

Nuclear projections look shaky after Fukushima

By Nic Maclellan

In recent years, concern over climate change and the environmental impact of coal-fired plants has spurred renewed interest in generating electricity from nuclear power. But nuclear industry projections for new reactor construction were looking shaky even before the post-tsunami nuclear crisis in Japan.

It will take some time for the long-term health and environmental impacts of the Fukushima accident to be documented, but the economic reverberations of the accident are already being felt. The nuclear industry's growth will be curtailed in coming years, in spite of increased global energy demand and the need to organise a transition away from oil and coal-fired power generation.

Here are ten of the challenges that will combine to thwart the so-called "nuclear renaissance":

1) Government subsidy

Energy corporations are reluctant to build nuclear reactors without massive government subsidy, insurance guarantees and significant investment capital from the finance sector. In Europe and North America, the industry only survives through direct government funding, loan guarantees, or guaranteed payback of investments through government-regulated markets for electric power.

Many governments have been willing to subsidise research and development of nuclear technologies because of their military applications (highlighted by the current debate over Iran's nuclear program). Now more taxpayers will ask whether government subsidy of nuclear power for electricity generation raises real opportunity costs at a time when other energy sectors (such as the solar thermal industry) are seeking funds for research and testing.

Concern of climate change is driving new investment in energy technologies. But banks, bond-rating agencies and private venture capital firms have been voting with their feet, even before the current crisis: in 2007, private investors put US\$71 billion into renewable energy research but nothing into nuclear power.

2) Will nuclear power maintain its market share?

While the energy industry has announced increased projections for nuclear power generation by 2030, the global share of electricity generated by nuclear reactors actually *dropped* a percentage point in 2007 and again in 2008. Without massive new investment in reactor construction, this share will continue to fall in coming years, as many reactors built in the 1960s and 1970s come to the end of their operating life.

Western Europe and the United States together account for over 60 per cent of current global nuclear capacity, but that proportion is falling. There were 177 nuclear reactors operating in the European Union in 1989 - by 2008 this was down to 146. In 2008, across the globe, not a single new plant was connected to the grid – the first time this has happened since 1955.

The nuclear industry proudly stresses that 65 new reactors are currently "under construction". However a dozen of these projects have been under construction for more than 20 years – many plants that are proposed are never licensed or begin commercial operation.

The International Atomic Energy Agency's *IAEA Annual Report 2010* shows the rate of reactor construction has fallen over the last two decades. On average, 16 new reactors were connected to the grid each year throughout the 1970s. Over recent decades, this number has fallen dramatically: from 2000 to 2009, only 3 new reactors were connected to the grid each year on average. The IAEA report acknowledges that an average of 22 reactors will need to be built each year to meet industry projections for 2030 – a big ask in the current climate!

3) Ageing reactors

By December 2010, there were 441 nuclear reactors operating in 31 countries around the world. However many of these reactors were built forty years ago and came on stream in the 1970s and 1980s.

Decommissioning old plants and replacing them by modern designs is supposed to improve safety. But in spite of ambitious projections, the loss of generating capacity from decommissioned reactors is unlikely to be replaced by proposed new plants, based on current construction timelines.

Faced with concerns over peak oil and the greenhouse impacts of coal-fired plants, governments in North America and Europe have been planning to extend the operating life of these ageing plants. However in the immediate aftermath of Fukushima, it will be much harder for governments to grant these extension licences.

Over the last fortnight Italy, Germany and other countries have already launched reviews of the extension process. Changing public opinion will certainly force regulators to maintain much tougher regimes of monitoring before such extensions are allowed.

4) America's industry in trouble

For decades after the 1979 accident at Three-Mile Island, nuclear construction in the United States ground to a halt, through a combination of increased regulatory standards, legal challenges, public protest and changing energy demand.

Over the last two years, the Obama administration has announced new insurance guarantees and subsidies to try to boost the industry. Unlike Australia, where the mining industry is trying to boost uranium investment, mainstream media have often avoided industry hype about a 'nuclear renaissance', recognising that the US nuclear industry was already in trouble before the current Japanese crisis. As *Time Magazine* reported last week: "Even before the earthquake-tsunami one-two punch, the endlessly hyped US nuclear revival was stumbling, pummelled by skyrocketing costs, stagnant demand and skittish investors, not to mention the defeat of restrictions on carbon that could have mitigated nuclear energy's economic insanity."

[http://news.yahoo.com/s/time/20110318/us_time/08599205945300]

The reputation of the global nuclear industry is vulnerable to unsafe practices in any country, and the failures of Japanese nuclear regulators and energy corporations like TEPCO will have an influence elsewhere.

French government officials and representatives of nuclear corporations like Areva and EDF have been sharply critical of Japanese responses to the post-tsunami accident. Beyond their interest in promoting French technology, there is recognition in Paris that the public debate will affect attitudes in their own country that, like Japan, has a high proportion of electricity generated by nuclear power.

5) Fukushima impacts Asian debate

Developing countries around the world, especially in Asia, are the new frontier for nuclear power generation, with proposals for industry expansion in China, India, Korea, Russia and other nations. China has six nuclear plants in operation and is building 27 of the plants currently under construction around the world.

But just as the 1979 nuclear accident at Three Mile Island damaged the US nuclear industry and the 1986 Chernobyl disaster delayed reactor approvals across Europe, so the Fukushima crisis will affect current plans across East Asia and South Asia (the main regions around the globe where the much-touted “nuclear renaissance” is on the cards).

Last week China’s State Council announced that construction on all new nuclear reactors would be suspended until revised safety standards are approved. Korea has also begun a review of reactor safety, especially as the country’s reactors are only engineered to withstand earthquakes at 6.5 on the Richter scale – well below the level of 9 for the undersea quake off Fukushima. Japan’s crisis has reignited debate in Indonesia, where plans for a reactor on the Muria peninsula are already facing local resistance and a fatwa from major Islamic organisations.

Whatever the final health and environmental impact for the people of Japan, the ongoing crisis has reawakened public consciousness about nuclear safety around the globe and this debate will resonate for many years. That’s bad news for corporations seeking government rapid approval for plant construction or extension of existing licences.

6) Costs of decommissioning

If the operating life of ageing nuclear reactors cannot be extended, someone must pay hundreds of millions of dollars to decommission them – and the cost of this process is ballooning.

In the United States, for example, nuclear power plant operators are legally required to set aside funds during a reactor’s operating life to ensure the reactor site will be properly cleaned up once the reactor is permanently shut down. In June 2009, the US Nuclear Regulatory Commission (NRC) contacted 18 nuclear power plants to clarify how the companies will address the effect of the global economic downturn on funds to decommission reactors in the future, suggesting that several plants must adjust their funding plans.

This scrutiny is likely to continue in the aftermath of the Japanese crisis, especially as the Fukushima reactors were designed or constructed by General Electric (GE) and its subsidiaries (The damaged Japanese Daiichi No. 1 reactor began commercial operation in 1971 and over twenty boiling water reactors of similar design are still running in the United States).

7) Who will staff the industry?

It's not just ageing technology that is an issue – it's the age of the engineers and technicians who run nuclear reactors. In many Western countries, nuclear industry staff are ageing and engineering schools are not turning out enough graduates to support proposed new reactor construction and operation.

As Der Spiegel noted in a 2009 study of the nuclear renaissance: “Forty percent of employees at US nuclear power plants are set to retire soon. The industry will have to find 26,000 new employees in the next 10 years - even if it doesn't build a single new nuclear power plant. However, only 841 nuclear engineers completed their studies in the United States in 2008. The situation is even more dramatic in Germany. Between 1998 and 2002, only two students graduated with an emphasis on nuclear engineering.” [<http://www.spiegel.de/international/europe/0,1518,655409,00.html>]

8) Cost overruns for new generation reactors

Nuclear proponents are eager to stress that new generation reactors are nothing like the ageing plants at Chernobyl or Fukushima. But companies have routinely misjudged the cost and complexity of building modern reactor designs and so-called “fourth generation” reactors are decades away from commercial operation.

The recent experience of Finland is evidence of this incapacity of industry to deliver in a timely and cost-effective manner. A new third generation pressurised water reactor is under construction at Olkiluoto in Finland, which already hosts two older reactors. However the project is an economic disaster, running four years late and more than US\$2 billion over budget. French nuclear corporation Areva and the Finnish electricity utility TVO are suing each other because of delays caused by poor engineering and increased safety inspections. After 10 years work, the plant was supposed to be operating in May 2009 but commissioning has been postponed several times and may not take place until after 2013.

European media have been covering this economic meltdown for years, but the Australian media continues to uncritically praise this project (for one example, see an article in *The Australian* last December by former foreign minister Alexander Downer – now an industry spin doctor in his role as a consultant with the lobbying firm Bespoke Approach).
[<http://www.theaustralian.com.au/business/nuclear-the-best-way-to-ensure-power-needs-while-reducing-emissions/story-e6frg8zx-1225967895551>]

9) What to do with the waste?

Rather than a reactor meltdown, a major hazard from Fukushima has been the release of ionising radiation from fuel rod assemblies stored in cooling ponds at the reactor site, which appear to have overheated. This will refocus international attention on the unresolved problem of finding secure, long-term storage for high level radioactive waste.

In spite of numerous attempts – such as the Yucca mountain project in the United States – governments and corporations around the world have signally failed to resolve the issue of long-term waste management and disposal. In coming years, taxpayers will begin to bridle at the funds that must be poured into resolving the nuclear industry's failure to fund research and development.

10) And then there's the proliferation of nuclear weapons.....