

# NUCLEAR MONITOR

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## Editorial

Dear readers of the WISE/NIRS Nuclear Monitor,

In this issue of the Monitor:

- We summarize some commentaries on the Fukushima anniversary, as well as a 2007 article on the profound corruption in Japan's nuclear industry.
- A call-out for support from Aboriginal Traditional Owners in Australia facing the imposition of an international high-level nuclear waste dump on their homelands.
- We summarize a report by Kendra Ulrich from Greenpeace Japan on radioactive contamination from the Fukushima disaster.
- Mary Olsen from the Nuclear Information & Resource Service writes about her experiences meeting woman dealing with long-term evacuation from the Fukushima exclusion zone.
- We summarize a report by radiation biologist Dr Ian Fairlie about the health impacts from the Fukushima disaster.
- We summarize two new studies which analyze the safety of nuclear power by looking at the historical accident rate and severity, and a report on the inadequacy of post-Fukushima safety upgrades in the United States.

The Nuclear News section has reports on the failure to prosecute a Rio Tinto subsidiary for a massive radioactive spill at the Ranger uranium mine in Australia; a great online resource called 'Mapped' with information on every power reactor that has ever operated; Switzerland's nuclear phase-out will begin sooner than expected; and information on an upcoming nuclear energy conference in Prague.

Feel free to contact us if you have feedback on this issue of the Monitor, or if there are topics you would like to see covered in future issues.

Regards from the editorial team.

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## Fukushima Reflections: Looking back, looking forward

**NM820.4543** Robert Jacobs has a short but powerful piece in the *Asia-Pacific Journal* on the topic of 'forgetting Fukushima':<sup>1</sup>

*"Forgetting begins with lies. In Fukushima the lies began with TEPCO (the owner of the power plants) denying that there were any meltdowns when they knew there were*



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TEPCO admitted that it was aware of the meltdowns much earlier, or to put it bluntly, it continued to hide the fact that it had been lying for five years. ...

*“The most powerful legacy of Chernobyl, besides its long-lived radiation, is the widespread use of the word “radiophobia” by nuclear industry apologists to describe the public response to large releases of radiation: fear. Look for this word and sentiment in the many articles being published this month about Fukushima. When you see it, or read the claim that more people were harmed at Fukushima by their own irrational fears than by radiation, you are seeing the work of forgetting turn its cruel wheels. Behind those wheels are the shattered lives and emotional wellbeing of hundreds of thousands of people whose communities were destroyed, and whose families were ripped apart by the Fukushima disaster. People whose anxieties will rise every time they or their children run a high fever, or suffer a nosebleed or test positively for cancer. People whose suffering – at no fault of their own – is becoming invisible.*

*“Soon when we talk about Fukushima we will reduce the human impact to a quibbling over numbers: how many cases of thyroid cancer, how many confirmed illnesses. Lost-hidden-forgotten will be the hundreds of thousands of people forced to flee their homes, in many cases permanently, and try to rebuild their shattered lives. Public relations professionals and industry scientists will say that these people did this to themselves. And the curtain will draw ever downward as we forget them. This is the tradition of nuclear forgetting.*

*“[W]e should not allow our gaze to remain fixed on the nuclear plants, we must learn to see the deep wounds to society that are left to heal in darkness. We must learn to bring the whole of the population and ecosystem that suffer from radiological disasters into the light of our awareness and concerns. We must grieve for all that has been lost and we must hold government and the TEPCO Corporation responsible for assisting those whose lives have been shattered.”*

The full article is online.<sup>1</sup>

## **TEPCO – a company rooted firmly in denial**

Mark Willacy, an Australian journalist and author of the book *Fukushima: Japan's Tsunami and the Inside Story of the Nuclear Meltdowns*, writes:<sup>2</sup>

*“TEPCO modelled a large offshore earthquake and predicted that it could spawn waves as high as 15.7 metres (about the exact height of the ones that did cripple the plant). But TEPCO would hide its report and do nothing.*

*“Taking extra safety measures would have been interpreted as TEPCO being worried about a tsunami. If we had built seawalls in front of the plant ... it would've made [local residents] worry,” TEPCO's Junichi Matsumoto told me.*

*“I was stunned. Here was one of the nuclear company's top brass telling me they knew a big tsunami could strike, but that they had done nothing about it because they didn't want to spook people living near the plant. Now these people were among Fukushima's 150,000 “nuclear refugees”, forced to evacuate their homes for tiny makeshift shelters many kilometres inland.*

*“I came to believe TEPCO was a company rooted firmly in denial. I would lose count of the number of times a*

*conga line of TEPCO officials would shuffle into a press conference, apologise to the people of Japan for what had happened and then bow deeply. It was too little, too late.*

*“Last month three former TEPCO executives were charged with negligence over the Fukushima meltdowns. But it only happened after a citizen's panel ruled they should face trial. Until that point prosecutors had twice dismissed the idea of indicting anyone.”*

## **Bottomless depths of corruption**

Few people or organizations can say they paid sufficient attention to the corruption in Japan's nuclear industry in the years before the Fukushima disaster. The Tokyo-based Citizens Nuclear Information Center (CNIC) is an honorable exception. Here is a brief excerpt from a 2007 CNIC article titled *Nuclear State and Industry: Bottomless Depths of Corruption*.<sup>3</sup>

*“A web of falsification and deception in Japan's electric power industry was uncovered late in 2006. On 30 March 2007, all 12 power companies submitted reports to the government. Their reports, covering nuclear, fossil fuel and hydroelectric power stations, identified a colossal 10,646 irregularities. Of those, 455 cases involved nuclear power plants, including 230 at Tokyo Electric Power Company (TEPCO) and 123 at Chubu Electric.*

*“On April 6th, power companies submitted reports to the Nuclear Industrial and Safety Agency (NISA) explaining how they propose to prevent such problems arising in future. NISA responded on April 20th by announcing administrative proceedings against four companies in relation to seven reactors. The penalty imposed is that the companies must alter their safety provisions. NISA has not demanded that reactors be shut down, nor has it suspended any licenses. With such lenient treatment as this, one can hardly expect that such problems will not arise in future.*

*“A previous TEPCO scandal came to light in August 2002 when a whistleblower revealed that the company had falsified inspection records and concealed problems at its nuclear power plants. Thereafter, similar problems were discovered at plants belonging to other power companies. On that occasion TEPCO was forced to close down all 17 of its nuclear reactors. Four directors accepted responsibility by resigning and the company promised to work to recover public trust. This time there is little evidence of contrition.*

*“During the 2002 scandal, the discovery of corruption in the government's periodic inspections showed the hollowness of Japan's nuclear safety system. This time the Minister for Economy Trade and Industry directed that a thorough investigation be carried out to “uncover the truth with no concealment”. However, by rights, these problems should have been identified at the time of the 2002 scandal. The root of the problem is that the government, the power companies and the plant makers are all in bed together. What we are seeing once again is the true nature of Japan's nuclear club. ...*

*“Can we be sure that there are no more incidents to be uncovered? Certainly not. NISA admitted as much during a meeting with politicians and citizens groups on April 13th. It seems that the depths of corruption in Japan's nuclear industry are unfathomable. ...*

*“It has become clear that we cannot trust the regulator any more than the companies, but even if it wanted to, NISA does not have the ability to properly check what is going on. When representatives of CNIC and other NGOs visited NISA on April 13th, NISA showed not the slightest sign of remorse. The fact that it is located within the Ministry of Economy Trade and Industry, which also has the role of promoting nuclear power, does not help of course.”*

A U.S. Nuclear Regulatory Commission report said of the fatal 1999 criticality accident at Tokai-mura: “The NRC staff agrees with the Government of Japan’s conclusion that the general root causes of the accident were: (1) inadequate regulatory oversight; (2) lack of an appropriate safety culture; and (3) inadequate worker training and qualification.”<sup>74</sup> Sound familiar?

CNIC’s highly informative English-language newsletters, pre- and post-Fukushima, are online at [www.cnic.jp/english/newsletter](http://www.cnic.jp/english/newsletter)

Here is a list of some of CNIC’s pre-Fukushima articles:

- ‘TEPCO’s Damage Cover-up and Data Falsification’, Nov/Dec 2002, [www.cnic.jp/english/newsletter/nit92/nit92articles/nit92coverupdata.html](http://www.cnic.jp/english/newsletter/nit92/nit92articles/nit92coverupdata.html)
- ‘Revelation of Endless N-damage Cover-ups’, Nov/Dec 2002, [www.cnic.jp/english/newsletter/nit92/nit92articles/nit92coverup.html](http://www.cnic.jp/english/newsletter/nit92/nit92articles/nit92coverup.html)
- ‘All 17 of TEPCO’s units shut down’, March/April 2003, [www.cnic.jp/english/newsletter/nit94/nit94articles/nit94tepc.html](http://www.cnic.jp/english/newsletter/nit94/nit94articles/nit94tepc.html)
- ‘Significant Incidents at Nuclear Power Plants and Nuclear Fuel Facilities in 2002’, May/June 2003, [www.cnic.jp/english/newsletter/nit95/nit95articles/nit95significant.html](http://www.cnic.jp/english/newsletter/nit95/nit95articles/nit95significant.html)
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- ‘Revelations of sloppy management at nuclear power stations’, March/April 2004, [www.cnic.jp/english/newsletter/nit99/nit99articles/nit99sloppy.html](http://www.cnic.jp/english/newsletter/nit99/nit99articles/nit99sloppy.html)
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- ‘Nuclear State and Industry: Bottomless Depths of Corruption’, May 2007, [www.cnic.jp/english/?p=1104](http://www.cnic.jp/english/?p=1104)

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## Aboriginal Traditional Owners in Australia seek international support

As discussed in the last issue of Nuclear Monitor, Aboriginal Traditional Owners in Australia are facing a push for an international high-level nuclear waste dump. They are now seeking international support. Non-government organisations around the world are asked to endorse their statement online at [www.anfa.org.au/sign-the-declaration](http://www.anfa.org.au/sign-the-declaration). Here is the statement:

*Irati Wanti: ‘The Poison – Leave It’*

*A group of politicians and business-people are developing a plan to build an international high-level nuclear waste dump in South Australia. The plan is strongly opposed by many South Australians and by an overwhelming majority of Aboriginal people.*

*The Australian Nuclear Free Alliance, representing Aboriginal people from across Australia, calls on nuclear nations NOT to dump nuclear waste in Australia. The nuclear*



Aboriginal Traditional Owners and supporters in Port Augusta, South Australia, May 2015.

*industry has a track record of Aboriginal dispossession and environmental pollution – from the atomic bomb tests to uranium mining to nuclear waste dump proposals.*

*We call on nuclear nations NOT to dump nuclear waste in Australia.*

# Radiation reloaded: Ecological impacts of the Fukushima disaster

**NM820.4544** Kendra Ulrich from Greenpeace Japan has written a detailed report on radioactive contamination from the Fukushima disaster, documenting the radioactive contamination of forests, rivers, floodplains and estuaries of Fukushima Prefecture, as well as the contamination of wildlife.<sup>1</sup>

Ulrich exposes flawed assumptions by the International Atomic Energy Agency:

*“The IAEA has declared that there will likely be no impacts on wildlife from Fukushima-derived radiation – while also admitting that they did not consider ecosystems or populations, but rather focused narrowly on individuals. Further, it states that its methodology was based on that proposed by the International Commission on Radiological Protection (ICRP), whose models are largely based upon individuals in laboratory or controlled environment studies.*

*“However, in recent years the French government-affiliated Institute for Radiological Protection and Nuclear Safety (IRSN), in its studies of wildlife in the Chernobyl Exclusion Zone, has found that animals in these natural conditions could be significantly more sensitive to chronic low-dose exposure to man-made radiation than they are in laboratory or controlled environment experiments. It was suggested that this could be due to a number of factors, including, but not limited to, increased stressors and length of exposure times. In fact, IRSN found that wildlife could be up to eight times in more sensitive in natural contaminated ecosystems.”*

The report is based on a large body of independent scientific research in impacted areas in the Fukushima region, as well as investigations by Greenpeace radiation specialists over the past five years. It draws on research regarding the ecosystem impacts of the Chernobyl disaster and the 1957 Kyshtym / Mayak disaster in the Soviet Union (which involved a chemical explosion in a liquid radioactive waste tank, spreading radionuclides over a wide area).

The report states that studies after the Chernobyl and Kyshtym disasters revealed evidence in contaminated forest systems of a gradual increase in the concentrations of radiocaesium in above-ground plant structures after five years. Uptake via root systems exceeded returns to the forest floor via leaching and litterfall, until a sort of equilibrium was reached. The same phenomenon may play out in Fukushima Prefecture. Declining radiation levels may plateau (or even rise), followed by a very slow decline as long-lived radionuclides decay (for example caesium-137 has a half-life of 30 years).

The greatest enemy of the clean-up efforts in Fukushima Prefecture is gravity. The topography of Fukushima prefecture is characterized by steep slopes, foothills, and flat coastal flood plains. The upper regions are covered in forests and plantations – interspersed with rice paddies, homes and other agricultural fields. Over 70% of Fukushima prefecture is forested, and these areas cannot be decontaminated. Ulrich writes:



Tokyo, 8 March 2015.

*“Its climate is highly erosive, with typhoons in the fall and snowmelt in the spring. During significant rainfall events, typhoons, and spring snowmelt, the stocks of radiocaesium in forests, hillslopes and floodplains can be remobilized and contaminate areas downstream – including those that did not receive fallout from the radioactive plumes, as well as areas that have already been decontaminated.”*

Thus there is an element of futility to the clean-up efforts:

*“Over the past four years, a massively expensive and labor-intensive decontamination effort has been underway in much of the heavily contaminated areas. Workers scrub down buildings, sidewalks, and roads, and remove enormous amounts of contaminated surface soil and debris – which is then packed into bags roughly a m<sup>3</sup> in size and piled up in mountains of temporary radioactive waste storage sites scattered throughout the prefecture. Forests are “decontaminated” in 20-meter strips along roads and around homes in an effort to lower radiation doses. Yet, due to the complexities of these ecosystems and the transfer of radiation within them, this effort is more symbolic than effectual. As such, despite the admirable and dedicated work of the decontamination workers, their heroic efforts in the Fukushima-impacted areas have yielded limited success.”*

Some of the specific impacts uncovered in the five years since the Fukushima disaster include:

- high radiation concentrations in new leaves, and at least in the case of cedar, in pollen;
- apparent increases in growth mutations of fir trees with rising radiation levels;
- heritable mutations in pale blue grass butterfly populations and DNA-damaged worms in highly contaminated areas, as well as apparent reduced fertility in barn swallows;
- decreases in the abundance of 57 bird species with higher radiation levels over a four year study;
- high levels of caesium contamination in commercially important freshwater fish; and

- radiological contamination of one of the most important ecosystems – coastal estuaries.

There's a saying that old atomic bomb test sites never die. The same could be said of severe nuclear accident sites. Ulrich concludes:

*“Unfortunately, the crux of the nuclear contamination issue – from Kyshtym to Chernobyl to Fukushima – is this: when a major radiological disaster happens and impacts vast tracts of land, it cannot be ‘cleaned up’ or ‘fixed.’”*

### Other reports released by Greenpeace

Greenpeace has released several other important reports to mark the Chernobyl and Fukushima anniversaries. *Nuclear Scars: The Lasting Legacies of Chernobyl and Fukushima* is a 50-page report summarizing the myriad social and environmental effects of the disasters.<sup>2</sup> It's well worth a read and will serve as a useful reference document.

The *Nuclear Scars* report comments on testing conducted by Greenpeace in Ukraine. Of 50 milk samples collected last year from three villages in the Rivne region of Ukraine, located approximately 200 km from Chernobyl, 92% contained caesium-137 at levels above the limit set for consumption by adults in Ukraine, and all were substantially above the lower limit set for children. Samples of mushrooms had caesium-137 levels well above the Ukrainian limit for human consumption. Forty-two percent of grain samples from the Kyiv region, 50 km from Chernobyl, had strontium-90 levels above the Ukrainian limit for human consumption. Seventy-five percent of wood samples from the Kyiv region had strontium-90 levels above the Ukrainian limit for firewood.

Greenpeace has commissioned a number of other reports which have been released recently:

- David Boilley, a nuclear physicist and chairman of Association pour le Contrôle de la Radioactivité dans l'Ouest, reviewed current research into the contamination from the Fukushima disaster.<sup>3</sup>
- A team of scientists led by Prof. Omelianets, Principal Scientist for the Laboratory of Medical Demography at the National Research Centre for Radiation Medicine of National Academy of Medical Sciences of Ukraine, reviewed the published national and international scientific data and research on the health impacts from the Chernobyl and Fukushima disasters.<sup>4</sup>
- Prof. Valerii Kashparov, the Director of the Ukrainian Institute of Agricultural Radiology of the National University of Life and Environmental Sciences of Ukraine, and his

team reviewed the published scientific research on the extent of Chernobyl's contamination 30 years later.<sup>5</sup>

### Nuclear disasters and sociopolitical change

Greenpeace's *Nuclear Scars* report comments on the broader political ramifications of the Fukushima disaster, noting that it “triggered many Japanese citizens to rethink their once deferential relationship with state and expert authorities. Fukushima has, in effect, changed the social relationships of Japanese society. This new distrust in authorities has spurred ‘bottom-up’ responses, including citizen-led science challenging government policies and protesting against government policies. When citizens lose faith in government expertise, they develop other means to protect their lives and health. Following Fukushima, Japanese citizens developed their own technical capacity to assess government safety reassurance, including learning to monitor, share and understand the risk of radiation levels in food and communities. This ‘scientific citizenship’ is a direct response to the Fukushima disaster. Simply put, due to distrust in government, citizens have come together to develop tools and community networks to protect their health and avoid radiation exposure.”<sup>2</sup>

Naoto Kan, Japan's Prime Minister at the time of the Fukushima disaster, has recently commented on the potential for far more radical changes in the social relationships of Japanese society.<sup>6</sup> Reflecting on the first few days of the Fukushima disaster, Kan said:

*“From a very early stage I had a very high concern for Tokyo. I was forming ideas for a Tokyo evacuation plan in my head. In the 1923 earthquake the government ordered martial law – I did think of the possibility of having to set up such emergency law if it really came down to it. We were only able to avert a 250-kilometre evacuation zone by a wafer-thin margin, thanks to the efforts of people who risked their lives. Next time, we might not be so lucky.”*

“The future existence of Japan as a whole was at stake,” Kan said. “Something on that scale, an evacuation of 50 million, it would have been like a losing a huge war.”<sup>6</sup>

Mikhail Gorbachev, General Secretary of the Communist Party of the Soviet Union at the time of the Chernobyl disaster, attributes the collapse of the Soviet Union in part to the nuclear disaster. He said, “even more than my launch of perestroika, [Chernobyl] was perhaps the real cause of the collapse of the Soviet Union five years later. Indeed, the Chernobyl catastrophe was an historic turning point: there was the era before the disaster, and there is the very different era that has followed.”<sup>7</sup>

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# Japan Diary: Fukushima women

**Author:** *Mary Olsen – Nuclear Information & Resource Service.*

**NM820.4545** Early March 2016 – I am here in Japan with Arnie Gundersen from Fairewinds Energy Education ([www.fairewinds.org](http://www.fairewinds.org)), and after leaving Fukushima Prefecture we have begun our speaking tour. People who have fled Fukushima turn up at our events, and side-gatherings are organized for me to meet with mothers and grandmothers who have moved out of contaminated areas. These meetings are called Tea Parties and are somewhat of a snowball! Word is spreading. I have met with Moms in Fukushima City, near Okayama, Onomichi, Kyoto, Maizuru, Osaka, and now in Tokyo ...often a Mom says a friend of hers met with me already.

These refugees from TEPCO's radioactivity are often in conflict. Many have left family members behind, in some cases suffering ridicule and derision from their relatives for leaving. There is a choice-point now that they have left; do they now fade into anonymity? Or do they stand up to say "see me" and fight for justice. Many are engaged in legal battles to win compensation. Some are now effectively homeless and relying on the help of service organizations, churches and help from family. Many are women whose husbands do not support their choice to move their children to less contaminated areas. Divorce due to Fukushima Daiichi is not uncommon.

In the field of physics they say that the act of viewing an event changes it. Here I will tell you that being seen, witnessed, also changes events. These two: seeing, and being seen, are not the same. A large part of what I can offer the radiation refugees is the simple act of being their witness. I met a representative of a service organization that has done interviews with families that were directly exposed when Fukushima Daiichi 1, 2 and 3 melted down ... and by contamination since 2011. When the report comes out, it will say that 80% of the large number of families they have spoken to have health problems. When this report becomes available, we will share it. For now, I will simply say: cancer is not the only harm that comes from radiation exposure.

For me, as a woman who suffered an acute radiation exposure at work at the age of 25 (1984), this is not news. This trip has been a personal gift to me insofar as I have never talked about the immediate and near-term problems I suffered after my exposure, but listening to these women I often say "Yes, that happened to me too. I understand."

Immediate harm includes decimation of the digestive tract, immune system, sensory function (primarily eyes but also sometimes taste and smell), reproductive function and physical depression. Some report becoming reactive to chemicals – something I experienced too. I have heard many reports of joint pain and a startling number of reports of spontaneous bone fracture. There are the nose-bleeds and headaches. It is also typical for people to be consumed by deep, tragic regret and/or rage. In Japan these last are clothed in daily decorum. And yes, thyroid cancer (in all ages) is appearing.

Yes, these symptoms all have multiple causations, but there is a pattern; and those suffering unequivocally know that they did not suffer these problems prior to exposure. The good news is that often these immediate non-cancer problems can reverse if the body is allowed to recover. A physician, one of the few here in Japan openly diagnosing radiation-related illnesses reports that when people move to safer zones, they are improving.

"You are the first person who has come to talk to me about radiation, and how to protect myself." I hear these words from a woman evacuated from her home in Namie, as we leave a Temporary Housing community room near Koriyama. It is nearly incomprehensible to me that I am the first person to talk with these women about the danger of radiation, and small ways they can reduce their exposures. Then, I remember: the invisibility of radioactivity is so convenient.

I meet this small group of women almost five years since they were forced to immediately leave their homes, many with only the clothes they were wearing. None of these women had any idea when they left that five years later they would still not be home. Most are allowed to visit their homes up to 30 times a year, but some of these visits are only for a few minutes because the radiation level remains high. The levels of contamination are a patchwork; some property has lower levels and one of my new friends spends a couple of afternoons a month at home.

Of 12 women I am meeting with, one has been officially informed that she can never go back, the level of radioactivity around her home exceeds any official plan to remediate. She sits quiet, it is apparent that her experience is quite different from the women who believe that the day will come when they can return. I am silently relieved that these women are grandmother-aged ... but I know that some areas are soon to be officially declared "OK" and that families with children are expected to return. If they do not, they will lose what benefits and support have been available to them ... but there is also no-one who would buy their homes. Really a bind.

One woman told me she has moved seven times in these five years. Her husband has died during that time, her children have moved away and she is alone now.

Where are the men? Many have died (those gathered are in their 60's and older). Some were already gone in 2011, and others are here, but prefer to hang together outdoors smoking. The Tea Party is a support group for women. Sometimes a guy will come, but not today.

I want to tell them that I do not think they should go to their house ... even if they are told their house is "OK." But there are many places here, in unrestricted areas of the Prefecture, where our monitoring team has seen levels 50 and 80 times usual background for this area ... and particles that are "through the roof" hot ... I am faced once again with depth of incomprehension that a nuclear meltdown's impacts produce. So, I say nothing.

# TORCH: The other Chernobyl report

*“Think again, think seven times again before you leap and start construction of new nuclear power plants. With my experience of Chernobyl I know what is involved. The explosion of one reactor required a superpower country to spend tens of billions of roubles. Still there was the longer pollution of the soil, the deaths of a number of people and consequences that will be far reaching.”*

– Mikhail Gorbachev, 2006<sup>1</sup>

**NM820.4546** Global 2000 / Friends of the Earth Austria has released an updated dated version of an important report on the Chernobyl health impacts.<sup>2</sup> Written by radiation biologist Dr Ian Fairlie, the report incorporates the findings of many relevant studies produced in the 10 years since the original ‘TORCH’ report was published.

The subject matter is inordinately complex but Fairlie explains a host of technicalities in language that anyone can understand. Thus the report is not only an invaluable, up-to-date report on the health effects of the Chernobyl disaster, but it also doubles as a good primer on the radiation/health debates.

Fairlie summarizes the main impacts:

- 5 million people in Belarus, Ukraine and Russia still live in highly contaminated areas, and 400 million people in less contaminated areas.
- 37% of Chernobyl’s fallout deposited on western Europe; 42% of western Europe contaminated.
- Initially, about 116,000 people were evacuated, and later an additional 230,000 people were resettled.
- 40,000 fatal cancers predicted across Europe (based on an estimated collective dose of 400,000 person-Sieverts and a linear no-threshold derived risk estimate of 0.1 fatal cancers per person-Sievert).
- 6,000 thyroid cancer cases to date, 16,000 more expected.
- Increased radiogenic thyroid cancers now seen in Austria: 8–41% of increased thyroid cancer cases after 1990 in Austria may be due to Chernobyl.
- Increased incidences of leukemia well established among the clean-up workers in Ukraine and Russia with very high risk factors. Slightly lower leukemia risks were observed among residents of seriously contaminated areas in Ukraine and Belarus. Indications of increased leukemia risks among infants have been observed in Slovakia, Germany, Greece, Italy and Belarus, but research that would clarify the matter has been stalled mainly by lack of funding.
- Increases in solid cancers were observed among clean-up workers in Belarus and Ukraine but their relative risks (20% to 50%) were considerably lower than the 700% increases observed for thyroid cancer, and the 200% to 500% increases observed for leukemia.
- Several new studies have confirmed increased risks of cardiovascular disease and stroke after Chernobyl. It is recommended that further studies be funded and carried out on radiogenic cardiovascular diseases. As current radiation dose limits around the world

are based on cancer risks alone, it is recommended that they should be tightened to take into account cardiovascular disease and stroke risks as well.

- A recent very large study observed statistically significant increases in nervous system birth defects in highly contaminated areas in Russia, similar to the elevated rates of such birth defects observed in highly contaminated areas in Ukraine. The International Agency for Research on Cancer should be funded to carry out a comprehensive study of birth defects, particularly nervous system defects and Down Syndrome after Chernobyl.

The report notes that many restrictions on contaminated foodstuffs have now been lifted but they remain in some areas on wild reindeer, boar, deer, wild mushrooms, berries and carnivore fish. Areas of Germany, Austria, Italy, Sweden, Finland, Lithuania and Poland still have raised caesium-137 contamination levels in natural or wild foodstuffs. Caesium-137 contamination will persist for a long time into the future (as is also the case in Fukushima Prefecture).

## Children

The report states that recent studies provide strong evidence of decreased health indicators among children living in contaminated areas in Belarus and Ukraine, including impaired lung function and increased breathing difficulties lowered blood counts high anaemia levels and more colds, and raised levels of immunoglobulin fluctuation.

Fairlie reflects on the ill-health of children:

*“A health factor which has received insufficient consideration in epidemiology studies is the general poor health of children still living in highly contaminated areas in Belarus, Ukraine and Russia.*

*“In adults, many commentators have remarked on the marked general deterioration in health indicators in Belarus, Ukraine and Russia. For example, between 1990 and 2005, the average lifespan for a male adults in Russia decreased from 70 to 61 years and in the Ukraine from 67 to 61 years: in western Europe, the average male life span is >75. Some of the complex factors involved in the considerable declines in health indicators in Belarus, Ukraine and Russia are described in [a 2002 United Nations Development Programme] report. However without access to government data, it is difficult to assess whether continued exposures to low residual levels of radioactivity are a factor.*

*“But it is not just adult life expectancy: anecdotally many children complain of ill health and many visitors remark on the poor health status of children in badly*

affected areas. Western science, of course, demands epidemiological evidence rather than anecdotal reports but this evidence has not been available – often due to the lack of central funding.

*“However these problems have appeared so acute and clear to thousands of non-medical lay visitors and to medical staff that in the 1990s and 2000s they established charities to bring the children of Chernobyl to their own countries in the West (including US and Canada) for temporary respites from high radioactivity levels. Scores of these NGOs now exist at international, national and local levels and each year they bring thousands of Chernobyl children to their own countries and homes. Without exception, these groups observed improvements in the health of invited children.*

*“In the past, these groups were unfortunately ignored on the grounds that the observed improvements in these children were subjective and due to the improvements in outlook and temperament that everyone experiences on holiday.*

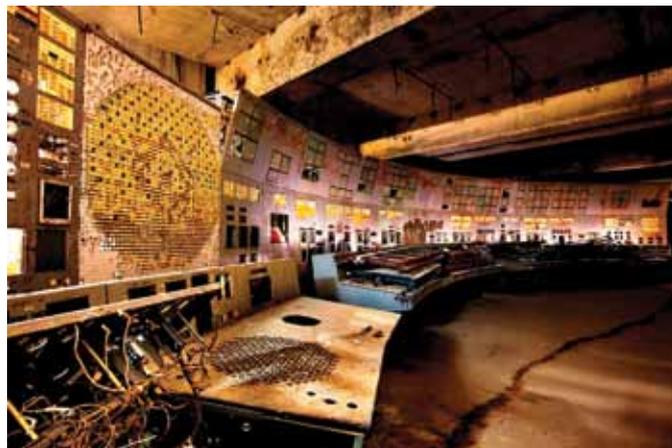
*“Recent authoritative studies have shed much-needed light on this matter: they indicate beyond reasonable doubt that radiation exposures to children living in contaminated areas are implicated in their poor healths. It is therefore unsurprising that their healths improve when they visit abroad.”*

The report notes that civil society has partially filled the void left by governments and nuclear agencies:

*“Unfortunately some international nuclear agencies and national authorities remain in denial about the scale of the health disaster caused by Chernobyl. This is shown by their continuing refusal to devote resources to humanitarian aid, rehabilitation and disaster management.*

*“This is regrettable: however there is one silver lining. Many thousands of concerned citizens throughout the world have mobilised to help stricken people in the three countries most seriously affected. Hundreds of local, national and international voluntary groups have been established especially to help the children in these areas. This help includes visits abroad for tens of thousands of children to provide respites from their radioactively contaminated homelands. This report provides strong epidemiological evidence that such visits are indeed helpful.*

*“Hundreds of doctors from many countries also work pro bono in contaminated territories, helping to minimize Chernobyl’s health consequences.*



The control room of the stricken #4 reactor at Chernobyl.

Source: © Gerd Ludwig's photo-book  
'The Long Shadow of Chernobyl'  
[www.gerdludwig.com](http://www.gerdludwig.com),  
[www.longshadowofchernobyl.com](http://www.longshadowofchernobyl.com)

*“These humanitarian actions are sorely needed and welcome. They constitute a silent rebuke of the disregard shown by some international nuclear agencies and national authorities towards the continuing plight of affected children in Belarus, Ukraine, and Russia.”*

### **Emergency preparedness**

Fairlie argues for improved preparedness for future accidents by means of the following:

- providing stable iodine to all citizens within at least 30 km of all nuclear reactors;
- stocking emergency levels of radioactivity-free water supplies, long-life milk and dried food supplies;
- distributing information leaflets to the public explaining what to do in the event of an emergency and explaining why precautionary measures are necessary;
- planning evacuations;
- constructing and staffing permanent emergency evacuation centres;
- carrying out emergency evacuation drills;
- planning subsequent support of evacuated populations;
- planning how to help those who choose to remain in contaminated areas; and
- increasing the mental health training of primary physicians and nurses.

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<https://www.global2000.at/sites/global/files/TORCH%20-%20The%20other%20Report%20of%20Chernobyl.pdf>

# New studies: How safe is nuclear power?

**NM820.4547** There are two broad methods of assessing the risks of nuclear power reactors. The nuclear industry calculates the probabilities of accident scenarios but these ‘probabilistic risk assessments’ are flawed and consistently underestimate the true risks, as discussed in Nuclear Monitor #803.<sup>1</sup>

The second method of assessing reactor risks is to analyze the historical record. One such study, by Thomas Rose and Trevor Sweeting, has recently been published in the Bulletin of the Atomic Scientists. Rose and Sweeting analyze all past core-melt accidents and estimate a failure rate of 1 per 3704 reactor-years.<sup>2</sup>

The authors state:

*“By our calculations, the overall probability of a core-melt accident in the next decade, in a world with 443 reactors, is almost 70%. (Because of statistical uncertainty, however, the probability could range from about 28% to roughly 95%.) The United States, with 104 reactors, has about a 50% probability of experiencing one core-melt accident within the next 25 years.”*

The authors also analyzed the role that learning from past accidents can play over time, using a much larger database of accidents and not just core-melt accidents, and conclude that few or no learning effects are in evidence. In their words, their statistical analysis finds “a probability for a (minor or major) accident in a nuclear power plant of about 1 in 1000 reactor years and shows no evidence of a learning effect.”

Their findings come with caveats. Information is hard to come by, partly because the International Atomic Energy Agency does not publish a full list of International Nuclear Event Scale-rated events. Choices necessarily made by scholars tackling these issues greatly affect the conclusions. For example Rose and Sweeting exclude core-melt accidents in research reactors, they exclude the Windscale / UK 1957 fire on the grounds that it involved a military reactor, and they count Fukushima as one core-melt accident instead of three.

Rose and Sweeting conclude with a parting shot at the IAEA for its indefensible refusal to release data it has at its disposal:

*“In conclusion, the number of core-melt accidents that can be expected over time in nuclear power stations is larger than previously expected. To assess the risk of similar events occurring in the future, it is necessary to determine whether nuclear power operators learn from their experiences. Our work shows that it is possible to investigate such learning effects through statistical analysis. Until the IAEA makes the relevant data available, however, the full story of accident probability and learning effects will remain untold.”*

## Scientists for Global Responsibility

A somewhat similar analysis by Spencer Wheatley, Benjamin Sovacool and Didier Sornette has been published by Scientists for Global Responsibility.<sup>3</sup> The authors compiled a dataset of 184 events from 1950

to 2014 that resulted in losses of US\$20 million (€18m) or more (inflation-adjusted). One of their conclusions is more positive than Rose and Sweeting: they find that the frequency of accidents dropped substantially after Three Mile Island (TMI) and Chernobyl, and has remained relatively constant since.

That is no reasons for complacency as the authors go on to explain:

*“This is good news, but not an adequate improvement: the post-TMI distribution is so heavy tailed that the expected severity is mathematically infinite. This is reflected by the fact that the severity of Fukushima is larger than the sum of all remaining events. This point cannot be emphasized enough, as it implies that, if one wants to reduce the total risk level, one needs to effectively exclude the possibility of the most extreme events. Put simply, we need to move to a situation where major nuclear accidents are virtually impossible.”*

On the basis of their analysis the authors estimate that:

- one event per year causing damage in excess of US\$20 million should be expected.
- there is at least a 50% probability of a Chernobyl-type event (causing about US\$32 billion (€28.7b) in damage costs) happening in the next 30-60 years.
- there is at least a 50% probability of a Fukushima-type event (US\$170 billion, €153b) happening in the next 65-150 years.

They state that while their estimates are highly uncertain, they are much larger than what industry estimates would suggest.

## U.S. safety regime flawed

“I am confident that the legacy of Fukushima Daiichi will be a sharper focus on nuclear safety everywhere,” said IAEA Director General Yukiya Amano in a March 10 media release. “There is widespread recognition that everything humanly possible must be done to ensure that no such accident ever happens again.”<sup>4</sup>

But the reality doesn’t match the rhetoric and the situation in the U.S. provides one example. The Union of Concerned Scientists (UCS) has released a report on the failure of the U.S. nuclear power industry to adequately respond to safety flaws in the five years since Fukushima, as well as the failures of the Nuclear Regulatory Commission (NRC).<sup>5</sup>

After Fukushima, the NRC set up a task force to analyze what happened at Fukushima and assess how to make U.S. reactors safer. In July 2011, the task force offered a dozen recommendations to help safeguard U.S. nuclear plants in the event of a Fukushima-scale accident. Unfortunately, the NRC has since rejected or significantly weakened many of those recommendations and has yet to fully implement the reforms it did adopt. The UCS report also finds that the NRC abdicated its responsibility as the nation’s nuclear watchdog by allowing the industry to routinely rely on voluntary guidelines, which are, by their very nature, unenforceable.

Among many other problems, the NRC decided to continue to allow plant owners to develop their own voluntary plans for managing a core-melt accident, rejecting a task force recommendation to require them to do so. If plans are voluntary, the NRC has no authority to review them or issue citations when they are deficient.

“Once again, the NRC is ignoring a key lesson of the Fukushima accident: Emergency plans are not worth the paper they are printed on unless they are rigorously developed, maintained, periodically tested, and subject to

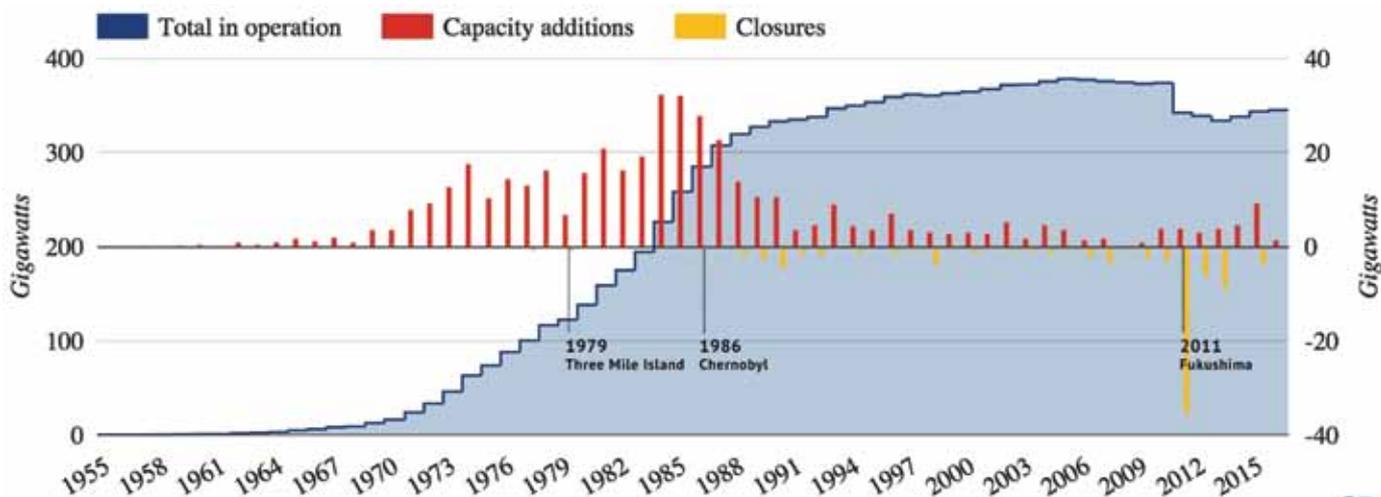
NRC inspection and enforcement,” said Edwin Lyman from the UCS. “When it comes to many critical safety measures, the NRC is allowing the industry to regulate itself.”

The UCS recommends a revised regulatory framework; expedition of transfer of spent fuel to dry casks; increased emergency planning zone sizes (beyond the current 10-mile radius); increased NRC oversight of operator guidelines instead of voluntary guidelines that are not subject to NRC enforcement; and validation of FLEX strategies that aim to make emergency equipment readily available to reactors during extreme events.

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# NUCLEAR NEWS



## Mapped: The world's nuclear power plants

Carbon Brief has produced a useful online resource showing the location, operating status and generating capacity of all 667 power reactors that have been built, or are under construction, around the world. The website also provides a useful snapshot of the sick and sorry state of the nuclear power industry worldwide, with statistical information on increased construction times, the aging of the global fleet of nuclear reactors, nuclear power's economic negative learning curve, and nuclear's falling share of worldwide electricity generation.

[www.carbonbrief.org/mapped-the-worlds-nuclear-power-plants](http://www.carbonbrief.org/mapped-the-worlds-nuclear-power-plants)

## No prosecution for massive spill at Australian uranium mine

In December 2013 a tank collapse resulted in a spill of 1.4 million of radioactive slurry at the Ranger uranium mine in Australia's Northern Territory. Investigations found that damage to a rubber liner had allowed the acidic mixture to corrode the steel wall of the tank, leading to its failure. Operations at the mine were suspended for six months.

Over two years later, the NT Department of Mines and Energy has decided not to prosecute Rio Tinto subsidiary Energy Resources of Australia (ERA) for the massive spill. The Department claimed "that it is not in the public interest to prosecute ERA under the Mining Management Act" ... or any other Act.

The decision was “derelict, deficient and deeply disappointing”, said Dave Sweeney from the Australian Conservation Foundation. “Many people expected the regulator to step up and regulate – these people and Kakadu deserve better than this failed and flaccid response from the Department.”

Greens Senator Scott Ludlam said: “The regulator failed to prevent the spill, they took years to deliberate, and came up with nothing. They’ve essentially announced to mining companies in the NT that there are no legal consequences for catastrophic negligence. We urge the NT government to reverse this decision immediately and force ERA to be accountable.”

Under the terms of ERA’s lease all mining and processing at Ranger is required to cease by January 2021. The company is legally obliged to rehabilitate the site so it can be incorporated into the surrounding World Heritage listed Kakadu National Park by 2026.

[www.acfonline.org.au/news-media/media-release/no-bark-no-bite-plenty-fleas-nt-mine-%E2%80%98watchdog%E2%80%99-kakadu-response-derelict](http://www.acfonline.org.au/news-media/media-release/no-bark-no-bite-plenty-fleas-nt-mine-%E2%80%98watchdog%E2%80%99-kakadu-response-derelict)

<http://scott-ludlam.greensmps.org.au/content/media-releases/what-regulator-again>

[www.world-nuclear-news.org/RS-Ranger-leach-tank-investigation-closed-1202167.html](http://www.world-nuclear-news.org/RS-Ranger-leach-tank-investigation-closed-1202167.html)

### Switzerland to start nuclear phase-out in December 2019

BKW is to permanently shut down its 373 MW Muehleberg nuclear power plant in western Switzerland on December 20, 2019, the company said on March 2. Muehleberg is to be the first Swiss nuclear plant to close under a federal government plan to phase out the country’s entire 3.3 GW nuclear fleet by 2035. BKW had intended to operate the plant until 2022, but in October

2013, the company announced it would close the plant in 2019, three years ahead of schedule, to avoid making long-term investments in the plant. BKW concluded that a weak power price outlook – in particular impacted by continuing expansion in renewable power in neighbouring Germany – could not justify the significant investments required for longer-term operations.

<http://analysis.nuclearenergyinsider.com/swiss-start-shutdown-dec-2019-doe-advances-smr-siting-idaho>

*Situation of the five Swiss nuclear power reactors as of August 2015:*

Beznau I	365 MW	46 years old
Beznau II	365 MW	44 years old
Mühleberg	373 MW	43 years old
Gösgen	970 MW	36 years old
Leibstadt	1190 MW	31 years old

### Nuclear energy conference in Prague

The third annual Nuclear Energy Conference, ‘Nuclear Energy – Expensive Gamble’ will be held in Prague on Tuesday April 5, 2016. It is organized by Hnutí DUHA (FoE Czech Republic), Calla – Association for Preservation of the Environment, and South Bohemian Mothers. Emmerich Seidelberger will address risks of the nuclear power industry in the world; Ian Fairlie will reflect on the Chernobyl disaster; speakers will address nuclear safety issues in Belgium, Slovakia and France; Oda Becker and Jan Jílek will report on the results of the risk and safety assessments carried out in response to Fukushima; and Tobias Heldt will discuss the issue of limited liability for nuclear damage. The Conference is free of charge. Translation into English, German and Czech will be provided.

Contact: [magersteinova@centrum.cz](mailto:magersteinova@centrum.cz)

Web: [www.nec2016.eu/images/pdf/NEC\\_2016\\_EN.pdf](http://www.nec2016.eu/images/pdf/NEC_2016_EN.pdf)

## WISE/NIRS Nuclear Monitor

The World Information Service on Energy (WISE) was founded in 1978 and is based in Amsterdam, the Netherlands.

The Nuclear Information & Resource Service (NIRS) was set up in the same year and is based in Washington D.C., US.

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, proliferation, uranium, and sustainable energy issues.

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 (pdf format) version. Old issues are (after 2 months) available through the WISE homepage: [www.wiseinternational.org](http://www.wiseinternational.org)

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