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### 1. Catastrophe clouds nuclear future

From: The Australian March 14, 2011 12:00AM

<http://www.theaustralian.com.au/news/features/catastrophe-clouds-nuclear-future/story-e6frg6z6-1226020728300>

**EVEN as Japanese authorities frantically fought to contain radiation leaks from nuclear power plants over the weekend questions are beginning to be asked whether they can ever be secure in earthquake zones. And the future of the nuclear industry across the world, set for possible expansion as an alternative to coal-fired electricity generators, is again coming under a cloud.**

The crisis started with Friday's massive earthquake and tsunami disaster, one of the worst on record in Japan, which caused electricity blackouts and led to malfunctions of the cooling systems in the reactors. of the Fukushima No. 1 plant, 250km north of Tokyo.

Authorities immediately declared a nuclear emergency and scrambled to prevent two reactors from overheating by pumping in water and releasing steam to depressurise them. Operator Tokyo

Electric Power took the drastic step of using sea water for cooling when a huge explosion Saturday tore away the outer concrete housing of one reactor.

The operator warned that another reactor, was also overheating and that so much water had evaporated at one stage that the top three metres of fuel rods were exposed to the air.

According to a TEPCO spokesman yesterday, radiation levels topped the permitted maximum leading to evacuations in a 20km radius of Fukushima 1 and areas surrounding nearby Fukushima No. 2, which has four reactors. Last night officials admitted there was a risk of another explosion, but said there would be no threat to life.

The assurance seemed of little comfort to millions of Japanese after two days without electricity and drinking water and a developing sense that the power company and government was overwhelmed by the problem with the reactors and the risk of radiation. Although officials say the risk of people being exposed to harmful radiation is small some 200,000 have been evacuated from a 20km radius around the first plant and another 30,000 from a 16km radius around a second Fukushima plant.

It seems the nuclear threat was at first a slow burn. For engineers at the Fukushima plant, during the hour or so after it was rocked by the first tremors on Friday, it looked as though the plant had ridden out the quake.

The plant is one of several on Japan's east coast, all facing towards the giant underwater fault that produced the quake and the tsunami it generated. While all the country's nuclear plants are designed to shut down after an earthquake; this has turned out to be less reassuring than it sounds.

Nuclear reactors produce heat in two ways: one is simple fission, where atoms are split to produce heat that generates electricity plus the neutrons that keep the nuclear chain reaction going. This process can be shut down in an instant by pushing control rods into the fuel.

However, there are far less controllable processes at work in all reactors.

According to Robin Grimes, director of the Nuclear Energy Centre at Imperial College London, "when you split an atom you get heat and radiation, but you also get two new atoms which then undergo further radioactive decay. That decay produces about 10 per cent of a reactor's heat output, and there is nothing we can do to stop it. It generates an incredible amount of energy and it takes days to die down."

So, even when a reactor has been technically shut down it is essential that cooling continue. If it does not, the heat will build up and melt the reactor core. At Fukushima that meant engineers had to keep pumping water through the core or face disaster. Initially all appears to have worked as intended. Three of the plant's six reactors were in operation when the quake hit and they automatically shut down. But then their normal cooling system stopped, too.

The plant operators started to remove the heat caused by nuclear decay with emergency diesel generators. But these failed about an hour later, perhaps because of flooding. When the hydrogen-filled steam was vented from the reactor vessel, the hydrogen reacted with oxygen, either in the air or water outside the vessel, and exploded. A similar "hydrogen bubble" concerned officials at the 1979 Three Mile Island nuclear disaster in Pennsylvania until it dissipated.

If the temperature inside the Fukushima reactor vessel continued to rise it could eat through the bottom of the reactor vessel. Next, it would eat through the floor of the already-damaged containment building. At that point, the uranium and dangerous by-products would start escaping into the environment.

At some point in the process, the 15cm stainless steel walls of the reactor vessel would melt into a lava-like pile, slump into any remaining water on the floor, and potentially cause an explosion much bigger than the one caused by the hydrogen. Such an explosion would enhance the spread of radioactive contaminants. If the reactor core became exposed to the external environment, officials would likely begin pouring cement and sand over the entire facility, as was done at the 1986 Chernobyl nuclear accident in the Ukraine, Peter Bradford, a former commissioner of the

US Nuclear Regulatory Commission, said in a briefing for reporters.

Ken Bergeron, a physicist and nuclear waste expert, added that as a result of such a meltdown the surrounding land would be off-limits for a considerable period of time, and "a lot of first responders would die".

As the authorities battle to avert a meltdown at the Fukushima plant, it emerged that a senior figure in Japan's nuclear community had resigned in protest from a safety panel saying guidelines to protect atomic power plants from earthquake damage were too lax.

Ishibashi Katsuhiko, a professor at Kobe University, said seismic guidelines brought in to protect Japan's 55 reactors in 2006 were "still seriously flawed".

He pointed out that big quakes had taken place in "close proximity" to three nuclear power plants in Japan from 2005 to 2007. In each case, the ground motion caused by the quake was stronger than that for which the plants had been designed. A tremor at the Kashiwazaki-Kariwa plant, less than 320km across the main island from Fukushima, had experienced a tremor with ground motion of 993 gal (a measure of ground movement), far beyond its design value of 450 gal. "Not only are the new design guidelines defective but the system to enforce them is in a shambles," wrote Katsuhiko after his resignation. He said it was just a matter of luck that the epicentre of each earthquake had not been nearer.

In an article in 2007 explaining his resignation, Katsuhiko said almost all of the Japanese archipelago had entered a period of brisk seismic activity since the Kobe earthquake of 1995.

"Unless radical steps are taken now to reduce the vulnerability of nuclear power plants to earthquakes, Japan could experience a true nuclear catastrophe in the near future," he wrote.

While the focus for now is on how Japan copes with the threat of an earthquake-induced nuclear disaster how the country came so close to an abyss will dominate politics for months to come and create questions about the 55 nuclear reactors that produce 30 per cent of Japan's electricity.

It will also impact on the nuclear industry's international push to become an alternative clean energy to solar and wind power.

Until the weekend the US nuclear power industry believed it was poised for a renaissance. President Obama's 2012 budget proposed \$36 billion in loan guarantees to build nuclear power plants. He had also called for hundreds of millions for nuclear energy research and modern reactor design. Powerful Republicans were on board, calling for expansion of nuclear power.

But industry experts and analysts are already pondering the political fallout in the US and whether this disaster will lead to a repeat response to that which followed the 1979 nuclear accident at Three Mile Island in Pennsylvania which froze the nuclear power industry in the US for 30 years.

The Three Mile Island incident--sparked by the failure of a cooling system--did not cause any deaths, but many Americans were terrified by the plant's move to vent radioactive steam into the air and by ominous talk of a potential meltdown. The 1986 nuclear accident at Chernobyl only reinforced American scepticism of nuclear power.

In recent years, the industry has steadily chipped away at that wariness. Industry executives and their political allies promote nuclear power as clean energy, because, unlike coal or natural gas, it does not produce the greenhouse gases linked to global warming. Industry boosters also call nuclear power an ideal way to break the nation's dependence on fossil fuels, especially oil from the Middle East.

The U.S. currently has 104 nuclear plants in 31 states, which produce 20 per cent of the nation's electricity. The Nuclear Regulatory Commission is now reviewing 20 more licence applications from a dozen companies seeking to produce nuclear power. Site preparations for new reactors have begun in Georgia and South Carolina, and plans are under way to finish a reactor that was started years ago but never completed in Tennessee. That reactor should come online in 2013 and those in South Carolina and Georgia are expected to begin operations in 2016. All told, the industry expects up to eight new reactors to be churning out power by 2020.

Peter Bradford predicts Americans would respond to the Japanese disaster with "greatly heightened scepticism and heightened unwillingness to have nuclear power plants located in one's own neighbourhoods". "The image of a nuclear power plant blowing up before your eyes on the television screen is a first," Bradford says. "That cannot be good for an industry that's looking for votes in Congress and in the state legislatures."

Even before the explosion in Japan, economic reality had taken a bite out of the nuclear industry's ambitious expansion plans in the US. Natural gas has been so cheap that utilities have turned to it to generate electricity, rather than contemplate building multi-billion-dollar reactors.

In Australia, the federal government and the opposition have both refused to buy into a debate on nuclear energy following Fukushima.

However, ALP president and Queensland premier Anna Bligh, who called for a debate on domestic nuclear power in December said the explosion was "cause for some pause and consideration before we see anybody jumping to invest in that sort of energy, particularly here in Australia".

The Australian Greens say Fukushima is another pointed reminder for Australia not to go down the nuclear route.

Greens leader Bob Brown used the incident as an argument against nuclear, which he labelled a delicate and unsafe technology.

"It's the potential for terrorism, you can't have it in flight paths, it needs to be built next to big areas of population . . . it takes up a lot of water, it's enormously expensive," he told Sky News.

"We have much better alternatives, thank God."

## **2. Even in earthquake zones, nuclear power is still a safe option**

Ziggy Switkowski

From: The Australian March 14, 2011 12:00AM

<http://www.theaustralian.com.au/national-affairs/even-in-earthquake-zones-nuclear-power-is-still-a-safe-option/story-fn59niix-1226020737031>

### **AS Japan deals with its earthquake-crippled nuclear power plants, questions are being asked.**

Why does such a geologically active region have nuclear power stations?

For an energy-hungry but resource-poor country with skilled engineers, nuclear power was and is an obvious answer. The industry has performed well for more than 40 years and helped propel Japan to technical and economic leadership.

In Australia, opponents of nuclear power already point to the situation in Japan as evidence of the dangers of nuclear reactors. They conveniently sidestep the loss of life and damage caused by exploding oil tanks, burst gas mains, electrical fires: hazards that come with living in a tectonically active region.

Japan has 55 reactors that generate about 30 per cent of its electricity. Half of these reactors are in eight power plants in the Sendai region. When the magnitude 8.9 earthquake hit, 20 reactors were operating. Eleven shut down as sensors reacted to the shifting earth and the remaining nine continued to operate safely. As they were designed for a geologically active region, the shutdown of the reactors went according to plan.

Under normal circumstances the core of a reactor operates at about 600 degrees C. Water circulating around the core is heated beyond boiling point, and the steam drives a turbine that produces electricity. A nuclear core is analogous to a coal or gas-fired furnace.

Without sufficient circulating water, however, even when a working reactor is shut down residual

radioactivity can push the core temperature to levels well in excess of 1000 degrees, causing dangerous pressure increases from steam and hot and radioactive gases. If unchecked, a partial core meltdown could follow, rendering the reactor inoperable. This happened at Three Mile Island in the US 1979.

Following the insertion of control rods to stop the chain reaction, cooling must be maintained. However, at the Fukushima plant where four reactors were online, the earthquake knocked out mains electricity and then the tsunami front flooded and destroyed some backup power supplies.

For one, and perhaps two reactors, this created an especially difficult situation as cooling circuit pumps failed. Reviews ahead may well investigate whether such a situation could have been better planned for.

The focus of the Japanese nuclear community has been to restore sufficient cooling to these reactors. However, as shown in graphic television pictures, the housing of the 35-year-old Fukushima No 1 reactor, though not the steel containment vessel within which resides the nuclear core, was blown out following an explosion that is presumed to be from excessive build-up of hydrogen associated with the cooling problem. This makes access to this reactor more complicated. (Nuclear reactors cannot have an atomic explosion but the combination of high-pressure gases, superhot water and electrical circuitry contains all the components for a powerful chemical or electrical explosion.)

Instruments to measure heightened levels of radioactivity are extensively deployed and very sensitive. Whenever radiation leakage is measured in the vicinity of a power station, a series of protocols is followed: community warnings, then evacuation from progressively larger areas. If there is a likelihood of measurable fallout, a subsequent step is distribution of iodide tablets to help saturate relevant organs in our body with benign iodine and inhibit the uptake of radioactive iodine in the air or from food. This is especially critical for young children.

Most of us are exposed to about 4 millisieverts (mSv) of mainly background radiation each year. Radiation workers are allowed 50mSv per year. At the current radiation level reported at the perimeter of the damaged Fukushima plant, an individual dose would exceed 50mSv after about a week's continuous exposure. Measurable radiation poisoning occurs at a much higher level still.

Controlled venting of excess and mildly radioactive gases is happening, will result in some community exposure to radiation, but is very unlikely to have an effect on community health. At this time, only workers on site are likely to have had elevated radiation exposures. In the context of the general devastation from the earthquake and tsunami, any health or property damage arising from the affected reactors is likely to be small.

If core cooling can be satisfactorily restored, then in the best case local residents could return to their homes in days.

Engineers have taken extraordinary steps to get coolant to the reactor of most concern, flooding the core with seawater. This is a step probably not in the playbook and reflects grievous concerns about core integrity. Still, the combination of venting and seawater flushing should stabilise the situation in the days ahead. The reactor itself is a write-off.

Plans in Japan anticipate further growth in nuclear power but an earthquake of this magnitude followed by a huge tsunami may well demand another look at design specifications.

We will learn from the tragic Japanese experience how to build more robust reactors, how to ensure multiple layers of protection work properly, how to better contain radioactive gases. But when the grisly causes of fatalities, injuries and asset damage are eventually itemised nuclear facilities may not even feature.

*Ziggy Switkowski is chancellor of RMIT and a former chairman of the Australian Nuclear Science and Technology Organisation*

### **3. Fukushima meltdown is worst reactor accident for a decade**

Jodie Minus

From: The Australian March 14, 2011 12:00AM

<http://www.theaustralian.com.au/fukushima-meltdown-is-worst-reactor-accident-for-a-decade/story-fn84naht-1226020752665>

**THE full impact of the Japanese nuclear explosion is yet to be known, but the accident ranks as the country's worst nuclear disaster since 1999, when two people died from radiation sickness at another nuclear plant in the same Tohou region.**

The explosion at the Fukushima Daiichi nuclear power plant, following last week's earthquake and tsunami in the northeast of the island, was rated a level-four on the International Nuclear Event Scale as an "accident with local consequences" likely to result in at least one radiation death.

The last such nuclear event on that scale was 12 years ago at the Tokaimura nuclear power plant, one of the country's 55 nuclear reactors, and a three-hour drive south of Fukushima.

The Tokaimura accident occurred on September 30, 1999, when inexperienced workers combined too much uranium, causing a critical mass resulting in the release of radioactive material. About 39 workers were exposed to radiation, and two died.

The International Nuclear Event Scale was introduced in 1990 by the International Atomic Energy Agency to rate the safety significance of nuclear accidents. The devastating Chernobyl nuclear disaster in April 1986 was rated as a level-seven on the INES scale -- the maximum rating -- and is considered the worst nuclear accident in history and the only one classified by the IAEA as a major accident.

The Chernobyl accident occurred after a routine test, when a power surge destroyed the plant's reactor four, releasing massive amounts of radioactive material.

Two of the plant's 600 workers died within hours, while 134 received high radiation doses and suffered from acute radiation sickness, with 28 dying within four months of the explosion.

#### **4. Plant leaks highlight 'atomic energy risks'**

Brendan Nicholson

From: The Australian March 13, 2011 9:59PM

<http://www.theaustralian.com.au/plant-leaks-highlight-atomic-energy-risks/story-fn84naht-1226020750741>

**THE explosions in a Japanese nuclear power plant triggered immediate strong warnings from Australian environmentalists on the dangers of atomic energy.**

David Noonan of the Australian Conservation Foundation said the terrible human cost of the earthquake in Japan was being made even worse by radiation escaping from damaged reactors. Mr Noonan said Australian uranium was used by the company that ran the Fukushima plants.

"Nuclear is a high-cost, high-risk electricity option that has no place in a sustainable energy future," Mr Noonan said.

But a strong proponent of nuclear power for Australia, Ziggy Switkowski, the chancellor of RMIT and former chairman of the Australian Nuclear Science and Technology Organisation, said more nuclear power stations could be built in Japan, but the damage caused by the earthquake and tsunami would mean tougher design specifications and more robust reactors.

Dr Switkowski said it was predictable that questions were being asked about why nuclear power stations operated in such a geologically active region.

"For an energy-hungry but resource-poor country with skilled engineers, nuclear power was and

is an obvious answer," he said. "In Australia, opponents of nuclear power already point to the situation in Japan as evidence of the dangers of nuclear reactors, conveniently sidestepping the loss of life and damage caused by exploding oil tanks, burst gas mains and electrical fires -- hazards that come with living in a tectonically active region," he said.

"We will learn from the tragic Japanese experience how to build more robust reactors, how to ensure multiple layers of protection work properly, how to better contain radioactive gases."

Julia Gillard and Tony Abbott both declined to be drawn on the broader nuclear debate yesterday.

"We need to focus just now on what the people of Japan need us to do," the Prime Minister said. "All of those things will, no doubt, be the subject of scrutiny and debate, but I don't think today is the day."

The Opposition Leader said the Coalition had no plan to promote nuclear power.

Greens leader Bob Brown said the episode reinforced the need for Australia to develop its opportunities for safe energy sources and not nuclear power.

"The proponents of nuclear power in Australia will know that if we were to go that direction, the region will follow suit," Senator Brown told Sky News.

"That includes Indonesia, where there are proposals for 11 or 13 nuclear reactors in Java, in the so-called 'Ring of Fire' in earthquake-prone areas.

"It's an unsafe technology. It's not just earthquakes, it's the potential for terrorism.

"You can't have it in flight paths, it needs to be built next to big areas of population energy use, it takes up a lot of water, it's enormously expensive and we have much better alternatives, thank God," he said.

ALP national president and Queensland Premier Anna Bligh said the explosion was "cause for some pause and consideration" in dealing with the notion of nuclear energy. "I don't think there's any doubt that the explosion in the nuclear power plant in Japan will be a great cause for caution before we see anybody jumping to invest in that sort of energy, particularly here in Australia," she said.

But she said this was not the right time for a full debate on the issue.

*ADDITIONAL REPORTING: AAP*

## **5. Facing down the fear of fallout**

Brendan Nicholson and Stephen Matchett

From: The Australian March 15, 2011 12:00AM

<http://www.theaustralian.com.au/news/features/facing-down-the-fear-of-fallout/story-e6frg6z6-1226021355097>

**THE shadow of Chernobyl hangs over the desperate effort to prevent reactors melting down at Fukushima in Japan, and the terror the risk of a radiation cloud over Pennsylvania created in 1979 dances in evil attendance.**

While nuclear energy has a strong safety record, even in countries such as Japan, which relies on it for 30 per cent of power, people still fear it.

And now they are waiting to see if those fears are justified, if the nuclear genie is almost out of the bottle, if the 80,000 people already evacuated from Fukushima's surrounds were at real risk of being poisoned by the broken reactors.

More modern Japanese plants such as Fukushima pose less of a threat than Chernobyl because they have a steel containment chamber that stops the enormous plume of radiation that spread across eastern Europe in 1986.

Fukushima also used water instead of the carbon employed at Chernobyl, reducing the threat posed by a giant shower of radioactive soot.

There is a view that nuclear power is safe in the hands of the highly organised Japanese and their success in building nuclear power stations in earthquake-prone areas is cited as a reason it would be safe to build nuclear power stations in areas of Indonesia in the so-called Ring of Fire that is prone to earthquakes and volcanoes.

But anxious Japanese have noted a tendency of their nuclear authorities to understate the danger from previous problems.

For people who have survived an earthquake and a tsunami, the threat of radiation poisoning is a grim fate, which reminds co-author Brendan Nicholson of what he saw when he visited Chernobyl five years after the 1986 disaster. Then, fear and fatalism lay heavily amid the silver birches and daffodils that surrounded the nuclear power station.

Three of its four reactors were still operating and most of the electricity they produced was carried on giant cables to Germany to earn Ukraine badly needed foreign exchange. But reactor No 4 lay buried within a giant concrete sarcophagus built to contain its active nuclear fuel.

Nuclear specialists insist the Japanese nuclear power stations hammered by the earthquake and tsunami are too robust to produce another Chernobyl. They argue that in nuclear-dependent countries such as Japan and France (which relies on this source of energy for half its electricity), Fukushima should not panic people.

Ziggy Switkowski, chancellor of RMIT University, former chairman of the Australian Nuclear Science and Technology Organisation and a strong proponent of nuclear power for Australia, says more nuclear power stations could be built in Japan but they'll be of tougher design with more robust reactors.

Switkowski says it is predictable that questions are being asked about why nuclear power stations operated in such a geologically active region.

"For an energy hungry but resource-poor country with skilled engineers, nuclear power was and is an obvious answer," he tells The Australian.

The industry has performed well for more than 40 years and has helped propel Japan to technical and economic leadership.

Switkowski says opponents of nuclear power are already pointing to the situation in Japan as evidence of the dangers of nuclear reactors, which conveniently sidesteps the loss of life and damage caused by exploding oil tanks, burst gas mains and electrical fires that come with conventional power generation.

"We will learn from the tragic Japanese experience how to build more robust reactors, how to ensure multiple layers of protection work properly, how to better contain radioactive gases," he says.

There are certainly lessons to learn, some still dating to April 26, 1986, in Ukraine, where design flaws and human error combined to create the disaster that has become the benchmark for everything that can go wrong in the nuclear power industry.

The four reactors at the Chernobyl power station produced electricity by heating water to steam that turned a generator turbine. Soviet reactors were badly designed and the reactor did not have the big containment walls common in Western reactors.

The reactor was designed to slow down if it overheated but an experiment to test this went badly wrong. The emergency shutdown procedure failed, the reactor fuel ruptured and a violent explosion of steam and gas blew the 1000-tonne roof off the reactor building.

That was followed by a second explosion. Temperatures reached over 2000C and the fuel rods melted. The graphite covering of the reactor caught fire and burned for 10 days, spewing vast amounts of radioactive material into the air.

In all, 57 people died as an immediate result of the explosions.

Nuclear regulators estimate that about 4000 people, most of them children, developed thyroid cancer as a result of their exposure to radiation and, by the end of 2002, 15 of them had died.

Doctors estimate a further 4000 people in the areas with highest radiation levels could eventually die of cancer caused by radiation exposure. About 6.8 million other people living farther from the explosion received a much lower dose of radiation and it has been estimated 5000 of them could die from illness caused by that exposure.

In comparison, the Three Mile Island accident barely rates. According to a report from the US Nuclear Regulatory Agency the crisis began when the feedwater pumps that cooled the reactor failed and the reactor automatically shut down in the early morning of March 28, 1979. This inevitably led to a pressure increase that triggered a safety valve automatically opening. But the valve, designed to close when the pressure dropped, also failed. Even worse, a second system failure meant plant operators thought everything was working properly.

The result was cooling water continued to pour out of the valve, causing the core of the reactor to overheat.

Alarms were sounding across the system, alerting operators to contradictory problems, but with no evidence that the temperature of the nuclear core was compromised they reduced the coolant flow to it, thus making the situation worse.

Without the required cooling, the tubes holding nuclear pellets ruptured and the fuel itself began to melt, resulting in a severe core meltdown. This could have led to a breach of the walls containing the reactor and a large release of radiation into the atmosphere, but the defences held.

This first stage of the crisis occurred across 12 hours or so and, although there was a small release of radioactive gas in the late morning, by evening the core had cooled and the reactor seemed stable.

However, on March 30, repair measures led to a second problem: radioactive gases from the reactor cooling system had built up in a tank in the auxiliary building and plant operators were pumping it to tanks designed to allow it to decay. But the compressors pumping the gas leaked and radiation was released into the atmosphere. The news generated panic in Harrisburg, Pennsylvania, the closest city to the plant.

The crisis finally concluded at the end of April when the reactor core cooled and was shut down.

For all the terror Three Mile Island created, it caused no fatalities and the World Nuclear Association claims the amount of radiation released was a fraction of that used in chest X-rays.

A 1984 survey of doctors in the region found no increase in illness among locals that could be attributed to the accident and a 1993 state government survey found no rise in radiation-related cancer.

Comparisons are being made between the explosion at the Fukushima nuclear power plants and these two crises.

But the Japanese crisis is nowhere near over and, while there is hope the dimensions of Japan's disaster will be more of a Three Mile Island than a Chernobyl catastrophe, last night there was an explosion in the outer chamber of another reactor.

What all three accidents have in common is human error. The mistakes at Fukushima were made long before Friday's earthquake. According to The New York Times, the diesel generators intended to provide back-up power for the pumps that cooled the reactor core failed because they were built behind a sea wall on low-lying coastal ground. It was a barrier Friday's tsunami easily overwhelmed. Once the generators went out, the back-up batteries could not last for long and, as in Ukraine and Pennsylvania, the water level in the reactor started to fall.

According to the Japanese nuclear safety agency, at one stage half the length of each 3.6m long fuel rod in the Fukushima No 1 plant was out of the water. By late Saturday night officials of the

Tokyo Electric Power Company made a desperate decision that demonstrated how hot things were getting.

Even after a nuclear chain reaction is stopped, a reactor continues to emit heat, which has to be cooled by water, and the ocean was the only available source. To reduce the temperature of the reactor core, TEPCO started injecting sea water (reportedly using fire engines) mixed with the chemical element boron, which can squelch a nuclear reaction. In the process TEPCO accepted that the corrosive sea water will permanently disable the plant's core.

It was hopefully as close as Japan has come to a Chernobyl moment, its equivalent of entombing the Ukrainian plant in concrete. Fortunately, TEPCO was able to act before a complete meltdown or large release of radiation from more explosions, while the Japanese government has ordered evacuations for a 20km radius around the Fukushima complex; this appears to be a precaution. But whether flooding, and writing off, reactors will work is not yet known: there are reports of other plants that are too hot for comfort.

Tilman Ruff, associate professor in the University of Melbourne's Nossal Institute for Global Health and chairman of the international campaign to abolish nuclear weapons, says companies running nuclear power plants in Japan have covered up potentially dangerous problems in the past.

Leaving aside the latest accident, Ruff says the increased threat of nuclear proliferation and problems disposing of waste are good reasons to avoid using nuclear power. "In terms of power generation . . . it's way too dangerous to be a safe or sustainable way to boil water."

But Switkowski insists what is happening in Japan is not close to what happened at Chernobyl.

The combined impact of the earthquake and tsunami has been many times greater than any disaster envisaged at the Japanese plan, Switkowski says, adding the Soviet reactor was a poor design and the technicians involved had much less understanding of the proper processes to follow.

"Having said that, we will learn from the Japanese experience. That will expose some gaps in our response mechanisms. . . . They will be quickly incorporated into revised protocols and then followed by the industry." Japan had a choice of developing nuclear power or relying on imported energy. "They'll study the infrastructure that survived the earthquake and tsunami and incorporate those lessons into new designs."

## **6. Blind to real disaster, fearmongers go into their own meltdown**

15 Mar 2011

The Australian

BRENDAN O'NEILL Brendan O'Neill is the editor of Spiked online.

<http://theaustralian.newspaperdirect.com/epaper/viewer.aspx>

The culture of fear talking up a Japanese nuclear holocaust is unhealthy and myopic.

IT is testament to the ascendancy of apocalyptic thinking that many are now looking at Japan and thinking: "Will it get even worse?" It is not enough, apparently, that there has been a monumental tragedy, with thousands of people killed by the tsunami that was unleashed by Friday's earthquake. No, many observers are now fantasising about a possible meltdown at a nuclear energy station that was badly shaken by the quake, which apparently could give rise to a radioactive holocaust that would make nature's fury look like a tea party in comparison.

The speed and gritty determination with which Western reporters and experts myopically turned their gaze to the nuclear power station in Fukushima in northern Japan has been extraordinary. And it has been driven not by hard evidence that there will be a devastating radioactive leak, but by a culture of fear which feverishly seeks out the worst-case scenario; by an almost

pornographic apocalyptic outlook unsatisfied by the images of waves of water wiping away towns and villages — no, it needs a nuclear component to this tragedy too.

It is worth putting the instability at the Fukushima plant into some perspective. Yes, it is profoundly worrying when a nuclear reactor experiences serious problems. Despite the fact that the tremor on Friday triggered an automatic shutdown of Fukushima, along with 11 of Japan's other nuclear reactors, still workers struggled to get things under control. Once Fukushima was automatically disconnected from Japan's national energy grid, it became reliant on its dieselpowered emergency generators for the purposes of keeping cool and safe. However, these generators failed, and so workers at Fukushima used mobile generators, trucked-in seawater and the trick of releasing some radioactive vapour (which is not harmful to the environment or humans) to try to keep the plant as normal as possible. Yet while they managed to get one of Fukushima's working reactors under control, two others proved more problematic. And on Saturday, there was a huge explosion at the power station, which injured four workers and gave rise to headlines around the world about a possible "nuclear apocalypse".

Yes, the situation at Fukushima is serious and still unpredictable. But the things that we do know for certain suggest that the Western media's obsession with what is happening there is seriously overblown and reveals more about us and our fears than it does about the reality on the ground in Japan. For instance, Japanese officials have confirmed that while the explosion caused the partial collapse of the concrete building around one of the nuclear reactors, still the steel container that houses the reactor has not been damaged.

Yes, there was an increase in the radioactive elements caesium-137 and iodine-131 in the vicinity of the troublesome reactors, but these elements have "since been observed to lessen".

We also know that, in the words of the World Health Organisation, the risk to the public from a radiation leak at Fukushima is "probably quite low". However, to be on the safe side, the Japanese authorities swiftly evacuated nearly 200,000 people from a 20km radius around the nuclear plant, which should ensure that, in the event of a leak, no civilians will come to any serious harm.

We also know that, despite the hysterical headlines claiming that there could be "another Chernobyl", in fact the Fukushima plant is very different from the one in the Ukraine which experienced a serious accident in 1986. A Russian nuclear expert said this week that a "Chernobyl-like disaster in Japan is impossible", since there is no graphite at Fukushima, as there was at Chernobyl, and therefore "there is nothing to burn there".

Moreover, if the explosion at Fukushima already makes this the "third-worst nuclear accident in history" — as we're told — then it's worth noting the two other accidents were not as terrible as we're often led to believe. Following the accident at Chernobyl, anti-nuclear campaigners claimed that up to 25,000 people would die as a result of radiation poisoning. In truth, as of 2005, fewer than 50 deaths had been directly attributed to the radiation released by the accident, most of them among highly exposed rescue workers. The other worst accident was the partial core meltdown at the Three Mile Island nuclear plant in Pennsylvania in 1979. Yet this caused no direct deaths, though some experts believe that "one or two" cancer-related deaths in the vicinity may have been linked to meltdown.

So if nuclear accidents have never proved as terrible as Hollywood movies promise, and if it is true that, so far, the problems in Japan's nuclear reactors have been brought under some kind of control, why has there been such an outpouring of media-led panic about a possible radioactive fallout that could spread through Asia and even as far as Europe? Because this coverage is being driven more by the politics of fear than by rigorous analysis. Because our apocalyptic mindset is insatiable; it needs even more than the terrible images already coming from Japan. And because the post-tsunami problems are being disgracefully exploited by environmentalist groups opposed to nuclear power, including Greenpeace, which published an article on Fukushima called "The myth of nuclear containment". The result is that the Western focus is mostly on one nuclear power plant in a country in which entire towns have been destroyed and thousands of people killed. The politics of fear has made us so irrational and self-obsessed that we risk becoming deaf

to the already occurring horrors in Japan.

## **7. Fuel rods exposed at Fukushima nuclear plant**

Peter Alford in Tokyo

From: The Australian March 15, 2011 12:00AM

<http://www.theaustralian.com.au/tens-of-thousands-dead-as-japan-scrambles-to-avert-nuclear-catastrophe/story-fn84naht-1226021465830>

**ANOTHER nuclear safety crisis has erupted at the earthquake-crippled Fukushima Daiichi power plant as fuel rods that became exposed yesterday afternoon might have started melting down.**

A second large explosion at the plant yesterday morning - at the No 3 reactor - heavily damaged the building, injuring three workers. But Fukushima operator Tokyo Electric Power Co last night disclosed an even more dangerous situation existed when the fuel rods at the No 2 reactor became fully exposed.

A Tepco official said water levels fell suddenly as pumps injecting seawater directly into the reactor as an emergency measure lost power.

Pumping has resumed, but Chief Cabinet Secretary Yukio Edano indicated late last night that technicians were still trying to stabilise the situation. Though he added the risk of a major explosion had diminished.

Mr Edano said the explosion at the No 3 reactor yesterday was caused by an accumulation of hydrogen gas, similar to Saturday's situation in the No 1 reactor building. "We (believe) the radioactive material is not spreading widely, however, we would guess that the release of certain levels of radioactive material cannot be avoided," he said.

The US navy confirmed it had moved the aircraft carrier USS Ronald Reagan, support ships and aircraft operations away from Fukushima's vicinity after the carrier's instruments detected a plume of low-level radiation from the damaged plant equivalent to a month's normal exposure.

The Ronald Reagan, operating as an emergency provisioning and search platform since Friday's catastrophic magnitude-9 earthquake and tsunami, was 160km northeast of Fukushima.

The new emergency at Fukushima, one of four nuclear power facilities shut down by the quake and tsunami, came as the area continued to be shaken by magnitude-4-5.5 aftershocks. Significant magnitude-6.2 quakes from a separate fault system about 100km due east of Tokyo rocked the capital. Reports of another large tsunami, which caused panic yesterday, proved to be unfounded.

Emergency services teams found about 2000 bodies along the coast of worst-hit Miyagi prefecture yesterday, raising the known death toll to more than 5000. By late yesterday, 88 countries, including Australia, which dispatched 76 search-and-rescue workers, had offered emergency aid to cope with a disaster that looks likely to cost more than \$US30 billion (\$29.7bn) in insured damage alone. By late yesterday, police had recorded 1647 identified victims and 1720 people officially missing from northeast Honshu.

Although 66,000 self-defence forces personnel had been deployed in six prefectures by last night, some coastal towns further north and in adjoining Iwate prefecture had still not been reached.

Their task and the burden of more than half a million homeless and displaced people occupying more than 2000 shelters in the six prefectures will become harder from today, when harsh weather from the north replaces the relatively balmy conditions. The body count is rising quickly, and about 1000 bodies were seen in Minamisanriku, where more than half the 17,000 population could not be found, and where an Australian team headed last night.

Another 1000 bodies were recovered from beaches along the southern flank of Miyagi's Oshika

Peninsula, washed back in with the tide.

As of last night, about 750 foreign search and rescue workers from 12 countries, accompanied by 35 sniffer dogs, had arrived in Japan.

Daily maximum temperatures today at Sendai are forecast to fall to 6C from 9C yesterday and to 2C by Thursday, with snow showers in the city.

Already, food, water and fuel are in short supply.

The military is deploying more than 100 helicopters and transport aircraft to airlift supplies to stricken areas, while the Coast Guard has 58 vessels engaged in rescue and relief.

The USS Ronald Reagan is stationed off the Miyagi coast and its helicopters were yesterday ferrying 30,000 food parcels to the shore.

Mr Edano said last night the government would immediately spend ¥=30 billion (\$361 million) on emergency food aid and medical supplies to the six stricken prefectures of northeast Honshu.

China, whose relations with Japan have been no better than frosty in recent years, yesterday made available 30 million yuan (about \$4.5m) in emergency assistance, with Premier Wen Jiabao extending "deep condolences" to the Japanese people.

The Bank of Japan, fearing a liquidity seizure in the wake of the disaster, told the markets before yesterday morning's opening it would inject a record ¥=7 trillion in emergency funds.

It followed up with another ¥=5 trillion.

The Tokyo Stock Exchange's first market still lost almost 7.5 per cent yesterday.

While communications are recovering between Tokyo and the four worst-hit prefectures, an estimated 1.4 million phone lines are down and about 9000 mobile relay stations damaged.

Freeways running to northeast Honshu remained closed, although access to undamaged sections was allowed to emergency services vehicles and foreign consular staff.

Bullet train services north of Tokyo remained suspended.

Owing to a series of fires at oil refineries triggered by the magnitude 9.0 earthquake, and the suspension of production at others, gasoline and other oil product supplies are rationed and running low.

Toyota Motor Corp suspended all its Japanese vehicle manufacturing operations until at least Thursday.

Sony, Toshiba and Mitsubishi closed plants in response to quake damage, supply shortages and power blackouts.

## **8. Damaged Fukushima power station to leak radioactive steam for months**

Cameron Stewart

From: The Australian March 15, 2011 12:00AM

<http://www.theaustralian.com.au/damaged-fukushima-power-station-to-leak-radioactive-steam-for-months/story-fn84naht-1226021438289>

**JAPAN may be obliged to release radioactive steam into the earth's atmosphere for months to try to avert a full-scale meltdown at its stricken Fukushima Daiichi nuclear power plant.**

A potentially catastrophic nuclear accident was averted yesterday when the steel container holding the plant's No 3 reactor remained intact despite a hydrogen explosion that damaged the building it is in.

But officials now face a crucial 48 hours as they desperately continue to pump seawater into the plant's badly damaged No 1 and No 3 reactors to cool and stabilise their overheated cores.

Last night, it was reported that the cooling system at the Fukushima plant's No 2 reactor had also failed.

Both the No 1 and No 3 reactors at the plant, 250km north of Tokyo, are now assumed to have suffered at least a partial meltdown after vital water supply was cut and fuel rods were left exposed following last week's earthquake and tsunami.

This has caused the reactor core to overheat and place pressure on its container which, if ruptured, could unleash deadly levels of radiation into the environment.

With 11,000 Australians estimated to be in Japan, the Australian government was last night seeking an urgent update on the status of the damaged nuclear reactors.

Japanese officials at Fukushima are reported to have released low-level radioactive steam from the two damaged reactors to depressurise them as part of the emergency cooling procedure designed to prevent a full-scale meltdown.

US nuclear experts who have been briefed on the status of the two damaged reactors, No 1 and No 3, told The New York Times that even if a larger disaster is averted, which now appears likely, the plant will have to release radioactive steam for months to help cool the reactors.

There is concern over how safe such long-term but low-level radioactive emissions may be.

Japan maintains the radioactive steam is not powerful enough to harm humans, but admits radioactivity near the leaking reactors at the weekend was twice the level it considers to be safe.

Yesterday, officials said radioactive levels at No 3 reactor were no higher than normal.

The Pentagon has reported that helicopters flying 100km from the plant have picked up small amounts of radioactive particles, which are currently being tested.

Japan says it will continue to enforce a 20km exclusion zone around the plant, which has led to 210,000 people being evacuated and more than 20 reportedly suffering the effects of radiation.

Japanese officials had been fearing yesterday's hydrogen explosion at the No 3 reactor would follow a similar explosion on the weekend at the plant's No 1 reactor. Both explosions are believed to have been caused by the build-up of hydrogen between the reactor and the outer buildings.

These outer buildings are designed to crumble under pressure rather than allow a dangerous build-up of pressure that could puncture or compromise the integrity of the steel reactors.

Japanese officials last night said they believed the plant's No 3 reactor was still intact despite the explosion and that no dangerous levels of radiation had escaped.

The problem is that the fission process is continuing inside both damaged reactors despite their having been shut down.

With no fresh water available, seawater is being pumped into the reactors to cool the hot fuel. Operators must then release the resulting radioactive steam to prevent a pressure build-up and to allow more cold water to be pumped in.

Japanese officials have no way of knowing how badly damaged the core of each reactor is or how effective the seawater is.

The danger, say officials, will come if the seawater and steam releases fail to properly cool the core. In this situation, the steel reactor containers could crack, releasing dangerous levels of radioactive material into the atmosphere.

In this case, authorities would be forced to try to entomb the reactors with concrete and sand to prevent a catastrophe.

Foreign Minister Kevin Rudd said Japanese authorities yesterday told the Australian Radiation Protection and Nuclear Safety Authority that reactor No 1 "now appears to be stable and that containment is intact".

But there was no immediate word on the safety of reactor No 3 after yesterday's explosion.

The US government yesterday released modelling from its Nuclear Regulatory Commission that found Hawaii, Alaska and the mainland were not likely to suffer harmful levels of radiation.

## **9. Fukushima facts obscured in fog of misinformation**

Gavin Atkins

From: The Australian March 16, 2011 12:00AM

<http://www.theaustralian.com.au/news/opinion/fukushima-facts-obscured-in-fog-of-misinformation/story-e6frg6zo-1226022073863>

### **IT is tempting to excoriate anti-nuclear activists for their blather about a Japanese Chernobyl occurring at Fukushima.**

But to do so would be like scolding a puppy for digging up the garden or chewing on your slippers. There are a large number of full-time anti-nuclear activists across the world, including in Australia, who are paid to misinform us; it's just what they do.

Like nature, the media abhors a vacuum, and that's why you can expect to find some entirely unqualified people offering advice on prime-time television about the likelihood of birth defects and cancers arriving in the next gust of wind.

It seems some of this hysteria may have rubbed off on our own Foreign Minister, Kevin Rudd, who reportedly told his Japanese counterpart during the height of the disaster that he was expecting detailed information to be provided to the bunkering citizens of Australia.

We can blame activists all we like, but following the Fukushima accident it really should be up to the experts to clearly communicate what is going on.

In the world of everything nuclear, the International Atomic Energy Agency is the most respected body. Only the best scientists from across the world land jobs with the agency. It does a great deal of good work in safeguards and many other areas, and it was a deserving winner of the 2005 Nobel Peace Prize.

However, its efforts to communicate to the broader public about Fukushima have been woeful.

Its spokespeople have been scarce and updates on Twitter and Facebook have failed to tell us the things we need to know. The worst of this has been the IAEA's failure to explain levels of radiation and what they mean.

For example, a typical update provided by the IAEA told us that 160 people were exposed to radiation. Another said: "As defined in Article 10 of Japan's Act on Special Measures Concerning Nuclear Emergency Preparedness, the alert was declared as a consequence of radioactivity readings exceeding allowed levels in the area surrounding the plant."

What does this mean? Did the victims eat a potassium-rich banana or have they gone critical and disappeared into a blue puff of smoke? Is radioactivity surrounding the plant dangerous or not?

Failing to quantify radiation levels is like Anna Bligh telling Queenslanders back in January that water would exceed allowed levels. It is entirely true but nearly useless and likely to cause more needless panic than prudent action.

The only way to combat misinformation is with information and on that score the IAEA has failed. What we need to know is simply: what are the radiation levels and what are the potential consequences of this? We need maps, we need numbers and we need diagrams. Where are they?

Writing in The Atlantic magazine, Cristine Russell noted: "Indeed it is also a race to find reliable, real-time public information about the rapidly changing Japan nuclear power emergency, amid a sea of confusing, conflicting and often limited information emanating from sources across the world."

It is hard to see why this should be the case. The information has always been available, including real-time radiation monitoring online, but no one from the IAEA has gathered the information we need and made it available.

This is even harder to explain when you know the director-general of the IAEA, Yukiya Amano, is an English-speaking Japanese. Unfortunately, during this event he has been no Anna Bligh.

Having studied previous nuclear accidents closely through the years, everyone at the IAEA would know that some of the worst consequences of nuclear accidents have turned out to be social and psychological effects on neighbouring populations, even on people who were not anywhere near the path of radiation.

In fact, the biggest study by the UN into Chernobyl conducted in 2005 rated psychological effects, rather than cancer or birth defects, as the largest continuing public health problem resulting from the accident.

Thankfully, there have been other sources of information, with the US Nuclear Energy Institute, various retired nuclear engineers and a Japanese official by the name of Noriyuki Shikata providing nuggets of reliable and timely information via Twitter and on websites.

The IAEA, meanwhile, has lumbered hours behind just about all of the media coverage, online and traditional. The absence of its spokespeople has provided a void on our television screens that the uninformed have only been too glad to fill.

*A former employee of the Australian Nuclear Science and Technology Organisation, Gavin Atkins blogs at [www.asiancorrespondent.com](http://www.asiancorrespondent.com).*

## 10. Crisis removes easy path to low-carbon world

Henry Ergas

From: The Australian March 18, 2011 12:00AM

<http://www.theaustralian.com.au/news/opinion/crisis-removes-easy-path-to-low-carbon-world/story-e6frg6zo-1226023501327>

**NO one knows how Japan's nuclear drama will end. Rightly or wrongly, however, it will greatly undermine public confidence in nuclear power. And even if new plants are built, their costs will rise substantially, as precautions are heaped on precautions.**

We are therefore still far from having a widely acceptable, reasonable cost technology for large-scale power generation that is genuinely carbon neutral. But for cumulative emissions to be stabilised by "decarbonisation", some 15 to 30 terawatts of primary power would need to be provided effectively emissions-free by the end of this century. It is now clearer than ever that that goal is not achievable without dramatic progress in our scientific and technological understanding of areas such as sequestration, renewables and fission and fusion energy.

As that realisation sinks in, countries will be even more wary of committing to credible, deep cuts in emissions. The notion that meaningful global agreement is around the corner is therefore fanciful. Unilateral action by Australia, which would only damage our economy without yielding any real environmental gains, consequently makes even less sense than it did before Japan's tragedy.

To this, the stock reply of supporters of early action is that market-based mechanisms (MBMs), such as carbon taxes and emissions trading schemes, are needed to induce the innovations a low-carbon economy requires. But those claims are implausible.

Australia is far too small for our decisions to have any discernible impact on global innovation. Whether we have a carbon tax will do nothing to address the world's technological challenge.

However, even putting that aside, the induced innovation hypothesis defies economic logic, as it is based on the premise that innovators today will expect, or at least place a high likelihood on, high future prices for emissions.

But if any initial constraints on emissions are very loose, so that the base price of emissions is low, investors' expectations would then have to be that the constraint would be progressively tightened, ultimately raising the implied emissions price to some very high level. At those high prices, potential emitters would place great value on any effective abatement technologies, so that firms owning those technologies would reap gains that would help offset the technologies' development costs.

It is unclear, however, why investors would hold such an expectation. There is nothing in the mere fact of introducing an MBM that irrevocably commits to steadily and progressively increasing the implied tax on emissions. Moreover, it would not be rational for a potential investor in technology development today to assume such an increase in the implied tax rate would indeed occur.

This can be seen by considering two broad scenarios.

In the first, the technologies needed to dramatically reduce emissions do not become available in the relevant future. In that event, it is implausible that governments, merely so as to honour commitments made many years earlier, would increase tax rates on emissions to levels that would cripple their economies. Rather, the likelihood is that any commitments made would be revised or ignored, so that effective tax rates on emissions would remain low.

In contrast, in the second scenario new effectively decarbonised technologies become available at some relevant future date. In that event, governments could, if they so chose, abide by commitments to substantially increase the tax on carbon; however, it is still unclear whether they would do so.

This is quite simply because once those technologies are available, even a modest tax will suffice to create an incentive for their deployment in the marketplace. After all, the bulk of the costs involved in developing those technologies will have been sunk. So long as the tax on carbon is sufficient to cover even only the incremental costs involved in making them available, innovators will be better off providing them than they would be if they sought to hold them back.

As a result, there must be a risk that at least some governments will seek to benefit their own community by allowing innovators little or no return on their sunk costs, much as many countries now do with life-saving drugs. The absence of any effective mechanism that can compel governments to impose a high tax once the required technologies are available must make this risk all the greater.

Two further elements accentuate the disincentive this provides to research and development.

First, for eminently sensible reasons, intellectual property rights are not available for scientific breakthroughs: they apply to inventions, not discoveries. However, advances required in areas such as nuclear fusion have a very substantial scientific component. As a result, a large, if not overwhelming, share of the investment currently required to achieve atmospheric stabilisation could not be adequately induced by the hope of securing intellectual property rights over the resulting output.

Second and at least as important, the pay-off to much of the R&D required may take many decades to eventuate. While some technologies, such as sequestration, may come into use as existing generation plant is withdrawn, others, such as geo-engineering, may not approach viability in the lifetimes of current generations.

This means that investors today, even if they could (somewhat implausibly) hope to ultimately claim the bulk of the social benefits these technologies would bring, would face the promise of rewards that, discounted to the present at the opportunity cost of private sector capital, would

amount to very little indeed.

As a result, compared with the magnitude of the task ahead, the contribution of MBMs is likely to be trivial. At most, they might serve to help finance some of the investment in innovation required; but even that merely begs the question of why relying on that funding source would be efficient.

To that question, the answer must be that it would not, as there is at best an inverse relation between the tax that is appropriate now and the scale of the innovation effort that would be needed. Current high abatement costs imply that only a very modest global carbon tax is efficient as abatement should be postponed until the costs are lower. But those same high costs would justify a huge technological effort, if the risks associated with climate change are indeed as great as many claim.

Japan's nuclear crisis therefore demands a reappraisal of global climate action and its prospects. The reality is that global emissions stabilisation is less likely today than merely a week ago.

Seen in that perspective, the government's mooted carbon tax is barely a sideshow, albeit one that threatens to inflict very high costs on the Australian public.

What is needed, and completely lacking, is an informed and mature discussion of the real choices ahead.

## **11. Safety shadow cast over nuclear renaissance**

Graham Lloyd, Environment editor

From: The Australian March 19, 2011 12:00AM

<http://www.theaustralian.com.au/news/opinion/safety-shadow-cast-over-nuclear-renaissance/story-e6frg6zo-1226024283814>

**JAPAN'S post-tsunami nuclear emergency has cast a long shadow over the much-anticipated renaissance of nuclear energy and, with it, global efforts to reduce carbon emissions to combat climate change.**

The disaster will almost certainly increase the world's short-term dependence on coal. Not only that, it will also add new impetus to the development of next-generation nuclear reactors and global safe-storage facilities for spent nuclear fuel rods, as well as speed up research into cleaner nuclear options such as radiation-free thorium reactors.

A dramatic increase in nuclear power generation has been at the heart of efforts in the developing world to meet the energy needed to lift hundreds of millions of people out of poverty and into a middle-class lifestyle without causing runaway carbon emissions.

But international nuclear power programs have been frozen and urgent safety reviews ordered in the wake of the disaster in Japan.

While the extent of the threat to health and safety posed by the Fukushima Daiichi plant will not be known for some time, enormous damage has clearly been done to the credibility of the nuclear industry.

But there is little cause for celebration by opponents of nuclear power who are also concerned about the level of future global carbon emissions.

Without nuclear, the pledges made by national governments to cut the growth rate of future carbon emissions in the developed and developing worlds will be impossible to achieve.

In the short term, a stalled nuclear renaissance can only benefit coal.

This point was acknowledged by Australia's climate change adviser Ross Garnaut when he told the National Press Club this week: "The coal industry as a whole will be much more affected by whether China is discouraged from its current very large nuclear program than it is by the carbon pricing in Australia."

Two reports published this week have underscored the role that nuclear power has been expected to play in the economic transformation of the world's two most populous nations, India and China.

A report by Climate Group, an international non-government organisation, says India is planning to increase its nuclear power capacity from 4.8 gigawatts to 63GW by 2032 with the construction of 20 new reactors.

The Climate Group report praises India's investment in renewable energy technologies and demand management, but clearly identifies the size of the challenge ahead.

India is the fifth-largest generator of power but per capita consumption is only 30 per cent of the world average. The Climate Group says this will change quickly following the phenomenal growth trajectory of the country and new capacity will be needed at unprecedented rates.

By 2030, India will have a gross domestic product five times higher than at present.

It will also have 100 million urban households in the middle-class bracket with higher purchasing power.

Of the total electricity consumed in India, 65.3 per cent is generated by thermal power plants, of which 53 per cent is coal-based and 10.5 per cent comes from gas.

The International Energy Agency forecasts India's energy demand is set to double by 2030, and without new energy policies India's coal imports could increase sevenfold.

China is also expecting a surge in coal usage despite this week putting a low-carbon emissions future at the heart of the Communist Party's five-year plan. But China's energy will be significantly undermined if its ambitious nuclear program remains frozen in the wake of the Japan disaster.

China's \$150 billion nuclear power program has been put on hold and the State Council has said all new nuclear power plants, including pre-construction works, should be suspended until revised safety standards were approved.

China has six nuclear plants in operation and is building 27 of the 62 plants under construction worldwide.

There are longer-term plans to have 100 reactors, with nuclear capacity increasing from 10.8GW to 86GW by 2020.

Events in Japan will definitely sharpen debate in China about the speed of the nuclear rollout and technology research effort.

In January, a report from the State Council Research Office, which makes independent policy recommendations to the State Council on strategic matters, called for caution on the pace of nuclear development.

It says the 2020 target should be restricted to 70GWe electrical generating capacity for each new plant so as to avoid placing undue demand on quality control issues in the supply chain.

The office warns of the dangers of China being left with outdated technology as the pace of nuclear development advances across the world. Only China is building gen-II units today in such large numbers. SCRO says reactors built today should operate for 50 to 60 years, meaning many gen-II units would still be in operation well into the 2070s, when even gen-III reactors would have given way to gen-IV and perhaps even to commercial nuclear fusion.

SCRO notes there would be a hundredfold increase in probabilistic safety brought by gen-III, and that future generations would continue the trend.

Meanwhile, China has staked an ambitious claim to leadership in the development of thorium reactors that can theoretically produce electricity without the radioactive by-product of traditional nuclear plants.

## 12. Mistakes plagued corporate response

Peter Alford and Cameron Stewart

From: The Australian March 19, 2011 12:00AM

<http://www.theaustralian.com.au/mistakes-plagued-corporate-response/story-fn84naht-1226024311668>

**AT the Tokyo Stock Exchange on Thursday, a handful of brazen investors bought shares in the Tokyo Electric Power Co, which is currently spearheading Japan's battle to prevent a nuclear meltdown.**

It was a bargain buy, if not a reckless gamble, given that TEPCO's shares had turned toxic since its Fukushima power plant was hit by a tsunami, free-falling by 63 per cent in less than a week. There were days when not a single offer was made.

Sharemarkets are a brutally honest environment and TEPCO's treatment by the market has sounded a warning that the world's fourth-largest electricity company is all but finished.

The reason is simple, according to nuclear engineers and technical analysts: since last week's earthquake and tsunami, TEPCO has somehow managed to make a bad situation worse. Its mismanagement of the damaged reactors at Fukushima has helped transform a momentary cut in water supply to its reactors into the worst nuclear crisis in a generation.

When all the facts emerge, some believe TEPCO may dwell in corporate infamy alongside Enron and BP.

"Every step TEPCO has taken has been a day late and a dollar short," the former vice-chairman of the Nuclear Safety Commission of Japan, Kenji Sumita, wrote in the influential Asahi Shimbun newspaper this week. "The release of information from TEPCO is even further behind."

The plodding utilities giant, whose plants supply about one-third of Japan's electricity, is a secretive nuclear behemoth that has been caught out for numerous safety violations dating back to the 1980s. But because Japan's nuclear industry is entirely run by the private sector, the government has had little choice but to let TEPCO handle the crisis.

The company cannot not be blamed for failing to anticipate a 7m tsunami that swamped its Fukushima plant after the March 11 earthquake, knocking out the power supply for its water cooling systems and causing fuel rods in three reactors to overheat.

But its response since then has been plagued by mistakes, confusion, secrecy and an apparent paucity of ideas about how to manage the unfolding crisis inside its own reactors.

That secrecy extended all the way to Japan's Prime Minister, Naoto Kan, who found out about an explosion at the Fukushima plant via television reports rather than through the plant's owner.

In press conferences, TEPCO executives have bowed their heads and apologised repeatedly for "causing inconvenience".

But they have been unable or unwilling to provide answers to basic questions about what is being done to prevent a full-scale nuclear meltdown in the plant's three damaged reactors.

Analysts believe TEPCO has made several crucial mistakes this week that are believed to have contributed significantly to the spewing of radiation from the plant and the prospects of a total meltdown.

Former nuclear safety vice-chairman Kenji Sumita says: "The exposure of fuel rods at the No 2 reactor for as long as several hours after the nuclear reaction had stopped should never have happened, even if it came two days after the (reactor was stopped). The incident reveals TEPCO's lack of crisis-management ability."

Analysts believe TEPCO's other major mistake this week was to neglect the state of spent fuel pools, which must be covered with water at all times because exposed spent fuel rods will emit

dangerous levels of radioactivity.

TEPCO was so busy trying to pump seawater into the three damaged cores of reactors No 1, No 2 and No 3 that it did not adequately monitor the water levels covering the spent fuel rods, which are stored at each reactor outside the reactor's steel vessel.

By the middle of the week, fire had broken out twice in the fuel pool of reactor No 4 because of low or non-existent water cover, spewing large amounts of radiation into the atmosphere and forcing the temporary evacuation of the 50 plant workers on shift.

TEPCO then discovered that a mystery plume of radioactive mist from reactor No 3 had been caused by insufficient water in that reactor's fuel pool.

It is TEPCO's apparent mismanagement of these fuel pools that has created most of the sometimes dangerous levels of radiation that have spewed from the plant during the past week.

"They have no crisis management because they were never ready for a crisis," Tokyo-based political analyst Michael Cucek told the Financial Times. "The fear is TEPCO is not telling the whole truth. They are not in the habit of telling everything they know."

But we should not only blame TEPCO, says Mitsuhiko Tanaka, a former Hitachi nuclear engineer turned anti-nuclear power activist. "The whole environment of what we call genshiryoku-mura (nuclear village) is the source of trouble," he says.

TEPCO management and engineers, bureaucrats and pro-nuclear commentators clump together, says Tanaka, and, at times of failure and stress, they hide the truth. "They tell each other we should not cause panic by giving out unconfirmed information to the people," he says.

Nuclear power companies everywhere are insular, defensive, engineering-dominated organisations, but TEPCO is also unusually accident-prone.

In 2002 it was caught out in a shockingly widespread structural safety and reporting falsification scandal.

In July 2007 the magnitude-6.8 Niigata quake triggered a serious fire at its Kashiwazaki-Kariwa plant -- where management's reaction again was to cover up.

Following the 2002 scandal, the then company chairman and several advisers bowed deeply and were booted. Tsunehisa Katsumata was promoted from vice-president to president.

Seven months after Kashiwazaki-Kariwa, Katsumata was sent upstairs to the chairman's office and Masataka Shimizu, a career-long TEPCO man like all the others, was promoted from vice-president of the supplies department to president.

It takes no special insight to predict what the company plans for Shimizu and Katsumata a month or two after the panic and confusion of Fukushima subsides. But there are strong indications the government will not allow this corporate in-breeding cycle to roll over again because the consequences for the country of allowing TEPCO to turn ever inwards have been so disastrous.

On Tuesday, Kan stormed into TEPCO's headquarters when he heard the company was planning to pull everybody from within the Fukushima site after another explosion.

"The TV reported an explosion. But nothing was said to (my) office for an hour," a Kyodo News reporter overheard Kan saying during a heated meeting with executives.

"What the hell is going on? In the event of withdrawal from (Fukushima), I'm 100 per cent certain that TEPCO will collapse. I want you all to be determined."

Immediately afterwards, the government announced it and TEPCO had formed a "joint taskforce" to manage information exchange. Sources told The Weekend Australian this was, in effect, the government try to take over the process.

Greg Story, an Australian expatriate with extensive Japanese business experience, was brought in as "general manager for excellence" when the collapsed former Long Term Credit Bank was

reconstructed as Shinsei Bank in the early 1990s.

Story sees a common "internal loop problem" between the old LTCB and organisations such as TEPCO: "They're promoting the same people all the way up the line, they're digging the same hole deeper, their pool of ideas and options becomes ever smaller.

"The other thing that's being overlooked here is those 50 workers still at the plant (working to control the disaster).

"Those people are real heroes, they're putting their lives at risk. And who's supporting them? The current management?"

One of TEPCO's more monstrous practices, industry analysts say, is the routine employment of deeply unqualified day labourers: people who, according to the Nuclear Control Institute, barely have a grasp of the basics of dealing with nuclear materials.

TEPCO reportedly clashed with Kan this week over the extent of the obligation of the 180 brave plant workers working in shifts to prevent a meltdown, earning just ¥9000 (\$113) a day.

According to the Mainichi Shimbun newspaper, TEPCO has asked the Japanese government to permit a full withdrawal of the last workers from the plant because of high levels of radiation.

But the Prime Minister told TEPCO: "Withdrawal is impossible. It's not a matter of whether TEPCO collapses. It's a matter of whether Japan goes wrong."

If TEPCO workers walked off the job, a nuclear meltdown is almost inevitable; yet if they stay they are exposing themselves to possibly grave health risks.

The paucity of clear information from TEPCO this week forced the head of the International Atomic Energy Agency, Yukiya Amano, to fly to Japan to monitor the situation firsthand.

TEPCO's attempts to play down the significance of the crisis immediately following the tsunami were quickly debunked.

Three explosions over three days in reactors No 1, No 2, and No 3 were followed by two fires in the fuel pool of reactor No 4. It was clear by mid-week that TEPCO had badly misread the situation.

With fresh drama unfolding daily, a desperate TEPCO was forced to resort to basics, sending helicopters to waterbomb the reactors and fire trucks to help pump seawater into them.

The US has become increasingly sceptical of TEPCO's assessment of the crisis and its management of it. Washington broke its silence in a spectacular manner on Thursday when the head of the US Nuclear Regulatory Commission, Gregory Jaczko, told congress he believed the situation was more serious than Japan had publicly acknowledged and that radiation levels were now "extremely high".

The US dispatched eight nuclear experts to give advice to TEPCO and sent a Global Hawk spy plane over the stricken reactors to examine their condition.

By early yesterday, with the plant moving closer to a possible catastrophic meltdown, panic was spreading faster than the radiation. US President Barack Obama was forced to front the cameras to reassure a nervous America that no deadly clouds of radiation were heading to California.

But it is not just TEPCO executives who have misread this crisis.

With each passing day, nuclear experts are becoming more red-faced as their strident predictions early this week that the crisis would amount to nothing are being proved wrong.

They initially ridiculed media comparisons between this crisis and the 1986 Chernobyl disaster in the former Soviet Union, which has killed thousands through radiation-induced cancers.

A growing number of experts now admit a full-scale meltdown is possible at Fukushima, although most still argue it is unlikely.

Even if the overheating reactors and spent fuel rods at the plant were brought under control immediately, the large doses of radiation emitted over the past week will have already posed serious health risks for the 180 workers there and have raised concerns about the longer-term impact on those who live in the vicinity.

Experts who predicted early this week there would be no serious radiation fallout at Fukushima are now consulting maps to determine whether the easterly wind patterns might blow radioactive plumes across the Pacific and over the California coast.

There are rising fears in Japan that the Fukushima crisis will end badly. These fears have spread across the globe, prompting the world to rethink its approach to nuclear safety. The US, Germany and China are among those who have ordered reviews of the safety of their nuclear plants in the wake of the incident.

In some non-nuclear nations, including Australia, the crisis has killed political debate about a nuclear future.

"When we see a crisis like the one in Japan, we have a responsibility to learn from this event and to draw from those lessons to ensure the safety and security of our people," Obama said yesterday.

After a dramatic week, the ability of TEPCO workers to prevent a catastrophic meltdown appears to hang in the balance. The key may lie in attempts this weekend to reconnect power supplies so the plant's anti-cooling systems can return to normal operation.

If this fails, the prospect of a larger meltdown remains frighteningly real.

Most analysts believe a full meltdown would result in the molten core melting the steel container through its floor and releasing giant and deadly levels of radiation into the air.

Where this radiation travels "would depend on the wind and the weather", says US nuclear scientist Kenneth Bergeron.

It might be confined to Japan or it could float to other countries, most likely across the Pacific with the prevailing winds. Either way, it would expose millions of people to the risk of radiation-induced cancer, just as the Chernobyl disaster did a generation ago.

With such high stakes, it would be more comforting if the fate so many people did not lie in the hands of such a flawed organisation as TEPCO.

*Additional reporting: The Times*

### **13. Here comes the high-cost sun**

Graham Lloyd, Environment editor

From: The Australian March 22, 2011 12:00AM

<http://www.theaustralian.com.au/news/features/here-comes-the-high-cost-sun/story-e6frg6z6-1226025655555>

**MARRYING the twin concerns of the federal government's carbon pricing challenge and Japan's Fukushima nuclear emergency, Julia Gillard yesterday took a picture opportunity at a solar power research facility at the Australian National University.**

The Prime Minister's message was that pricing carbon was about creating the right incentive to drive the clean energy future that would be good for the environment and good for Australian jobs.

It was a message she wanted to be heard yesterday, given the federal government's climate change adviser Ross Garnaut will launch his updated paper on low emissions technology tomorrow. He will look at advances in solar and other technologies in Australia and globally.

But at a post tour press conference Gillard was not asked once about solar power. Attention was focused instead on the government's delayed tax summit, the bombing of Libya, the Christmas Island asylum-seeker quagmire and the failure of indigenous policy in the Northern Territory.

Given the looming carbon tax, renewed concerns about the safety of nuclear power and Australia's longstanding role as a key player in solar research and development, there is a lot to be said about efforts to harness the power of the sun.

As Gillard's visit to ANU highlights, Australia remains at the forefront of global research of photovoltaic panels, which convert sunlight directly into electricity, and large-scale concentrated solar thermal plants that offer the promise of stable supplies of electricity, even at night.

While neither technology can yet compete with fossil fuels such as coal and gas for reliability or for price, the solar development and technology curve is moving quickly.

According to Mark Twidell, executive director of the Australian Solar Institute, solar PV remains the faster growth curve locally and globally.

This year there will be about 20 gigawatt hours of solar PV installed globally and it is a good bet that Australian research will be included in most of the panels.

The global market for photovoltaic panels is about \$100 billion a year with the costs falling dramatically in response to the economies of scale from boosted production capacity at low-cost centres such as China.

During the past year, prices have fallen by 20 per cent to 30 per cent as the manufacturing industry expanded by 50 per cent.

Experience during the past 30 years shows that costs can be expected to fall by 20 per cent for every doubling of industry production. Increased production scale also has resulted in a structural change in the supply chain, with the solar industry no longer forced to buy scraps from the semiconductor industry for its silicon.

"We have seen adjustments in silicon manufacturing so they are dedicating supply to the solar industry, which is resulting in much greater cost stability and price reduction," Twidell says.

The solar industry says improved efficiencies will continue to drive down the cost of solar panels to the point where the cost of electricity production at the household will be comparable with the retail price of electricity.

"Electricity is getting close to 40c a kW/h in the afternoon and that is about what could justify a business model for household solar panels," Twidell says.

In Australia, falling prices have driven an explosion in public demand for rooftop solar panels, which has forced state and federal governments to prematurely reduce public subsidies.

But even with the growth, solar power is still responsible for only a tiny fraction of Australia's total electricity market. And even at a large solar scale of 50 megawatts or bigger of electricity an hour, photovoltaics still cost twice as much as wind and four or five times as much as coal or gas.

(In comparison big coal-fired plants pump out more than 700mW.)

"Wind sets the market in the context of Australia and the renewable energy target," Twidell says. "You are able to finance wind projects at the \$100 to \$120 per mW/h level but solar PV at scale still requires double that."

Solar photovoltaic does have its advantages, however, not least of which is the fact it generates electricity during the day when electricity prices are higher.

Like wind, solar photovoltaic plants will produce only 20 per cent to 30 per cent of their peak capacity but, Twidell says, from an investor's perspective it is easier to forecast how much electricity a solar power plant will generate.

Rather than compete, Twidell says, solar complements wind, which is often better at night when

solar PVs are not producing.

However neither wind nor solar PV can deliver the round-the-clock reliability that can replace the baseload electricity delivered by coal and gas.

This is why the new frontier for solar is in the area of concentrated solar thermal, where mirrors are used to focus the power of the sun.

The attraction of solar thermal is its ability to store heat and supply "firm capacity" (guaranteed to be there on demand) to the electricity market as opposed to intermittent capacity from solar PV or wind.

"By having firm capacity you don't need to have the complexity of another gas generating plant sitting behind you in order to secure supply," Twidell says.

But solar thermal is a less developed industry globally than solar PV, supplying less than 1GW of electricity a year compared with about 20GW from solar PV worldwide.

However, there is a lot of research under way, with the emphasis changing from what are known as line focus systems to point focus systems, or solar towers.

Line focus systems include trough technologies, which have been working in the US at a commercial utility scale level since the late 1970s.

The trough systems comprise a long, mirror-lined trough that concentrates the heat of the sun on to a liquid that is used to drive a steam turbine.

Trough systems are very reliable, well proven and can attract bank financing.

But it has proved difficult to get the cost of electricity production below 30c a kilowatt hour, compared with 5c a kilowatt hour for coal-fired power, because of high related costs such as land and steel.

To really drive solar thermal technology down the cost curve it is necessary to increase the temperatures that can be generated from the mirrors.

The goal is to increase temperatures from about 300C, which the solar trough technology can achieve, to the super-critical temperatures achieved by modern thermal coal power stations.

To get there, research is shifting from the trough system to banks of mirrors, or heliostats, focused towards a solar collector at the top of a tower.

ANU is developing a system using a big mirror dish.

Both methods are capable of producing much higher levels of concentration of sunlight to get higher temperatures.

Australia's CSIRO is completing construction of a solar tower research project at its Newcastle renewable energy facility.

The CSIRO project is focused on a medium-scale solar tower project suited to our electricity demand and financing profile.

Unlike most solar thermal plants, the CSIRO project is based on a Brayton cycle air turbine, which does not run on water, rather than the more traditional Rankine cycle turbine, which is driven by steam.

CSIRO's Brayton cycle power generation technology works in exactly the same way as an aircraft jet engine but, instead of using kerosene to heat the air and expand it through turbine blades, mirrors are used to concentrate the sun's rays to heat air and expand it through the turbine to produce electricity.

According to James McGregor, energy systems manager for CSIRO Energy Technology, the aim is to get the cost of electricity produced from the tower down to 10c a kilowatt hour, which would make it competitive with existing electricity supplies. The starting point is expected to be 20c to

30c a kilowatt hour for a pre-commercial scale 1mW plant.

The new solar field will start operation and testing this month, with an official launch mid-year.

A big attraction of the CSIRO plant is that it does not require water, which makes it ideally suited for use in Australia's remote mining areas that have the world's best solar resources but not much water.

"A lot of solar thermal technologies use water to generate steam, but a lot of the best solar resource is in the desert and, guess what, the desert doesn't have a lot of water," McGregor says.

"To really develop technologies that reduce the requirement for water is going to be critical."

Even at a higher cost the technology will prove attractive for mining companies in the northwest that at present are forced to rely on expensive electricity from diesel generators.

Wes Stein, renewable energy manager for CSIRO Energy Technology, says take-up by mining companies in remote locations would help prove the technology so it could be financed and developed on a larger scale.

"Australia has never had the capacity to put \$1 billion down on some new technology that has big risk," he says.

"We can access \$50m to \$100m in risk capital but the steam turbine systems being developed elsewhere all have to be 100mW or bigger, which need a hell of a lot of money."

The solar tower using a Brayton cycle turbine can be built on a scale of 1mW/h, 5mW/h or 10mW/h. To scale up to 100mW/h is a matter of building consecutive solar towers.

"That sort of flexibility for Australia is essential because there are only so many places in Australia where you can build a 100mW solar power plant that has land, transmission, roads, sun, gas backup and in particular the transmission capacity," Stein says.

The CSIRO is also pioneering other solar technologies.

"What we are doing is developing the mirror technology as best we can to be low cost and high precision because if we get this right we can do lots of different things: we can do air turbine, we can do steam generation, we can do storage, we can do liquid fuel," Stein says.

Solar researchers in Australia are looking at the Desert Tech concept, which proposes selling solar electricity from North Africa to Europe. But Stein says Australia does not have the luxury of being able to send across the Mediterranean, going from the North African sun to the European green energy market, where electricity prices are 20 times higher. Instead, Australian researchers have been developing a way to concentrate solar energy to turn gas into a liquid form and boost its energy content.

"The thing we want to do is make solar liquid fuels," Stein says. "If we can get the sun into liquid fuels we can transport that around easily. That would be the best way to transport Australian sun to Japan."

Stein says the technology starts to become effective at about \$100 a barrel oil price.

Twidell says solar thermal technology is following a predictable development path.

"One of the big challenges for solar markets generally is to find applications where they become economic first because that develops scale and gives financiers confidence that the technology works," Twidell says.

"It is almost a progression towards the central grid."

In photovoltaics, that pathway started with individual households and in solar thermal it is likely to be in off-grid areas such as remote mining towns.

Twidell says solar will not replace existing coal and gas power plants but will make an increasing contribution to the energy mix.

"Any system needs a diverse range of inputs and outputs to be sustainable, and the energy system is no different," he says.

Certainly solar thermal has a role to play and the potential to be a part of a bigger picture.

Says Twidell: "We are starting to see a lot of activity happening now and over the course of this decade we will start to see the next wave of solar technologies being demonstrated at a scale that will give the finance sector the confidence it needs to roll it out beyond that."

## **14. Japan shock wave engulfs pro-nukes**

Author: Daryl Passmore

Sunday 20 March 2011

Publication: Sunday Times Perth (54, Sun 20 Mar 2011)

<http://aap.newscentre.com.au/acc/110322/library/environment/25301231.html>

NUCLEAR fallout. Are there two more terrifying words?

Even as the expected death toll from the earthquake and tsunami that devastated parts of Japan nine days ago soared to 10,000 or more, the scale of that tragedy was overshadowed by the crisis unfolding hour-by-hour at the Fukushima nuclear power plant.

More than 170,000 people within 20km of the 40-year-old plant were evacuated after a series of explosions and fires, leaving an estimated 150,000-plus in a danger zone as high-level radiation leaked from two crippled reactors.

Authorities rushed to assure the 13 million inhabitants of Tokyo, 250km south, that radiation levels up to 10 times higher than normal there posed no health risk. But with pharmacies running out of potassium iodide tablets, which can offer some protection from radiation poisoning, many chose to flee the capital.

Even on the other side of the Pacific Ocean, sales of the supplements soared along with geiger counters, with Americans panicking despite experts saying there was no risk there.

The broader shock waves spread rapidly around the world.

Success over recent years by the nuclear power industry to re-cast itself from environmental pariah to a clean, safe alternative to greenhouse-gas-polluting fuels such as coal literally went up in smoke on TV screens across the world.

It's given governments and investors the jitters. Countries including Germany, Switzerland and China announced urgent safety checks of their own plants and a freeze on future plants while they reviewed standards. The 30 existing nuclear nations and dozens more planning to join them over the next few years will now urgently reconsider their future energy strategies in the face of international opposition to nuclear energy, which has reached a level not seen since the Chernobyl disaster a quarter of a century ago.

The decisions they make will have enormous implications for Australia. We don't have any nuclear power stations. And in the wake of the catastrophe in Japan, not even the most ardent proponents are brave enough to argue that we should right now. "Now is not the time to have that debate," Australian Uranium Association executive director Michael Angwin said. "We will return to that."

And in what may well be the understatement of the year, Australian Nuclear Science and Technology Organisation chairman Ziggy Switkowski said: "This has the potential, I think, to set back interest in nuclear power globally."

Both Prime Minister Julia Gillard and Opposition Leader Tony Abbott have made it clear discussion of a nuclear power industry here is off the agenda.

Ms Gillard is in a particularly difficult spot: On one side she has the strongly pro-nuclear Australian Workers Union faction which was instrumental in her replacing Kevin Rudd; on the other side she is increasingly dependent on the vehemently anti-nuclear Australian Greens, which will hold the balance of power in the Senate from July.

However Australia is anything but a disinterested observer in the global debate over the future of nukes. We have the planet's biggest deposits of uranium the raw material used in reactors.

More than 30 per cent of the world's total uranium resources are here. We are the third-biggest producers, after Kazakhstan and Canada, exporting about 9000 tonnes a year. Japan is our third-largest customer.

"Australia has a direct link to this tragedy because the Tokyo Electric Power Company that operates the Fukushima reactors, buys and burns Australian uranium," David Noonan, a nuclear-free campaigner with the Australian Conservation Foundation, said.

He said the Japanese disaster would not only kill off any suggestion of a nuclear industry being developed within Australia, but would be "a major long-term obstacle" to the rapid growth of the industry internationally.

When the Chernobyl plant in the Ukraine exploded in April 1986, raining radioactive fallout over a huge area of Europe in the world's worst nuclear accident, it appeared to sound the death knell for the industry's future.

However, since the start of the new millennium, there has been a "nuclear renaissance".

The planet's supplies of conventional fossil fuels, such as oil and coal, to produce electricity are dwindling, and with climate change taking centre stage in world affairs, the inconvenient truth for opponents of nuclear energy is that it offers a power option with virtually no greenhouse gas emissions.

There are 443 nuclear reactors operating around the world, 62 are being built and a further 482 are planned between now and 2030.

Stocks in uranium explorers and miners have been riding high, but in the days after the Japanese disaster billions of dollars were wiped from company values as investors dumped shares before a slight bounce-back in the past few days.

Many analysts and the uranium industry itself remain confident in the long-term future of nuclear power.

If the world decides to continue along the nuclear path, it will be impossible without a major expansion of

Australia's uranium mining industry.

Our uranium exports are forecast to rise to \$3 billion by 2016, but bans on mining in Queensland, New South Wales and Victoria would have to be lifted if the industry were to meet forecast global demand.

## **15. Minister's uranium pitch fires up debate**

Rebecca Puddy and Michael Owen

From: The Australian March 22, 2011 12:00AM

<http://www.theaustralian.com.au/national-affairs/ministers-uranium-pitch-fires-up-debate/story-fn59niix-1226025692568>

**SOUTH Australian Mines Minister Tom Koutsantonis has proposed the development of a uranium enrichment industry in Australia and called for a potentially divisive debate at the ALP national conference.**

In remarks that have split state and federal Labor, Mr Koutsantonis said Australia should maximise uranium profits and provocatively pointed to the nuclear crisis in Japan as proof that enrichment should be embraced.

"No deaths have been attributed to radiation (in Japan)," Mr Koutsantonis told the annual Paydirt uranium conference in Adelaide yesterday.

"I am not joining the chorus of naysayers. I urge you to step up to the plate and argue the safety of nuclear reactors. I will stand with you and argue that case."

Mr Koutsantonis said the old way of digging something out of the ground and sending it offshore had to change.

"We've got to start looking at uranium exports and how we can value add here to get the maximum bang for our buck," he said.

"One day, down the track, were going to have to start enriching uranium . . . we need to start the debate."

Senior minister Kevin Foley, the minister assisting Premier Mike Rann on the Olympic Dam expansion project, backed Mr Koutsantonis.

"I think what Tom has said is both sensible and inevitable," he said. "We should have a full-blown debate on the nuclear industry. There is no reason why the Labor Party should shy away from a debate about our nation's future."

A spokesman for Mr Rann said the federal government position to oppose uranium enrichment was clear and the state government supported that position.

Mr Foley denied the state ALP was split, saying the Premier was entitled to his view.

Federal Resources Minister Martin Ferguson yesterday said he did not expect a change of federal Labor policy at this year's national conference.

"Minister Koutsantonis is entitled to raise these issues, however, the current national platform prohibits the establishment in Australia of nuclear power plants and all other stages of the nuclear fuel cycle," Mr Ferguson said.

Australian Conservation Foundation nuclear spokesman David Noonan yesterday said Mr Koutsantonis was "out of step with his own party and state and federal governments".

"I do not think there is any popular support for Australia to go down the nuclear industry path," he said. "We have seen the nuclear disaster unfolding in Japan and there is the potential that Australian and even South Australian uranium has been involved in those reactors that have been exploding in Japan."

Simon Mead, the ALP state secretary in resource-rich Western Australia, said the party platform did not support uranium mining or enrichment.

Greens Senator Sarah Hanson-Young said public opinion would prevent the government from moving towards uranium enrichment.

## **16. Propaganda has no place in crisis**

Geoffrey Barker and Paul Dibb

From: The Australian March 23, 2011 12:00AM

<http://www.theaustralian.com.au/national-affairs/commentary/propaganda-has-no-place-in-crisis/story-e6frgd0x-1226026345696>

**ANTI-NUCLEAR activists have moved with unseemly haste to turn the Japanese earthquake tragedy into an opportunity for propaganda.**

As Japanese authorities struggle to contain potentially grave radiation leakages from the damaged Fukushima reactors, conservation and green ideologues have rushed to claim the catastrophe shows there is no future for nuclear power.

Australian Conservation Foundation spokesman David Noonan says nuclear power has no place in a sustainable energy future; Greens leader Bob Brown says the Japanese crisis is a reminder that nuclear energy is outside the limits of human safeguards. These sorts of statements, echoed by activists globally, are at once false and heartless.

Nuclear power generation is an overwhelmingly safe and clean global technology notwithstanding events at Fukushima. Most Japanese reactors are unharmed; most advanced and many advancing nations look to nuclear reactors for electricity supplies. There is no credibly clean alternative to satisfy heavy baseload power demands.

More immediately important is the reality that the Japanese earthquake, tsunami and nuclear crises are heartbreaking tragedies for millions of people whose immediate suffering should be the priority concern of international relief efforts.

There is, of course, room for legitimate argument about the effectiveness and the transparency of Japanese efforts to deal with the nuclear crisis. And there seems little doubt there will be renewed global concerns about nuclear power safety.

Happily, though, international efforts are being made to assist the brave Japanese engineers trying to cool the damaged reactors. An extraordinary natural disaster produced this nuclear crisis. It was not the result of human failure or the inherent danger of nuclear power generation under normal circumstances.

But generalised arguments against nuclear power are separate, irrelevant and inappropriate issues at this time of appalling devastation and human suffering wrought by the earthquake and tsunami. With a probable death toll of many tens of thousands, and widespread destruction of homes and economic infrastructure on the north coast, Japan is facing challenges quite reasonably claimed by Japanese Prime Minister Naoto Kan as the country's greatest challenge since the end of World War II.

The nuclear crisis is only one frightening element in what may be a fundamental turning point in Japan's modern history at a time when it is already facing daunting shifts in its global economic and security situation.

In these circumstances, international government and non-government assistance priorities should be to ease the terrible suffering of earthquake and tsunami victims; to assist and support Japan's long-term economic and social recovery; and at the same time to reduce radiation risks.

Sterile ideological arguments over the future of nuclear power should be for another day. It verges on the indecent for anti-nuclear activists to propagandise when perhaps millions of Japanese are traumatised by bereavement, hunger, homelessness, joblessness, fear and cold. To her credit, Julia Gillard was quick to say that now was not the time to reopen the nuclear debate in Australia.

This is a critical moment in Japan's history. Before the present crisis it was facing political, economic and security challenges that were raising questions about its future as a key regional power. For the past couple of decades Japan has experienced indifferent economic growth and more recently it has had weak governments and too many changes of political leadership.

All this has occurred as China has outstripped Japan in economic size and developed a threatening strategic posture and military build-up.

It is very much in Australia's national interests that Japan recovers from this crisis. It is Australia's second largest export market, a main buyer of our minerals, energy and food, and an important supplier of manufactured goods to us. It is a liberal democracy with which Australia shares basic political values and aspirations, despite some differences in social conventions.

It is also a nation with which Australia and the US have important regional security relations,

which have the potential to help balance the rise of China in our region.

So let us not be distracted by Green obsessions about nuclear power. Japan's long-term welfare and recovery is too important to be held hostage to such comparatively irrelevant side issues.

*Paul Dibb is emeritus professor and Geoffrey Barker is a visiting fellow in strategic studies at the Australian National University.*

## **17. Leading green now backs nuclear power**

Graham Lloyd, Environmental editor

From: The Australian March 23, 2011 12:00AM

<http://www.theaustralian.com.au/leading-green-now-backs-nuclear-power/story-fn84naht-1226026365653>

**ONE of the world's leading environmental campaigners, George Monbiot, has changed his view on nuclear energy to one of strong support following the Fukushima emergency in Japan.**

"As a result of the disaster at Fukushima, I am no longer nuclear-neutral. I now support the technology," Monbiot wrote in his latest column in The Guardian.

"A crappy old plant with inadequate safety features was hit by a monster earthquake and a vast tsunami. The electricity supply failed, knocking out the cooling system. The reactors began to explode and melt down.

"The disaster exposed a familiar legacy of poor design and corner-cutting. Yet, as far as we know, no one has yet received a lethal dose of radiation."

Monbiot is one of the environmental movement's most respected thinkers.

In 1995, Nelson Mandela presented him with a United Nations Global 500 Award for outstanding environmental achievement.

He has written several best-selling books including *Heat: How to Stop the Planet Burning* and *The Age of Consent: A Manifesto for a New World Order*.

In response to Fukushima, Monbiot said some greens had wildly exaggerated the dangers of radioactive pollution.

He said other forms of energy production caused damage and the impact of nuclear accidents had been overstated. He quoted a website showing the Three Mile Island disaster had given someone living within 16km of the plant a 1/625th of the maximum yearly radioactive exposure permitted for US radiation workers.

"If other forms of energy production caused no damage, these impacts would weigh more heavily. But energy is like medicine: if there are no side-effects, the chances are that it doesn't work."

Monbiot said, like most greens, he favoured a major expansion of renewables but could also sympathise with their opponents. "It's not just the onshore windfarms that bother people," he said "but also the new grid connections."

Monbiot said the impacts and costs of renewables rose with the proportion of power they supplied, as the need for storage and redundancy increased.

Monbiot said the energy source most economies would revert to if they shut down their nuclear plants was not wood, water, wind or sun, but fossil fuels. "On every measure (climate change, mining impact, local pollution, industrial injury and death, even radioactive discharges) coal is 100 times worse than nuclear power.

"Yes, I still loathe the liars who run the nuclear industry. Yes, I would prefer to see the entire sector shut down, if there were harmless alternatives. But there are no ideal solutions.

"Every energy technology carries a cost; so does the absence of energy technologies. Atomic energy has just been subjected to one of the harshest of possible tests, and the impact on people and the planet has been small. The crisis at Fukushima has converted me to the cause of nuclear power."

## 18. Concern as seas off plant turn radioactive

Rick Wallace, Tokyo correspondent

From: The Australian March 23, 2011 12:00AM

<http://www.theaustralian.com.au/concern-as-seas-off-plant-turn-radioactive/story-fn84naht-1226026370539>

**RADIATION fears grew in Japan yesterday as tests showed seawater near the Fukushima Daiichi nuclear plant was contaminated, prompting new tests to check on the spread of radioactive nuclides.**

Samples taken 100m from shore showed high levels of radioactive iodine and cesium, fuelling fears of the effect on sea creatures.

The level of iodine 101 in the water was more than 125 times higher than normal. Cesium 134 levels were about 25 times normal and cesium 137 about 16 times higher in samples taken on Monday. But Chief Cabinet Secretary Yukio Edano and the Nuclear and Industrial Safety Agency tried to play down fears, saying the levels detected posed no risk to humans. "There should be no immediate health impact," Mr Edano said.

Even if the contaminated seawater were consumed by a human for a year, the concentration of radioactivity would pose no health problems, he said. Although if the radiation levels were high for some time the risk would increase.

Workers at the crippled Fukushima plant have been pumping seawater into several of the damaged reactors in a desperate attempt to prevent a meltdown.

Further samples were being taken yesterday and today in eight locations along the coast, and the results were expected to be released tomorrow.

A later test conducted close to the plant yesterday found the iodine 101 level had dropped to 30 times the normal level.

The government said it would step up the checks on seafood.

Kenya Mizuguchi, professor emeritus at Tokyo University of Marine Science and Technology, said the contamination levels were low enough to avoid major damage to sea creatures and appeared to come from airborne radiation.

But Professor Mizuguchi, the author of a book on the impact of nuclear power plants on marine life, warned that massive contamination could occur if any of the thousands of tonnes of seawater being used to cool the reactors flowed back out to the ocean.

"That happened at Three Mile Island and Chernobyl," he told The Australian. "If they discharge the seawater back to the sea, there will be incredible contamination."

Plant operator TEPCO and the government will be testing more samples to determine the spread of radioactive compounds in the waters off the plant.

Despite calling for a halt in the shipment of leafy vegetables from the area and milk from near Fukushima, the Japanese government has said the levels of radiation found in them would have no immediate effect on human health if they were consumed.

Iodine 131 has a half-life of about eight days, but cesium 137 takes up to 30 years to lose half its radioactivity.

Australia's food safety regulator, Food Standards Australia New Zealand, has described the risk to Australians of being exposed to radioactive nuclides from Japan as negligible.

## 19. Chernobyl: when truth went into meltdown

Rob Lyons

From: The Australian March 26, 2011 12:00AM

<http://www.theaustralian.com.au/news/features/chernobyl-when-truth-went-into-meltdown/story-e6frg6z6-1226027914874>

**DURING the crisis at the Fukushima nuclear plant in Japan, experts have been keen to stress that the incident is "not another Chernobyl".**

In fact, Chernobyl was not Chernobyl either: the reality of what happened after the world's worst nuclear accident has never lived up to the myth, as I discovered when I visited the plant on a tourist trip in January.

It may seem bizarre that anyone would want to visit, given Chernobyl's reputation. There certainly isn't a big sign saying "Welcome to Chernobyl". Despite the fact tourists have been allowed to go to the former nuclear reactor site in Ukraine since 2002, our presence is tolerated rather than actively encouraged (although the Ukrainian government has announced plans for officially approved tours to start this year). Permits must be arranged in advance and passports shown to enter the exclusion zone, a two-hour drive north of the capital, Kiev.

At an office in the town of Chernobyl itself, our guide explains how to use the radiation meter, which looks like one of those old-fashioned sets of scales found in pharmacies 30 years ago. Stand on the platform, put your hands on the metal plates on each side, then wait for the green light. But even if the light turns red, he tells us, we should simply wash our hands. This is the first of a series of apparently scary warnings accompanied by a casual sense that there is nothing to worry about.

Before we begin the tour, we have to agree to abide by the rules: no shorts, skirts or sandals; don't touch anything, particularly not the vegetation; no eating or smoking outside. (On this last point, no one seems to have told the staff, who puff away merrily by the front door.) We also need to sign a disclaimer that the government will not be "liable for possible further deterioration" of our health after our visit to the exclusion zone. In other words, it's safe, but don't blame us if you get cancer.

After a 10-minute drive, we stop about 400m from the plant to take photographs. Beyond the river, frozen by the January chill, are several buildings: to the right, something big, red and half-built; to our left, all grey concrete and metal.

It could be an industrial facility anywhere, if not for that chimney. With its distinctive metal framework, the smokestack that stands above reactors 3 and 4 is the defining symbol of the 1986 Chernobyl accident. The red stripes may have faded in the past 25 years, but the shape is utterly familiar. Our little tour group shivers and snaps away, then we all clamber back into the van and drive around to reactor 4, the scene of the accident.

We suddenly have an eerie soundtrack: the twittering of our guide's Geiger counter. The pace of its tweets quickens as we get closer to the reactor, until it sounds like heavy rain on a tin roof.

The meter reading showed levels about 10 times the normal level found in Kiev. (By comparison, I probably received a bigger dose of radiation flying from London to Kiev than during my visit here.) We are no more than 100m from the site of the explosion. The gaping hole where the reactor erupted has long since been covered up by the "sarcophagus", a hastily built cover containing thousands of tonnes of concrete that keeps most of the radiation inside. Even this does not look out of place among the grim Stalinist industrial architecture.

What is remarkable, given the hype about the accident, is just how mundane Chernobyl is. This is

not, as a visitor may expect, a nuclear wasteland.

Once the sarcophagus was built, electricity generation from the three remaining reactors at the site restarted just seven months after the explosion and thousands of people worked here. Even now, there are buses full of people nipping around the site, working not only to maintain the safety of reactor 4 but also to decommission the other three reactors, a process that may take decades.

The last working reactor, No 3, just a few metres from reactor 4, closed only in December 2000. Were it not for the checkpoints and that iconic chimney -- and the sound from the Geiger counter -- it would be hard to believe there was anything wrong at Chernobyl.

Our next stop is the dormitory town of Pripyat, 3km from the plant. The town was evacuated within a day or so of the accident. Its residents weren't told what would happen in the future, just to grab their things and get on board the buses provided. They would never return.

It is weirdly quiet. Bit by bit, it is falling down. The seven-storey Hotel Polissia is an empty shell, the windows caved in, the floors covered with broken glass. We carefully negotiate the icy steps to the top-floor balcony to see the city laid out below: the restaurant, the cultural centre, the playground that was built but never opened, the empty apartment blocks. Gradually, they are being absorbed into the countryside.

We go back to the information office and stand on the radiation detector. Our party receives green lights all round, so we can safely eat a lunch of Ukrainian stodge -- lots of potato, cheese, chicken and soup -- which leaves us all feeling sleepy on the journey home. This is supposed to be "extreme tourism", but the trip is remarkable for how unremarkable it is.

The irony of Chernobyl is the accident was the result of a safety test, an attempt to see if a new idea for a backup system would work if the electricity supply to the plant failed. Unfortunately, it all went wrong. Power levels suddenly surged during the test. When the operators tried to drop the control rods that dampen the nuclear reaction back into the reactor, they jammed. The reactor exploded.

The sealing cap on the reactor, weighing 1000 tonnes, was blown upwards and, while not destroyed, landed at an angle so the reactor core was exposed. During the next eight days, hydrogen flames up to 500m high pushed vast amounts of radioactivity into the atmosphere. Firefighters and helicopter pilots, running what for many of them were suicide missions -- in conditions far more toxic than the "Fukushima 50" have faced -- strove to put out the fire.

For more than a week, no one knew if the fire would carry on pouring radiation into the sky indefinitely, before the flames finally went out. Much of the radioactive material settled in the surrounding area and in nearby Russia and Belarus, but a lot was carried by the wind to countries right across Europe. Sales of milk and fresh vegetables were banned in some nations. Even now, many farm animals intended for human consumption are tested for radioactivity in Scandinavia and Britain (although this is almost certainly an excessive precaution).

While the exact cause of the accident will probably never be known, the contributory factors were obvious and included: a reactor design that was flawed and out of date, devoid of the solid reactor containment that is usual in Western nuclear power plants (and that has been remarkably durable at Fukushima); the culture of secrecy and complacency in the Soviet Union that meant lessons from earlier, much smaller accidents were not shared or acted on; the inability of Soviet industry to manufacture to the high standards required for reactors; and human error by the operators in the lead-up to the incident.

The best attempt at assessing the death toll from the accident has been a report published by the Chernobyl Forum -- a group including the UN, the International Atomic Energy Agency and the World Health Organisation -- in 2006, at the time of the incident's 20th anniversary. Chernobyl's Legacy: Health, Environmental and Socio-Economic Impacts suggests about 1000 workers received high doses of radiation in the immediate aftermath. Of these, 134 were diagnosed with acute radiation sickness and 28 died during 1986 as a result.

Two others died from injuries after the explosion. A further 19 died during the next seven years, but some of these deaths were not related to radiation.

Beyond these deaths, how many people have died from radiation-related disease in subsequent years? The difficulty for those trying to measure the health effects is that there has been no obvious spike in rates of cancer or other illnesses. The exception has been a surge in thyroid cancer, which is normally rare and usually treatable. Chernobyl's Legacy stated there had been about 4000 cases to 2006, with 15 deaths.

So we know about 50 deaths can be linked directly to the accident. Estimates of the wider death toll are educated guesses. Chernobyl's Legacy identifies two main groups of people according to the doses of radiation received. There were 600,000 clean-up workers or "liquidators" who worked at the plant in the months after the accident. The report suggests most of these received doses of radiation that would increase the risk of cancer by "up to a few per cent", eventually resulting in "up to 4000 fatal cancers in addition to the approximately 100,000 fatal cancers to be expected due to all other causes in this population".

A further five million people in the countries that surrounded the plant -- Ukraine, Belarus and Russia -- lived in "contaminated areas". The report argues that the doses of radiation received by this wider group were so small "any projected increases are more speculative but are expected to make a difference of less than 1 per cent in cancer mortality".

The figures presented by Chernobyl's Legacy have been controversial. Opponents of nuclear power argue that hundreds of thousands of people will ultimately die because of the accident. In 2006, Greenpeace claimed Chernobyl would eventually cause 250,000 cancer cases and 100,000 cancer deaths.

A more recent research project for the European Commission has been trying to provide a more comprehensive analysis of the disaster's health effects. One of the researchers involved, Keith Baverstock of the University of Eastern Finland, explains the problems of estimating the effects of radiation on the affected population. "Practically everything we know is derived from the Japanese bomb survivors [at Hiroshima and Nagasaki]," he says. "The exposure was to quite high doses, but the dose was delivered in a flash." In the case of Chernobyl, he says, "the doses are spread out over years and are comparatively low". Because of this, Baverstock says, the overall death toll is "very much a guessing game".

He believes the Chernobyl Forum figures may be too low for several reasons. For starters, radiation is thought to have adverse health effects beyond cancer, such as higher rates of heart disease. In addition, Baverstock says, there is "no reason to believe there is any kind of threshold" before those exposed to radiation suffer an increased risk of ill health, something referred to as the "linear no threshold", or LNT, hypothesis. In other words, the mainstream assumption is that even small doses of radiation increase the risk of disease and that risk rises as the dose increases.

How many people does Baverstock think will ultimately die because of the accident? "Personally, I think the figures that come out [of] around 20,000 to 40,000 deaths in Europe over the lifetime of the exposed population, that's the order of magnitude," he says.

Others take a different view. Oxford academic Wade Allison, author of *Radiation and Reason*, believes there is a threshold below which radiation is essentially harmless. He argues the human body is constantly confronted with poisonous substances and infections in everyday life but has many defence mechanisms to cope with them, which it generally does successfully. It is only when a relatively large dose of something poisonous -- such as radiation -- is received that the body's defences become overwhelmed.

Allison points out that, relative to exposures in medical procedures such as X-rays and radiotherapy for cancer, the doses received by people after the Chernobyl accident were very small. As a result, he thinks the Chernobyl Forum report may have greatly overstated the number of deaths from radiation. In Allison's view, only the deaths of clean-up workers in the weeks after the accident from radiation sickness and the cases of thyroid cancer can be convincingly

attributed to Chernobyl.

Where Allison does agree with Chernobyl's Legacy is on the suggestion that the health and social consequences of the sudden evacuation, with tens of thousands of people shifted to places where they had no homes, jobs or social connections, had a more adverse effect than the radiation, particularly when combined with the assumption that sickness and death from cancer were inevitable. As Allison says: "Reminding people constantly that they are survivors of Chernobyl, that effect has been disastrous."

Despite its terrible consequences, Chernobyl may represent a strong argument in favour of expanding the use of nuclear energy. The accident is almost certainly the worst that could happen: a serious explosion followed by more than a week of radiation flooding into the atmosphere.

If such a coincidence of Stalinist-born bureaucracy and bungling, human error and decrepit technology can have such a relatively small effect, creating health risks that are far smaller than from more familiar sources such as tobacco and alcohol, then the risks associated with well-run, modern nuclear power plants seem well worthwhile in exchange for clean, reliable energy.

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## **20. Vote for mother Earth gets dimmer by the hour**

Bjorn Lomborg

From: The Australian March 26, 2011 12:00AM

<http://www.theaustralian.com.au/news/world/vote-for-mother-earth-gets-dimmer-by-the-hour/story-e6frg6ux-1226028322610>

**COPENHAGEN'S central square hardly competes with New York's Times Square for glitz, but it is prime commercial space in my home, Denmark.**

Now there's a new advertiser among the neon signs: a brightly lit billboard exhorts everyone to participate in Earth Hour, the 60 minutes tonight in which the whole world is urged to dim the lights to cut greenhouse emissions. There is a certain irony in renting brightly lit advertising space to exhort us to save electricity for one hour, but this is apparently lost on the organisers.

Dimming the lights is promoted online as a "vote for mother Earth" that will reveal "the impact we have on the environment".

Actually, the only real result will be to make it harder to see. The environmental effect of the past three annual lights-out hours has been negligible. If everyone in the world participated in this year's Earth Hour, the result would be the same as turning off China's carbon emissions for roughly 45 seconds.

When we switch off the electricity, many of us turn to candlelight. This seems natural and environmentally friendly, but unfortunately candles are almost 100 times less efficient than incandescent light bulbs and more than 300 times less efficient than fluorescent lights. Using one candle for each extinguished bulb cancels the CO<sub>2</sub> reduction; two candles emit more CO<sub>2</sub>.

Millions of well-intentioned people will take part in Earth Hour. I commend the efforts by organisers to encourage participants to continue engaging in environmentally friendly choices such as recycling or saving energy after the hour has ended. But I fear the campaign is symptomatic of an environmental movement that is too focused on hollow, feel-good actions that at best only inch us in the right direction.

In a bid to cut carbon emissions, the environmental movement has pushed for "green" alternative energy to be used across the world. Many countries now provide financial support to solar panels and wind turbines. But this technology is still inefficient, so the environmental results are negligible.

Germany is a good example. Despite being a fairly cloudy country, it has led the world in solar panel subsidies, spending \$US75 billion putting inefficient, uncompetitive solar technology on rooftops.

This delivers a trivial 0.1 per cent of Germany's total energy supply and will postpone the effects of global warming by just seven hours in 2100.

With the financial crisis, Germany and others have to rein in lavish subsidies. It is easy to forget that while sunlight is renewable, subsidies certainly aren't.

Similarly, many environmentalists enthusiastically endorsed government financial support for biofuel as a silver bullet to cut carbon emissions. The subsidies are now massive and entrenched, and one-sixth of the world's corn supply is burned just to help fuel cars in the US, contributing to the highest food prices ever and increasing starvation.

As other countries race to create more food, forests are being razed for agriculture, causing more emissions than will be saved from biofuels during the next 100 years.

It's easy to feel as if we're helping the planet if we have a government-funded solar panel on the roof or fill our car with fuel from a tank adorned with green slogans, but the reality is that we're doing no such thing.

It is time to look to a smarter solution to global warming that would do more than just make us feel good about ourselves. We will not make a sustainable shift away from dependence on fossil fuels so long as the alternatives remain so expensive. Solar panels are still about 10 times costlier than fossil fuels in terms of cost a unit of energy output. That's the reason only well-heeled Westerners (being paid significant subsidies by their governments) can afford to install them.

Consider how this would change if our innovation made solar cells or other green energy technology cheaper than fossil fuels. Everyone would shift to the cheaper and cleaner alternatives, including the world's developing nations, which cannot afford to engage in today's hollow, feel-good policies.

Much more investment in research and development is needed to bring about game-changing breakthroughs for alternative-energy technologies - something in the order of 0.2 per cent of global gross domestic product, or \$US100bn annually.

The harsh reality is that the shift away from fossil fuels will not be easy. Reducing carbon emissions is a lot more difficult than dimming the lights for an hour. It requires genuine willpower and investment. Instead of just dimming our lights, we need to get much brighter about solving global warming.

*Bjorn Lomborg is the subject of the film Cool It, out on DVD on March 29. He is director of the Copenhagen Consensus Centre at Copenhagen Business School.*

## **21. Japan's high radiation data creates panic**

Agencies, The West Australian

March 28, 2011, 7:33 am

<http://au.news.yahoo.com/thewest/a/-/world/9085568/japans-high-radiation-data-creates-panic/>

The operator of a crippled nuclear plant in Japan has retracted an announcement that radiation in water near one of the reactors was 10 million times higher than normal.

Tokyo Electric Power said the mistake was due to confusion between readings of iodine and cobalt in the water.

Earlier TEPCO said radiation of more than 1000 millisieverts per hour had been detected in puddles of water thought to have leaked from the number two reactor at its Fukushima Daiichi plant.

It did not retract that figure.

TEPCO employees had fled the complex's Unit 2 reactor when a reading showed radiation levels had reached 10 million times higher than normal in the reactor's cooling system.

Officials said they were so high the worker taking the measurements had withdrawn before taking a second reading.

On Sunday night, though, plant operators said although the water was contaminated with radiation, the extremely high reading was a mistake.

"The number is not credible," said TEPCO spokesman Takashi Kurita. "We are very sorry."

He said officials were taking another sample to get accurate levels, but did not know when the results would be announced.

The situation came as officials acknowledged there was radioactive water in all four of the Fukushima Dai-ichi complex's most troubled reactors, and as airborne radiation in Unit 2 measured 1000 millisieverts per hour - four times the limit deemed safe by the government, Mr Kurita said.

Officials said they still did not know where the radioactive water was coming from, although government spokesman Yukio Edano said some was "almost certainly" seeping from a cracked reactor core in one of the units.

While the discovery of the high radiation levels - and the evacuation of workers from one reactor unit - again delayed efforts to bring the deeply troubled complex under control, Mr Edano insisted the situation had stabilised partially.

"We have somewhat prevented the situation from turning worse," he told reporters on Sunday evening.

"But the prospects are not improving in a straight line and we've expected twists and turns. The contaminated water is one of them and we'll continue to repair the damage."

The discovery over the past three days of radioactive water has been a major setback in the mission to get the plant's crucial cooling systems operating more than two weeks after a massive earthquake and tsunami.

The magnitude-nine quake off Japan's north-east coast on March 11 triggered a tsunami that barrelled onshore and disabled the Fukushima plant, complicating an immense humanitarian disaster.

The death toll from the twin disasters stood at 10,668 on Sunday, with more than 16,574 people missing, police said. Hundreds of thousands of people are homeless.

Workers had been scrambling to remove the radioactive water from the four units and find a safe place to store it, TEPCO officials said.