory for the public, but to DOE and NNSA it was apparently just a long set-back on the unrelenting desire to not take proper care of nuclear waste. Then-Secretary of Energy Bill Richardson blocked the release of thousands of tons of volumetrically radioactive contaminated metal into everyday recycling. It was a further success for the public and metal industry when he suspended the release of all scrap metal from radioactive areas of the US nuclear weapons complex from going into commercial recycling.

The DOE moratorium and suspension on release of radioactive metal into recycling for the past 13 years has prevented exposure to transport workers, metal workers, the public and the environment that cannot be quantified. But NNSA and DOE, tired of managing the waste and not wanting to pay the costs of disposal, are now moving to do away with the bans and resume dispersing radioactive metal into our lives.

The agencies expect to release an Environmental Assessment (EA 1919) for public comment before the end of 2012. It is expected to try to provide the authority to the DOE to approve the release of radioactive scrap metal into commercial recycling using either site specific or preapproved "authorized" limits, as if DOE and NNSA have the moral authority to contaminate the metal supply for the sake of costs. When the Secretary Richardson suspended recycling of scrap metal, he cited poor record keeping, unverifiable detection procedures, incomplete historical knowledge and inadequate or nonexistent documentation. Research carried out by NIRS in 2003 to 2007 confirmed these problems. Some are inherent and cannot be solved.

The fact that radiation is more harmful to women cannot be remedied by any amount of record keeping. The fact that kids are even more at risk makes this the radiation fight of our lives.

The Metal Industries Recycling Coalition, comprised of most metal industries' trade associations (except aluminum), has opposed the release of radioactive metal into the recycling stream due to public concerns, worker concerns and enormous costs to decontaminate their facilities. They have worked hard to recycle as much as possible and persuade the public of the positive value of recycling, so don't want to mix in any

radioactive waste. Will DOE be able to convince them and the public that the metal from contamination areas is actually clean? Are we back to the conflict of interest inherent in the owners/managers of the waste being trusted to detect and isolate or release some detectable level of radioactivity? Will they choose some allowable contamination level or set the detectors so nothing detectable can get out. Neither is full prevention when there is no safe level of exposure.

The nuclear interests in the European Union demanded that all member states adopt, by 2004, "clearance" levels from the 1996 European Commission Directive 96/29/Euratom. The industry selected 10 microSieverts (or 1 millirem)/year as a clearance level but allowed an unlimited number of waste streams or truckloads--each of which could be released, making these unenforceable and unverifiable exposures.

In the U.S., efforts by the DOE, NRC and EPA were repeatedly stopped so, at the advice of the National Academy of Sciences, these efforts were moved to decentralized deregulation of wastes. Thus Tennessee became a major center taking nuclear waste for "processing." Without public knowledge, increasing amounts of nuclear waste have been going to regular trash landfills, some already leaking. Numerous radioactive incinerators operate in the state. Another has started in Washington near Hanford and there is one for medical research waste in Florida. In 2012, another processor opened shop on Lake Erie in Ohio, NewGreen. The owner is inviting the Bruce Steam generators to Ohio for processing. It is not clear whether New Green can send metal to commercial recycling, but it is also unclear how to prove they and the Tennessee processors are not doing so.

Following a series of setbacks due to public opposition, and under the guise of "harmonization," U.S. agencies joined forces with the International Atomic Energy Agency and other international industry groups to use their industry recommendations as justification for weakening U.S. standards. The NRC sought the authority of the National Academy of Sciences, hiring them to study how to let the waste out of regulatory control.

In 1988 without public knowledge, DOE adopted Internal Order 5400.5 and referred to Order 5820.2A which directed

that some radioactivity could be considered "Below Regulatory Concern" (BRC), consistent with the BRC policy of the NRC. But Congress revoked NRC's BRC policies in 1992 because of public, state and other industry opposition. DOE continued to use Chapters 2 and 4 of 5400.5 to release radioactively contaminated materials and property other than metal from DOE controls at higher levels than NRC had attempted (some at up to 100 millirems/year, or 1 milliSievert/year) if there were no other sources of exposure and in some cases for limited number of years, 500 millirems/year or 5 mSv/year. In 2011 DOE replaced 5400.5 with DOE Order 458.1 clarifying allowable releases. The new DOE Order is allegedly the justification for overturning the DOE bans.

A Sample Resolution is available against radioactive transport and melting into commercial metal. It started as an effort to stop steam generators from the Bruce Nuclear Power reactors in Canada being shipped through the Great Lakes, St Lawrence Seaway, Atlantic Ocean, and treacherous passages to the Baltic Sea for alleged cleaning and melting into metal for the everyday metal supply. Hundreds of organizations, individuals and many local governments came out against releasing nuclear waste into regular trash and recycling. It is time to reactivate and expand the knowledge about this unacceptable threat.

**Source:** Out of Control — On Purpose <http://www.nirs.org/radwaste/outofcontrol/outofcontrolreport.pdf> pp, 23-27.)

# Perils and promises of studying health impacts of low-level radiation

**Members of the public and scientists have been concerned about environmental contamination from nuclear weapons and nuclear power generation for a long time. The National Academy of Sciences is currently working on a request from the Nuclear Regulatory Commission to design an epidemiologic study of cancer around nuclear facilities in the USA.**

**(755.4285)** People living near nuclear facilities may see an epidemiologic study as a way to shed light on their health concerns. An epidemiologic study could do that. However, if epidemiologic studies are not well-designed, they can be used to dismiss the public's concerns and avoid implementation of public health protections.

There are many perils of epidemiologic studies, especially ones focused on low-level exposures. It's easier to detect the effect of larger exposures, for example of nuclear workers, than the effects of smaller exposures, for example of people living near nuclear facilities. Furthermore, radiation exposures of most nuclear workers are monitored, whereas exposures of residents are not. This presents a big challenge, because an epidemiologic study that cannot sort people correctly into exposed and unexposed groups cannot detect an effect of exposure.

Several epidemiologic studies in Europe have found excess childhood leukemia among children living near nuclear

power plants. These studies compared children living close to nuclear plants – within 5 km (3 miles) – to children living further away. No similar studies have been conducted in the USA, in part because we don't have a national medical program that counts cancer cases, and in part because most of our health data are only reported for large geographic areas like counties.

The National Academy of Sciences study could be designed to improve on the European studies. However, the Nuclear Regulatory Commission has asked for a study that includes adults, who are less sensitive to radiation exposure than children. Furthermore, adult cancers may appear decades after exposure, increasing the opportunity for people to move between exposed and unexposed areas. Studies of adults, of large areas like counties, and of cancer death instead of cancer diagnosis, would not advance scientific knowledge about health effects of living near nuclear facilities, but such a study could become grounds for dismissing concerns about radiation releases.

Another problem is that epidemiologic studies may be conducted under the assumption that radiation exposure is too low to affect cancer. Then, if an excess is found among people living near nuclear facilities, scientists must attribute it to some other unknown cause. This circular logic – evidence of the effect is dismissed because it is already believed there can be no effect – is unscientific but is dressed in the trappings of science to make it appear reasonable.

Members of the public concerned about radiation exposures from nuclear facilities should critically consider any proposed study to decide whether to give it their trust and support.  
– Steve Wing, University of North Carolina

For further reading: Wing S, Richardson DB, Hoffmann W. *Cancer risks near nuclear facilities: The importance of research design and explicit study hypotheses*. *Environmental Health Perspectives*, 119:417-21, 2011.

## NRC/NAS CANCER STUDY--PHASE 2

**In October 2012, the U.S. Nuclear Regulatory Commission directed the National Academy of Sciences to implement the first large-scale study of health impacts in U.S. communities near nuclear facilities since 1980.**

**(755.4286)** Communities near selected nuclear facilities licensed by the U.S. Nuclear Regulatory Commission (six reactors and one nuclear fuel factory) have been designated as part of a pilot study of cancer: San Onofre, in CA; Millstone and Haddam Neck in CT; Dresden in IL; Oyster Creek in NJ; Big Rock Point in MI and Nuclear Fuel Services in Erwin, TN. Big Rock Point and Haddam Neck are both permanently closed.

This study is billed as an "update" of a 1990 National Cancer Institute effort to

look at cancer deaths reported in the U.S. counties where nuclear reactors are located. This work was deeply flawed in its design and construction, was conducted twenty years earlier in the period of release of radioactivity from the reactors and did not include any local data, only published information that was very incomplete.

In a refreshing break from business-as-usual, several years ago Representative Ed Markey (D-Mass.) and numerous concerned citizens (many of whom have

suffered health consequences while living near reactors) managed to jettison NRC's original plan in which it would have conducted this study itself--the basic equivalent of a primary school child filling in their own report-card. It is NRC's regulations (enforced or not) and NRC's licensing of these facilities that create the question of whether atomic fission and routine and non-routine releases of radioactivity have increased cancer in these communities.

While many U.S. activists groaned when Rep. Markey suggested the National Academy of Sciences (NAS) to conduct the study, the NRC accepted the idea, since it would still allow a supervisory role for the Commission. Those who rejected the idea of the Academy cite its typical bias toward industry; they advocated for NRC to make a grant to an institution like the National Institute for Environmental Health where it would be administered with complete independence to fund proposals from qualified researchers competing in an open forum with peer review.

Nonetheless, many observers and citizen advocates who have been personally impacted are heartened by aspects of the recommendations that the NAS made in what is known as "Phase 1" of the cancer study. Of particular note is that two different studies will be performed in each pilot community and one of these will be "case-controlled" and focus specifically on pediatric cancer.

"This is a break-through moment for the NAS and NRC" said Mary Olson, Director of the Southeast Office of Nuclear Information and Resource Service, "Case-control is what distinguishes a detailed study from broad correlations or associations based on published data, like health department tallies, which provide no real basis to assert causality; case-control means that details about each individual are gathered, providing a finer grain or higher resolution in the data. If there are health impacts in these communities, and the study is done well, this type of study can deliver a statistically significant causation. The choice to focus the case-control work on children is also stunning since children are far more susceptible to radiation exposure than adults. The pitfall always comes when the numbers studied are too small."

### **Strange Bedfellows Sometimes Agree**

The potential for this work to deliver non-information remains great, and this view is shared by both the nuclear industry's advocacy arm, Nuclear Energy Institute, and one of the very few active epidemiologists to look at nuclear communities in the U.S., Dr. Steve Wing. In 2010 the NEI Blog stated: "Studies of...occupationally and environmentally exposed populations...are useful in addressing allegations of adverse health effects in the population and in demonstrating a concern for the health of the exposed people. However, unless they

are sufficiently powerful, they do not add to the scientific knowledge of low dose effects."

From his very different perspective, Steve Wing has contributed to this issue a side bar "Perils and Promises of Studying Health Impacts of Low-Level Radiation" (see page 12) which expresses much the same view.

People are prone to drawing comparisons between radiation and tobacco. If there had been a twenty year lapse in studies of the impact of tobacco AFTER it was already publicly known that tobacco is damaging to health, how would people have reported on that? We cannot with any sense of conscience oppose any study of this issue--but we certainly expect vigilance on the part of this community to ensure that if it is shown to be poorly conducted, or worse--yet, designed to fail, it becomes an inexcusable tarnish on all associated with it.

A step that NAS could and should take to ensure that a real peer review of its work is possible would be to publish both the details of the study protocols, and also the raw data used in their work. Today web publication makes this an easily viable option. Only this level of disclosure will allow a real assessment of the integrity and value of the study.

### **The view from the nuclear study sites:**

The *Nuclear Monitor* reached out to people in the impacted communities, and the overwhelming response was essentially "it is too soon to know what to think of this." There is a guarded optimism and hope summed up by Gene Stone of ROSE (Residents Organized for a Safe Environment) near San Onofre on the Pacific coast between Los Angeles and San Diego California: "We worked really hard to bring our health concerns forward and to get the attention that has led to this study--and are also very concerned that it be done right. We want to see independent oversight of the NAS team--so that every single procedure and decision down to the finest points is subject to peer review. We are really excited about this study, if it is done credibly."

This view was echoed by people near Dresden (IL), Nuclear Fuel Services (TN) and Big Rock Point (MI) and Oyster Creek (NJ).

Let us hope that the NAS has the honor and the decency to work for these communities, rather than the source of the money for the study: the U.S. Nuclear Regulatory Commission which licenses each and every one of these sites...and dozens more in the U.S.

"CAN believes that the study of communities leaving in the contamination pathway of nuclear reactors is vital. However we are concerned that any finding will be used to justify the continued operation of this generation of nukes. Studies have already occurred in Germany as well as in this country that have demonstrated an increase in cancer and other diseases. It could be more productive to study the similarities in the diseases found in communities living in proximity to nukes such as cancer, birth defects, miscarriage, Down syndrome and learning disabilities."

--Deb Katz, executive director  
Citizens Awareness Network.

### **Thumbnail Portraits of the Facilities**

**San Onofre**, Southern California Edison. Originally three PWR reactor units, Unit 1 opened in 1967 about 15 years ahead of the other two, and in 1992 was closed permanently. Units 2 and 3 are currently down due to dramatically quick failure of replacement steam generators due to a design flaw that led to vibrations that cause systematic thinning of the tube walls which leads to increased chance of rupture and catastrophic radiation release. San Onofre is located in a densely populated area -- 8.4 million people live inside a 50 mile radius of the site, and a 100 mile radius includes 18 million people. More info on the steam generator problems of San Onofre can be found at <http://fairewinds.com>

**Dresden**, Exelon Corp. Like San Onofre, Dresden was three reactor units, and Unit 1, one of the first in the U.S.A (1959) is now closed. All three units are BWRs (the two remaining are GE Mark I's) that came on-line in the early 1970's. Located in Morris IL, the Dresden site has a population of 67,000 within a 10 mile radius and is 60 miles from "The Loop" of downtown Chicago. Dresden, like many of the selected sites has a history of contaminated ground water, likely from failure of underground pipes on the reactor site.

**Big Rock Point**, a GE BWR reactor owned by Consumers Energy (formerly Consumers Power) is another old, small reactor (75 MWe) that came on-line in 1964 and closed in 1997. Big Rock was experimental, and it was also used to test experimental nuclear fuels, many of which ruptured during use resulting in astronomically high radiation releases to air, water and solid waste. There is circumstantial evidence that open incineration took place on the site, including of "low-level" radioactive waste, which in addition to spills, leaks, and floods have made this section of Lake Michigan shore line (the "fourth finger" is the peninsula on which the site is located, west of Traverse City in Charlevoix) a very contaminated place.

**Haddam Neck** (Connecticut Yankee) operated from 1976 to 1994 and was a single unit 582 MW PWR. It was operated by Yankee Atomic and closed for economic reasons stemming in part from safety concerns. The site has groundwater contamination and Haddam/Meriden CT is an area with diffuse

but significant population.

**Millstone.** Another site that has three reactor units, the oldest shut and two remaining in operation. Millstone, owned by Dominion Generation, is on the Long Island Sound in Connecticut. Unit 1 is a BWR (GE) that operated from 1970--1998, Units 2 and 3 are PWRs. Both are plagued by leaks, many repairs, a lax safety culture and near-misses. Inside the 10 mile radius there are 140,000 people.

**Oyster Creek**, owned by Illinois-based Exelon Corporation, is a Fukushima – clone (GE Mark 1 BWR) sitting for the past 43 years on a New Jersey bay where the 6.5 foot surge of SuperStorm Sandy exceeded the level of the cooling water in-take pumps. As luck would have it the reactor was down for refueling, however another 6 inches would have forced a Fukushima-style use of a firehose to keep the fuel pool coolant full and moving. This dinosaur is plagued with many safety issues inspiring a constant shut-down battle from local folks for the past 20 years. Instead,

NRC approved a license extension which has been renegotiated to 2019; 140,000 people live within 10 miles.

**Nuclear Fuel Services**, Erwin, TN. Unlike the others, NFS is a fuel factory-compounded in the last decade by the addition of a "low-level" radioactive waste heat treatment facility that cooks the hottest of this type of waste: filters and resins from the primary coolant loop of reactors. This site is tucked into a "holler" off a valley in the Appalachian Mountains where "company town" is an understatement. NFS has only recently returned to making commercial reactor fuel, having primarily supplied plutonium fuel for the propulsion reactors of the U.S. Nuclear Navy. The intimacy of the position of this industrial site with the small town it is planted in is, one hopes, rare. Backyards and jungle gyms about the site, the local elementary school is a block away, and the river into which some wastes have been "straight piped" for decades has tested positive for highly enriched uranium and plutonium as far as 90 miles downstream.

## First New “Low-Level” Nuke Dump in US in Over 40 Years Controversial Right-Wing Billionaire-Owned Company Buries Waste Despite Technical and Legal Challenges

**A new sacrifice area in West Texas on the New Mexico border opened up to commercial nuclear waste on 27 April 2012. It is the first “full service” dump in US since the 1980 Low Level Radioactive Waste Policy Act passed seeking new sites, and the first since the Barnwell, South Carolina dump opened in 1971. After decades of searching, cajoling, maneuvering, and a billion dollars or more spent in 18 or more states, the nuclear industry has managed to find a new hole in the ground to bury its waste. Waste Control Specialists (WCS) joins the original 6 “low-level” waste dumps in the US that opened in the 1960s and 70s and the Utah EnergySolutions site.**

(755.4287) Four of these sites are closed. The EnergySolutions (formerly Envirocare) dump in Utah, started taking abandoned radioactive waste in 1988 and kept expanding to take more kinds of nuclear and hazardous waste. But the Utah legislature has never let it accept the more concentrated Classes B and C “low-level” radioactive waste (some of which can give a lethal dose if exposed without shielding). WCS can take Classes A, B and C, commercial and weapons waste, mixed radioactive and hazardous, and hopes to expand to take even more.

Waste Control Specialists (WCS) is a subsidiary of Valhi, owned by multimillionaire Harold Simmons, one of the 50 wealthiest people in the U.S. and a major political donor in Texas and nationally. Simmons, who was a key funder of the “swiftboat” ads against former Presidential candidate John Kerry, and gave millions to Mitt Romney Super PACs, has used his influence from the start--first getting the state to change the law to allow a private company to own and run a nuclear waste site, then in getting a state license even though the full technical review team unani-

mously rejected it for not protecting the water. Three members of that team quit in disgust when the license was granted by the political appointees that head the agency. It was granted with over 90 “conditions” that it had not met.

Interestingly, while the application was under review by one state agency, the Texas Water Development Board changed the location of the Ogallala Aquifer, moving the mapped boundary from the WCS site to miles away, at least partly based on information provided by WCS geologists. WCS sued a critic who

charged the site threatens the aquifer and he has since become silent on the issue. The Ogallala Aquifer, one of the world's largest fresh water aquifers, extends from Texas and New Mexico through the farm belt of the U.S. up to the Dakotas. Local residents who questioned or challenged WCS have been harassed.

The Lone Star Sierra Club is still fighting for a hearing on the licensing. The court ruled that a contested case hearing should be held but the state and WCS have appealed. Waste is being buried even though the appeal is pending. Ironically the first waste to be buried was from a company outside the Texas-

Vermont Compact. The dump had been touted to be exclusively for waste from the two Compact states only and its licensed capacity is less than the amount needed by generators in those two states. Regardless, the Texas and Vermont governors'-appointed Compact Commission approved taking "out-of-compact" waste, at the behest of WCS.

Prior to this, intensely radioactive nuclear weapons waste from the Department of Energy (DOE)'s Fernald site (K-65 ore from the Belgian Congo) was buried there under a different license. Under the Texas law passed specifically to enable this private dump, commer-

cial compact waste had to begin being disposed before more DOE weapons waste can be buried.

This translates into billions of dollars in contracts from weapons sites across the country in addition to the commercial waste from TX, VT and generators from all the other states which the compact commission is approving with a rubber stamp. Simmons and WCS will make big bucks. Andrews Country gets 5%. The nuclear industry has the illusion of a solution to its waste problem. The water, air, environment and the species that depend on them pay the price.

## Study Finds Increased Leukemia among Chernobyl Cleanup Workers

**On November 8, 2012 a study entitled "Radiation and Risks of Chronic Lymphocytic and Other Leukemias among Chernobyl Cleanup Workers," was released examining the risks of leukemia, specifically, the most common type, chronic lymphocytic leukemia (CLL), in Chernobyl cleanup workers exposed to protracted low dose radiation (1). The findings of this study, which examined 110,645 Ukrainian cleanup workers between 1986-2006, demonstrated that exposure to low doses of radiation from post-Chernobyl clean-up caused a significant increase in the risk of leukemia. This study was significant because while the risks of high levels of exposure are well known, the risks of low doses have been more controversial. This is crucial because during the Chernobyl disaster approximately 500,000 people were registered as emergency and recovery workers, receiving low, continuous doses.**

**(755.4288)** The Ukrainian male workers examined were between the ages of 20-60 years during cleanup activities in 1986-1990 following the Chernobyl nuclear power plant accident, were registered in the Chernobyl State Registry of Ukraine (SRU) before 1992, who resided in Kyiv City or in any one of five study oblasts (areas similar to a state or province: Cherkasy, Chernihiv, Dnipropetrovsk, Kharkiv and Kyiv) at the time of registration. Of those 110,645 a total of 162 cases of leukemia were found. This was found by examining cancer registries, conducting expert hematologic (blood) review and case ascertainment coupled with radiation dose estimates. For all leukemia cases a significant positive association existed with continuous radiation dosage. The proportion of chronic lymphocytic

leukemia cases in the study (roughly 58% of all leukemia cases) was higher than the 40% figure reported by most population based cancer registries and the 44% of all diagnosed leukemia cases among males. The cancer registries were estimated to be missing as much as 38% of all of the chronic lymphocytic leukemia cases.

This study confirmed and strengthened previous studies which showed significant associations between protracted radiation exposure at low doses and leukemia incidence. Increased risks of leukemia, although not statistically significant, were also reported from a study of Chernobyl cleanup workers from Belarus, Russia and Baltic countries. Additionally, the results indicate that radiation risk estimates are elevated for both chronic and non-chronic lymphocytic

leukemia (CLL and non-CLL). However, examining CLL is crucial given that this is the most prevalent form of leukemia and incidents of CLL are expected to rise when the population ages. Generally, studies had looked at high doses of radiation and it has been assumed that protraction of radiation dose results in a reduction of adverse biological effects; however this study has demonstrated quite the opposite.

This study was published in *Environmental Health Perspectives* (2012; doi:10.1289/ehp.1204996)

<http://www.nirs.org/radiation/radhealth/ehp1204996chernobylhealth.pdf>

# NEW ON THE WEB: LINKS TO RADIATION MONITORING SYSTEMS AROUND THE WORLD

Since the Fukushima Daiichi disaster, many people have grown more interested in accessing data on radiation levels in their communities. This task has often proven difficult due to the lack of an organized internet directory of monitoring data. In order to facilitate the public's access to radiation data, NIRS has created a webpage with links to real-time and historical monitoring data from around the world. This webpage is called Radiation Monitoring and can be accessed at <http://www.nirs.org/radiation/monitoring.htm>

(755.4289) NIRS has compiled two monitoring directories: one for data from locations in the United States, and one for international data. Each entry in these directories contains the link to the data, information on the monitoring location and the person, organization, company, or agency conducting the monitoring. When possible, NIRS has also included information on the medium sampled (including groundwater, seawater, drinking water, precipitation, foodstuffs, milk, and air) and the specific type of radiation sampled for (including alpha, beta, and gamma radiation, or the radionuclides such as uranium, iodine, strontium).

One of the entries in the directory is a link to RadNet, radiation data posted by the US Environmental Protection Agency. The EPA's air monitors measure for beta and gamma radiation and sample air at a flow rate of roughly 60 cubic feet per hour. The air monitors report their data hourly to the EPA's National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama. NAREL also analyzes milk, precipitation, and drinking water samples, as well as samples of air particulates that are collected from filters on air monitors. According to its website, RadNet usually publishes these air data within two hours. There are also 40 air monitors in storage that can be deployed at any time, although the EPA inexplicably ordered that these not be deployed during the post-Fukushima emergency. Yet as

far as NIRS can tell, the only near-real-time air data on the website are very recent data. NIRS' searches for drinking water, precipitation, and milk data turn only scant information since June 2011. It is unclear whether this information has not been posted or whether the EPA has not monitored at all in the intervening time. All in all, NIRS has found that the RadNet website is difficult to use; it contains three separate descriptions of the EPA's monitoring protocol, but they contradict each other and fail to unambiguously state exactly how often the EPA monitors for radiation, or for which isotopes it samples.

NIRS' directory also provides links to data collected by concerned citizens groups such as Safecast, a website that posts radiation data collected by trained volunteer monitors around the world, mostly in Japan. Safecast's volunteers monitor air radiation by strapping standard 2" pancake sensors to cars and driving through towns street-by-street. They have taken this approach because it is clear that radiation levels can differ wildly between houses on the same street; by taking measurements every five seconds, they hope to give individuals a good idea of radiation levels at their own home. Safecast measurements are taken 1.5 meters off the ground, much lower than many stationary air monitors, since this is the level at which people are most likely to be exposed. There is little information on the presence of specific radioisotopes,

since Safecast does not have access to an isotope lab. They monitor for alpha, beta, and gamma radiation.

C-10 Research and Educational Foundation, funded by the Commonwealth of Massachusetts, operates in the ten-mile radius surrounding the Seabrook reactor in New Hampshire. It monitors the air at 16 sites throughout northeastern Massachusetts and southeastern New Hampshire, and in fact began monitoring before the power plant came online in 1990 in order to obtain data on the normal background radiation in the area. C-10 also monitors radiation levels in mussels near the plant's cooling tunnel outfall. In addition to collecting radiation data, C-10 monitors incidences of human cancer within the ten-mile radius of the plant. Its data is available upon request, and contact information can be found by clicking on the link in NIRS' directory.

RadNet, Safecast, and C-10 are just a few of the more than 60 websites listed on NIRS' monitoring directory. We are still looking to add to this list and ask that you please contact us with information on any databases that we may have missed.

Send corrections and additions to [dianed@nirs.org](mailto:dianed@nirs.org)



# Startling News for Reactor Communities: Radiation Spikes During Refueling

International Physicians for the Prevention of Nuclear War (IPPNW) reported in August 2012 on some sleuth work by its affiliate in Germany that turned up documentation of a short-term spike 200--500 higher amounts of radioactive gases being released from the Gundremmingen reactor site in Southern Germany. The investigators established that this rise was associated with the opening of the reactor vessel, as is routinely done for reactor refueling and inspections. Further, the group reported that the elevation of radioactive pollution persisted for the next week, well above usual levels during ongoing operations.

**(755.4290)** The numbers for concentrations of noble gases reported by IPPNW are: 3 Bq/m<sup>3</sup> for usual operations; the spikes were 700 Bq/m<sup>3</sup> increasing to a peak of 1470 Bq/m<sup>3</sup> in the initial hours after the vessel was opened, then tapering down to an average of 100 Bq/m<sup>3</sup> for the next week.

Every reactor generates radioactive gases during normal operation, including noble gases, tritium, carbon-14, iodine and small amounts of volatile cesium and strontium. Reactor vessels are not designed to capture the gases that are present in the core prior to opening for activities like refueling or maintenance and inspections. When the core is opened, these gases escape.

The IPPNW's Reinhold Theil points out that these airborne emissions are of particular risk for women and pregnant women in the vicinity since women are at elevated risk for cancer, and the embryo and fetus suffer the greatest impacts from radiation exposure during gestation; the female fetus is at the highest risk. Tritium has the potential to cross the placental barrier to enter the fetus directly. Gamma emissions from noble gases are also a threat since these inert elements, if inhaled, are likely to be stored in fat deposits of the mother, typically near to the abdomen.

This situation has remained secret, or at the least invisible for the last six decades of reactor operation worldwide

because the regulators allow self-reporting of emissions rather than publicly available real-time monitoring, and because regulations allow averaging over the reporting period. Since the NRC requires only annual reports, that allows the US reactor operators to hide these 500 times higher spikes above "usual" by leveling it in the typically lower levels of release.

**Source:**  
<http://www.ippnw-europe.org/print/en/nuclear-energy-and-security.html?expand=707&cHash=8752881e4a>

We are slowly moving to a new website.

Please check [www.wiseinternational.org](http://www.wiseinternational.org) .  
Comments are welcome.

And help us by changing links on your website from [www.antenna.nl/wise](http://www.antenna.nl/wise) to [www.wiseinternational.org](http://www.wiseinternational.org)

# Fukushima Lessons Learned?

## The US National Academies of Science panel replicates the same collusion that led to the disaster

In March 2012, a panel was put together for a study by the National Academies of Sciences (NAS) to examine the lessons learned from the Fukushima accident. The study, entitled “Project on Lessons Learned from the Fukushima Nuclear Accident for Improving Safety and Security of U.S. Nuclear Plants,” was recommended by the Blue Ribbon Commission, mandated by the United States Congress, and sponsored by the United States Nuclear Regulatory Commission. As of December 2012, three meetings have been held to discuss and examine the causes of the Fukushima disaster, with a particular emphasis on safety systems and regulations.

**(755.4291)** The first meeting, held on July 18th and 19th 2012, introduced the provisional panel, which was challenged almost immediately given that many members of the panel had a pronounced pro-nuclear bias and would be unable to provide accurate assessments of the current safety culture. On July 17th, 2012, 15 national organizations including NIRS, 25 state organizations, and 47 individuals submitted a letter (1) to the NAS expressing these concerns. One reason these concerns were so pressing was due to a report filed issued by the Japanese Diet in Mid-July 2012 on the Fukushima accident. (2) Within this report from the Japanese Diet much of the blame for the accident was placed on a “collusive relationship” between the industry and regulators. This relationship ultimately led to a betrayal of the public’s right to be safe. The NAS panel selection appeared to be replicating the same disastrous Japanese pattern of collusion.

The letter added that a major problem with the panel’s conflict and bias would be revealed when they would be unable to provide an accurate self-assessment of agency conduct and actions. Involved in this assessment would be the key players in the nuclear industry. Those players are the federal agencies, the Nuclear Regulatory Commission and the Department of Energy; the industry and other advocacy groups such as Institute on Nuclear Power Operations, Nuclear Energy Institute, the American Nuclear Society, and the Health Physics Society. In the U.S., as in Japan, there is a very symbiotic relationship between federal agencies and nuclear industry advocacy groups. Several members of the panel were directly involved with or associated with the entities mentioned above, causing the concerns about self-assessment, bias and conflict. The groups writing the letter were also concerned that the panel was completely devoid of nuclear critics, which would lead to an unbalanced view on safety

issues and concerns. This meeting, as with the others that followed, provided very little in the way of ensuring that bias and conflict would not be an issue. This panel is yet another example that the nuclear industry has a powerful and dangerous stranglehold on the National Academy of Sciences, and can impede crucial safety improvements by packing a panel with pro-nuclear enthusiasts, rather than with individuals and scientists who can make changes for public good and protection.

### Sources:

- (1) <http://www.nirs.org/fukushima/nasfukushimaltr%207-18-12.pdf>
- (2) [http://www.nirs.org/fukushima/naaic\\_report.pdf](http://www.nirs.org/fukushima/naaic_report.pdf)

WISE/NIRS NUCLEAR MONITOR	WISE AMSTERDAM/NIRS
<p><b>Nuclear Monitor</b></p> <p>The Word Information Service on Energy (WISE) was founded in 1978 and is based in Amsterdam, the Netherlands. The Nuclear Information &amp; Resource Service (NIRS) was set up in the same year and is based in Washington D.C., US.</p> <p>WISE and NIRS joined forces in the year 2000, creating a worldwide network of information and resource centers for citizens and environmental organizations concerned about nuclear power, radioactive waste, radiation, and sustainable energy issues.</p> <p>The WISE/NIRS Nuclear Monitor publishes information in English 20 times a year. The magazine can be obtained both on paper and as an email (pdfformat) version. Old issues are (after 2 months) available through the WISE homepage: <a href="http://www.wiseinternational.org">www.wiseinternational.org</a></p> <p><b>Receiving the Nuclear Monitor</b></p> <p>US and Canada based readers should contact NIRS for details on how to receive the Nuclear Monitor. Others receive the Nuclear Monitor through WISE.</p> <p>For individuals and NGO's we ask a minimum annual donation of 100 euro's for 20 issues (50 euro for the email version).</p> <p>Institutions and industry should contact WISE for details of prices.</p> <p><b>WISE International</b> Po Box 59636, 1040 LC Amsterdam, The Netherlands</p> <p><b>Web:</b> <a href="http://www.wiseinternational.org">www.wiseinternational.org</a> <b>Email:</b> <a href="mailto:monitor@wiseinternational.org">monitor@wiseinternational.org</a> <b>Phone:</b> + 31 20 6126368</p>	<p>ISSN: 1570-4629</p> <p>This issue was written by: Diane D'Arrigo, Dominique French, Tyler Kerce, Heidi Hutner, John LaForge, Mary Olson, Dr. Steve Wing and Kim Roberson Editing: Michael Mariotte</p> <p>The "Elfi Gmachl Foundation for a Nuclear-free Future" / PLAGÉ-Salzburg supports the Nuclear Monitor financially. See: <a href="http://www.plage.cc">http://www.plage.cc</a> (not available in English (yet))</p>

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