

Nuclear matters

By George Frampton

Following the recent earthquake and tsunami-triggered nuclear crisis in Japan, US President Barack Obama summoned the country's Nuclear Regulatory Commission's chairman Gregory Jaczko to the White House to 'request' that the NRC – an independent agency – conduct a thorough review of US reactors. The NRC promptly announced that it would conduct a 90-day review to identify obvious and potentially critical issues posed by the Japanese disaster, and then a longer-term assessment.

Much remains unknown about what actually occurred at the Fukushima plant in Japan, but an intense international effort will have to be mounted to assess the vulnerabilities in the safety and back-up systems revealed by the accident to identify lessons learnt and to develop requirements to address these risks.

Vulnerabilities

That process will certainly include, based on what we know now, assessments of at least the following: availability and redundancy of back-up facility power, as well as the 'design base accident' scenarios now used in the US risk assessment system; systems for bringing back-up water to the reactor vessel and spent-fuel pools; venting systems for hydrogen and other gasses; the location, design and size of spent fuel ponds and the need to increase use of dry-cask storage; accident response planning, radiation monitoring and communication systems and the positioning of reactors near fault lines and seaside locations.

The NRC adopted new rules in the aftermath of the 11 September 2001 terrorist attacks on the US that directly address some vulnerabilities revealed in Japan, such as spent fuel pool exposure and draining, fire suppression and extended loss of power. But details about these steps are classified and

confidential. It is imperative that new requirements are developed in a transparent fashion so that the public gains confidence in nuclear power without sacrificing security concern and regulators in other countries can integrate our thinking.

There will also be increased attention to the safety of the newest reactor designs currently under construction or awaiting permits in the EU, China and the US, particularly the AP-1000 Westinghouse reactor. This, like other so-called generation III+ designs, incorporates important 'passive' features, for instance, internal emergency cooling occurs by convection for a certain period when pumps cannot be powered. However, the AP-1000 has been criticised for sacrificing a strong containment structure to save cost. At the same time, estimated costs have spiralled at the first AP-1000 sites.

There will be more attention to the large inventory of spent fuel located in open ponds at US reactor sites, including demands that substantial amounts of it to be incorporated in 'dry casks'. Political and environmental factors have blocked any reprocessing of spent reactor fuel to make new fuel in the US for decades, as is done in the EU, Japan and elsewhere. That deadlock might need to be reconsidered.

Government loans

In the US, the Japan accident may have little long-run impact on our nuclear future. Currently, nuclear energy cannot compete in the marketplace without government loan guarantees. Just a handful of new plants are likely to receive guarantees in the next few years. Moreover, with the prospect of abundant low-price domestic natural gas (the result of new hydro-fracturing technologies) and little estimated increase in demand for electricity over

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the next decade, nuclear's high cost will continue to be a disadvantage. For instance, wind is now competitive with coal; solar is more expensive but costs will continue to fall. Events in Japan can only increase the cost of nuclear, which is already significantly higher than solar.

New reactor designs can, theoretically, be operated at levels 1,000 times safer than the 40-year old reactors at Fukushima. But ultimately the safety of any nuclear programme depends on a national commitment to put safety first. This requires a strong regulatory body, well-funded, with the authority and will to intervene when operators are not doing what they should do.

Transparent regulation

The regulatory programme must also be transparent. The US and EU have regulatory regimes that meet these tests, or at least are capable of doing so when well-administered. Japan traditionally has had a more passive oversight body focused on promotion and science, much like the old US Atomic Energy Commission (which pre-dates the NRC). Institutional changes in the Japanese regulatory regime may be required to restore public confidence in that country's nuclear programme.

Similar issues will arise as the Chinese reconsider their own programme, which has temporarily been put on hold. China badly needs new generation nuclear capability as well as substantially increased renewable energy to de-carbonise its energy sector. But will the Chinese government be able to convince its people that it has in place the institutional arrangements necessary to make sure that operators are putting safety first?

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