

Update of nuclear power – Published in ENGINEERS AUSTRALIA April 2009

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With the continuing rise in the world population, the demand for electricity could rise from 20,000TWh per year in 2008 to 30,000TWh per year in 2030 and there are reasonable prospects that the 372GWe of nuclear electricity in 2008 (or about 16% of the world's electricity) will increase to 635GWe by 2030, according to Dr Selena Ng from AREVA. Based in Melbourne, Ng is currently responsible for developing the company's nuclear activities in the Asia-Pacific Region.

She made these remarks in her presentation at the annual meeting of the Australian Nuclear Association, the Nuclear Panel of Engineers Australia, the Australian Institute of Energy and the Royal Society of NSW in Sydney on 25 February.

The increase in electricity from nuclear plants would require the building of more than 300GWe of new plants (taking life extensions and reactor shutdowns into account) representing at least 180 new plants if they each had a capacity of 1600MWe, Ng said.

She acknowledged that opposition to nuclear power remains strong, even though it offers electricity generation at vastly reduced levels of carbon dioxide emissions compared with coal-fired plants.

One of the reasons for much of the opposition, she said, was the difference between risk perception and risk reality. Numbers, data and statistics of probabilities of accidents or deaths often play only a small role in the public's perception of risks, she suggested.

For instance, a nuclear accident is very low on the list of probabilities of dangerous events and modern western-designed reactors are invariably equipped with containment buildings to prevent the release of radioactivity if an accident or terror attack should occur, she said. In addition, in regard to radioactivity she pointed out that the natural background levels of radiation and the levels that can be measured around nuclear powerplants and fuel cycle facilities are very low compared with the levels that can cause death or serious injury, she said.

As for stealing radioactive material, Ng explained how difficult it would be for a terrorist group to obtain the fissile uranium or plutonium required for a bomb from civil nuclear plants in which the normal materials used were not suitable for making bombs anyway. A more probable risk would be for terrorists to make a "dirty bomb" by mixing radioactive material stolen from a hospital or commercial irradiation plant with a conventional explosive.

Another public concern is that radioactive waste could not be managed safely for long periods. Ng explained that radioactive waste is separated into at least three kinds – low, intermediate and high level. The first two kinds do not pose long term risks.

The volume of high level waste is relatively small but the major problem is the very long half-life of its components, from a few hundred years to thousands of years.

The amount of high level waste could be greatly reduced by reprocessing it to remove uranium and plutonium for recycling, Ng said, and the remaining high level waste could be packaged and safely buried deep underground.

In Australia the present government does not support the introduction of nuclear power even though it supports an expansion of uranium mining for use in overseas nuclear plants. Ng does not expect this policy to change unless the government's preferred energy sources of coal (with capture and sequestration of carbon dioxide), supported by solar, wind and hot rock, failed to meet its expectations.

The AREVA group, with its head office in Paris, is an integrated supplier to the nuclear power industry. Its activities include uranium exploration, uranium mining, conversion and enrichment, nuclear fuel fabrication, construction of nuclear powerplants, used fuel recycling and management of nuclear waste. The company does not operate nuclear powerplants or final waste disposal facilities. In Australia the company is mainly active in the electrical transmission and distribution industry, as well as in uranium exploration.

Dr Clarence Hardy, Dr Don Higson, and Dr Neil McDonald are members of the Australian Nuclear Association and Engineers Australia's Nuclear Panel. McDonald is also a member of Engineers Australia's National Fuel and Energy Committee.