14 NUCLEAR SUPPLY

OUTLOOK FOR NUCLEAR ENERGY IN THE APEC REGION

Even after the serious accident at the Fukushima Daiichi Nuclear Power Plant in Japan in March 2011, considerable growth of nuclear energy utilization in the APEC region is projected over the outlook period. This growth reflects not only the economic and environmental advantages of nuclear energy, but also the focus on ensuring nuclear safety that has intensified since the accident. The economic advantages of nuclear energy include its low fuel cost and lower risk of fuel price fluctuations compared to fossil fuels. The environmental advantages include the technology's relatively low greenhouse gas emissions throughout its supply chain.

The main impediment to nuclear expansion is low public acceptance due to safety issues. The Fukushima accident has, of course, lead to increased concerns about safety. Since the accident was triggered by a huge natural disaster, the resilience of nuclear facilities in the face of natural disasters has gathered much attention. At the same time, there are concerns that similar serious accidents could be caused by malicious human attacks.

Therefore, an enormous effort will need to be made worldwide by the scientific, business and governmental communities to address these concerns and recover public confidence in the safety of nuclear power. In this regard, initiatives to develop advanced nuclear technologies, upgrade nuclear safety standards for construction and operation, and tighten nuclear security are being undertaken in many economies, and should be continued in the future.

The growth of nuclear energy utilization in the APEC region is expected to be predominantly centred in China, Russia, and Korea, whose policies promote large-scale development of nuclear power. Viet Nam also plans to add nuclear to its energy mix sometime after 2020. Other South–East Asian economies, like Thailand, continue preliminary studies and planning for construction of nuclear plants, but without a firm commitment to proceed as yet. On the other hand, the future of nuclear energy in Japan and Chinese Taipei, which have historically been major nuclear power users in the APEC region, is very uncertain at the time of writing.

On the other side of the Pacific Ocean, the United States currently has the largest nuclear capacity in the APEC region. However, the US nuclear fleet is aging. Before 2012, no construction of new reactors had been approved since 1978. Two new reactors in Georgia were given approval for construction in February 2012 and two more in South Carolina were approved in March 2012 (Wall Street Journal, 2012).

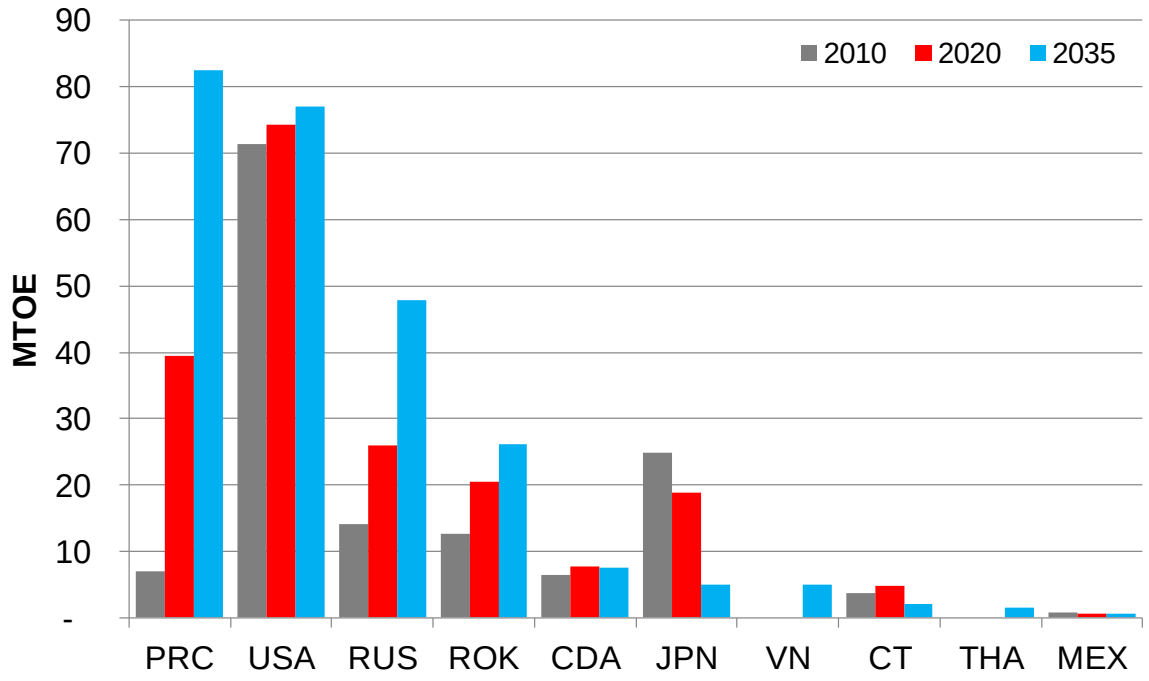
However, beyond these four reactors, plus one in Tennessee approved in the 1970s but only now being completed, further construction of new reactors in the US is likely to come slowly if at all (USEIA, 2012, pp. 50–51; Scientific American, 2012). Even before the Fukushima accident, high initial construction costs, regulatory uncertainties, safety concerns, the unresolved issue of waste disposal, and competition from low-cost natural gas were major obstacles to new US reactor construction. Nuclear energy in Canada and Mexico (which has only one commercial nuclear plant) faces similar obstacles.

Figure 14.1 shows projected electricity generation from nuclear energy by economy in Mtoe. By 2035, the amount of electricity generation by nuclear is expected to reach 292 Mtoe, compared to 141 Mtoe in 2009.

Overall, nuclear energy supply is projected to grow at a rate of 2.2% from 426 Mtoe in 2009 to 753 Mtoe in 2035. The share of nuclear energy in total primary energy is also projected to increase from 6% in 2009 to 7% in 2035.

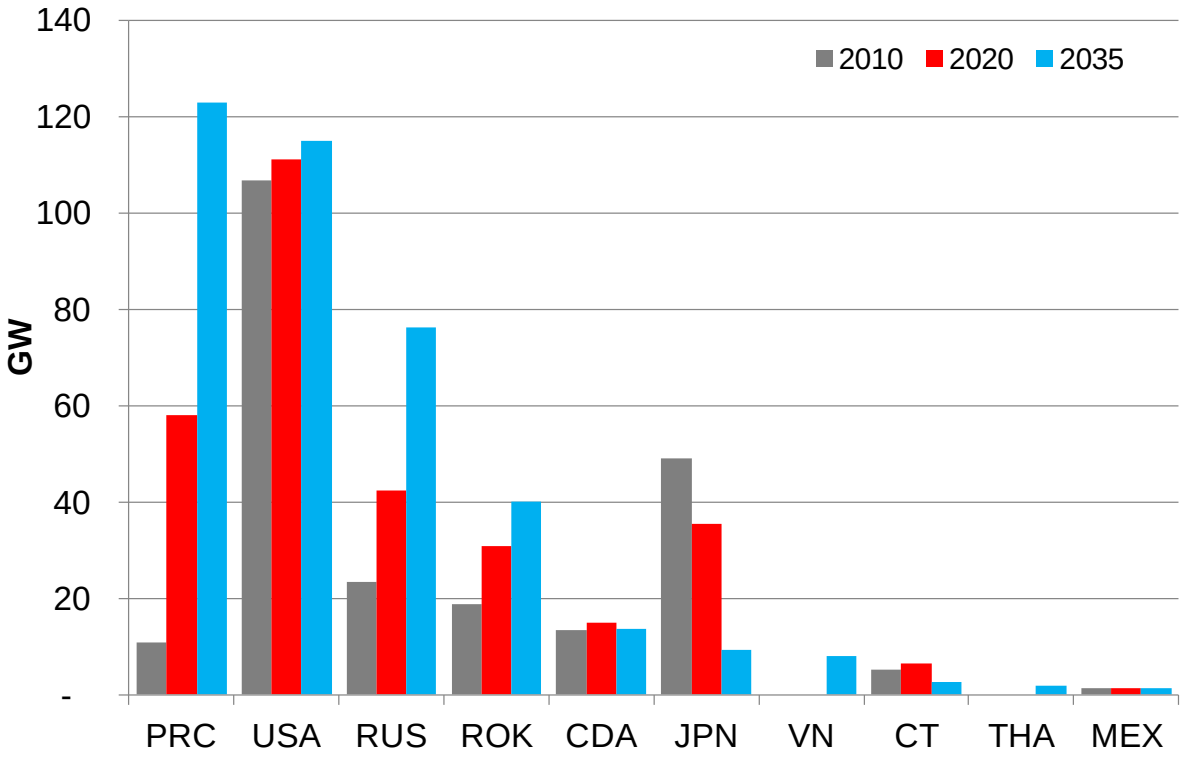
Figure 14.2 shows projected nuclear capacity by economy. In the APEC region, China is expected to be the clear leader in growth in nuclear power capacity, adding about 114 GW of capacity by 2035 to their 2009 capacity of about 9 GW. Russia will add 53 GW of new capacity, while Korea is expected to add about 21 GW of new capacity by 2035.

Figure 14.1: Projected Electricity Generation from Nuclear Energy



Source: APERC Analysis (2012)

Figure 14.2: Projected Nuclear Power Generation Capacity



Source: APERC Analysis (2012)

THE IMPACT OF THE FUKUSHIMA NUCLEAR ACCIDENT

When Japan revised its Strategic Energy Plan in 2010, aiming at doubling the rate of energy self-sufficiency (18% in 2010) and that of the zero-emission power sources (38% in 2010) by 2030, the key resource for achieving these targets was nuclear power. The share of nuclear generation in Japan's electricity generation mix was expected to be about 50% in 2030. That would require 14 or more nuclear power reactors.

However, the accident at the Fukushima Daiichi Nuclear Power Plant of Tokyo Electric Power Company (TEPCO), triggered by the Great East Japan Earthquake on 11 March 2011, has substantially changed not only the Strategic Energy Plan of Japan but also the outlook for nuclear development around the world.

The most dramatic impact was seen in Europe. In May 2011, Germany reconfirmed its earlier policy of phasing out nuclear energy by the early 2020s, beginning with the immediate shutdown of eight older plants, reversing a more recent policy of granting life extensions (BBC, 2011a). Switzerland dropped plans for new nuclear plants and decided to phase out its existing plants, although not until 2034 (New York Times, 2011). In Italy, which had abandoned nuclear energy in the 1980s, voter response to a referendum in June 2011 was 94% in favour of cancelling their government's plans for new reactors (BBC, 2011b).

Compared with Europe, the impact of the Fukushima accident in the APEC region has been more limited. Though all economies have reviewed their plans, and especially their safety regulations, no economy has so far decided to abandon nuclear energy. Except for two economies, the outlook for nuclear appears to be little changed.

The two exceptions are Japan and Chinese Taipei. In Japan, nuclear energy has become highly controversial, and there exists a great deal of uncertainty regarding its future. At the time of writing, only two of Japan's 50 remaining nuclear power units are in operation (four others at Fukushima Daiichi were decommissioned). The current nuclear situation in Japan is discussed in the Japan Economy Review in Volume 2. It will be up to the new Japanese government as elected in December 2012 to sort out Japan's nuclear policy going forward. In this Outlook, APERC has assumed nuclear generation will resume in Japan, but no new nuclear units will be built during the outlook period and existing units will be phased out at the end of their 40-year life.

In Chinese Taipei, the government has announced a policy of reducing dependence on nuclear generation, but has stopped short of a nuclear phase-out. Specifically, no life extension will be granted for the existing three nuclear power plants (six units), implying that the first unit will be decommissioned in 2018 and that all six existing units will be decommissioned by 2025. The one new plant currently under construction (two units) will, however, be completed and put into operation. See the Chinese Taipei Economy Review in Volume 2 for more discussion of the nuclear situation in that economy.

Recommendations of the Fukushima Nuclear Accident Independent Investigation Commission

As a basis for future nuclear policy, the National Diet of Japan established the Fukushima Nuclear Accident Independent Investigation Commission (NAIIC). The outcome of the NAIIC's investigation was seven recommendations. Although these recommendations were addressed to Japan, they provide important lessons for other economies involved in nuclear power development. In summary, the recommendations were (NAIIC, 2012):

1. **The National Diet should establish a permanent committee to supervise nuclear industry regulators** in order to secure the safety of the public.
2. **The crisis management system must be reformed**, including a consolidated chain of command and the power to deal with emergency situations. The boundaries dividing the responsibilities of national and local governments and operators must be made clear.
3. **The government must take responsibility for the public health and welfare consequences of the accident.** This includes continued monitoring of hotspots and spread of contamination, a detailed program of decontamination and relocation, and medical diagnosis and treatment of victims at state expense. Full information disclosure should be a priority.
4. **TEPCO should undergo a 'dramatic corporate reform',** including addressing issues of governance, risk management, and information disclosure with safety as the sole priority. The government should set rules and disclose information regarding its relationship with operators. Operators should set up a system of mutual peer review to maintain safety standards at the highest global level.

5. **A new regulatory body should be established which is independent, transparent, professional, consolidated, and proactive.**
6. **Laws related to nuclear energy should be reformed to meet global standards for safety, public health, and welfare.**
7. **Japan should establish a system of independent investigation commissions to deal with unresolved issues** including the reactor decommissioning process, spent fuel disposal, and post-accident decontamination.

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