Opportunities for US nuclear firms in China, India, UK: speakers

Opportunities exist for US companies in new nuclear construction in Canada, China, India, and the UK, as well as in the decommissioning of retired reactors, speakers at a conference in Washington said July 21 and 22.

The US Nuclear Infrastructure Council, which represents US-based nuclear supply chain companies including reactor vendors and component manufacturers, sponsore dthe conference and has been involved in exhibits and trade missions to France and the UK in recent months. "It's just unbelievable the opportunities we have in the UK right now," said Bobby Wilson, senior vice president of Chicago Bridge & Iron and chairman of the US NIC, at the conference July 21.

China was recognized as the country with the greatest nuclear reactor construction activity by several speakers at the conference.

A key factor underlying China's aggressive drive to add nuclear generation was a major 2005 snowstorm that cut rail links between coal mining fields and coal-fired power stations, some of which ran out of on-site fuel, said KP Lau, a consultant with Fraser Energy Consulting. Lau provides consulting to nuclear companies interested in doing business in China.

The snowstorm showed the dependence of China's power grid on coal-fired generation, and soon the country's policymakers unveiled a plan to build dozens of power reactors, he said at the conference July 21. Efforts to reduce air pollution and CO2 emissions have contributed urgency to those plans for nuclear units, he said.

China has 23 reactors in operation, with an installed capacity of 20 GW, with 27 additional units under construction and 34 in the planning stages, Lau said. By 2025, the country will have 100 reactors in operation, he said.

China adopted a policy favoring construction of only reactors based on the Westinghouse AP1000 reactor design, which incorporates a series of passive safety features. However, delays in the completion of the first AP1000 units in China have provided an opening for Chinese companies seeking to promote their own designs, Lau said.

China's State Council forced the companies, China General Nuclear and China National Nuclear Corp., to combine rival designs into one nominally integrated design, the Hualong One, he said. That design incorporates some passive safety features, and while most components are similar, the two company versions incorporate differing reactor core designs, Chinese officials have said.

At one point, China was preparing to build 28 AP1000s, but the delays in commercial operation of the first AP1000 units have affected that plan, Lau said.

"If AP1000 can get online soon, I think AP1000 can still get the lion's share" of new nuclear reactor projects in China, Lau said.

The Fukushima I accident resulted in a pause in new nuclear project approvals and China conducted an "unprecedented" comprehensive nuclear safety review, Lau said. The country drafted a national nuclear safety plan and doubled the staffing of the nuclear regulator, he said.

In 2012, the country's State Council decided to resume nuclear project approvals at an "orderly pace" and required that all approved reactors be of a design equivalent to Generation III+, meaning with safety improvements over so-called Generation III designs, Lau said.

That decision also gave consideration to public opinion as another factor in project advancement, Lau said.

More and more opportunities from the Chinese projects will go to Chinese companies, as the country has been "fairly successful" in using locally made components in reactor projects, Lau said. The goal is for 85% of nuclear projects to be sourced locally, he said.

"Despite China's fast expansion of nuclear program … for China to export nuclear technology … they would have to have countries like the United States and others with mature technologies to be their backstop," Lau said. US companies can form joint ventures with Chinese companies to get access to projects led by China, he said. This will bring with it a loss of some "decision-making control," and the risk of losing control of intellectual property, he said.

If the country's third major nuclear power company, State Nuclear Power Technology Co. and its merger partner China Power Investment, succeed in exporting nuclear reactors, it will still benefit Westinghouse because they will be somewhat dependent on the AP1000 technology the US company licensed to Sntpc, Lau said.

One export product other than the Hualong One and the AP1000 and its variants is a new pebble-bed high temperature reactor that is being built commercially in China for the first time, Lau said. The HTR-PM reactor design under construction in Shidaowan will be offered in an export variant, he said, which will feature six 100-MW modules connected to a single 600-MW turbine.

India

Indian's nuclear power program will be accelerating in the coming years, said Vijay Sazawal, a consultant with IAEC Consulting who focuses on India. India is preparing to build a generation of light-water reactors to add to its predominantly heavy-water reactor fleet, Sazawal said.

"There's a window in which you can apply and get into the Indian market, and it's not going to be there forever," he said. The country is looking to move to different types of reactors in the future, including fast reactors and thorium-fueled reactors, he said.

Following the nuclear cooperation agreement reached with the US in 2005, controversial because of India's failure to ratify the Nonproliferation Treaty, India's nuclear power market was opened to Western firms, Sazawal said. The US received a commitment from India saying that two reactor vendors with US ties would be awarded the ability to build reactors at two pre-selected sites.

Indian laws on nuclear accident liability, which reactor vendors have said expose them to unlimited liability unlike laws in most other countries, have made US and French companies unwilling to move forward with construction of new units. In January, leaders of India and the US said agreements had been reached that could resolve industry concerns, but it remains unclear whether US-based vendors will move forward with projects in India.

US companies should act quickly if they are going to move forward with plans to build units in India, because policy-makers there are beginning to develop a "Plan B" to add nuclear generation in case Western vendors do not participate, Sazawal said.

New international lending institutions, including the BRICS Bank, set up by the fast-growing countries of Brazil, Russia, India China and South Africa, as well as the new Asia Infrastructure Investment Bank, could support construction of nuclear reactors in India, Sazawal said.

UK

Chris Gadomski, lead nuclear analyst with Bloomberg New Energy Finance, said during his July 22 presentation at the conference that the cost to build two 1,600-MW EPR reactors at Hinkley Point in the UK is more than twice what he said is being estimated by EDF.

EDF estimates these units can be built for GBP 14 billion ($21.78 billion) plus GBP 2 billion "in owner's expenses," Gadomski said in slides presented at the conference. The "bottom line," rather, is GBP $24.5 billion, according to the slides, which noted this "includes debt financing costs."

Gadomski also noted that an analysis conducted by his company that projects the mix of generating sources in the UK through 2030, indicates that wind and solar will significantly erode nuclear generators' contribution to peak generation within 15 years.

While nuclear energy accounts for about 10 GW of generation during an hourly load period "for a typical summer" day, by 2030 there will be three intervals during a seven-day period when nuclear generation will decline to about 5 GW and two internals when it will be zero, according to a chart Gadomski presented at the conference.

Canada

The planned refurbishment of 10 Canadian power reactors commencing 2016 through 2028 will require Ontario's government to replace this generation with a combination of renewables, natural gas and demand-response, a nuclear industry consultant said at the conference.

Potentially most critical is that around 6,175 MW of installed capacity is slated to be offline at various times between 2020 and 2025, T. Rosemary Yeremian, president of Strategic Insights, told conference attendees July 22.

The Toronto-based consulting company advises companies within the energy sector, including nuclear generators and suppliers.

For example, between the fourth quarter of 2019 and the fourth quarter of 2022, Ontario Power Generation's 934-MW Darlington-2 and -3 will be shut and the 805-MW Bruce Power Bruce-3 will be shut for most of this period, according to slides Yeremian presented at the conference.

Between the third quarter of 2022 and the first quarter of 2024, the 934-MW Darlington-3 and -4 units will be shut, as well as the 872-MW Bruce-5.

Overall, available nuclear capacity from the Darlington and Bruce units will decline from about a 12,500 MW during the time of peak demand this year to about 7,500 MW in 2022, according to Ontario's long-term energy plan.

The four Darlington units will be refurbished for C$6 billion-C$10 billion (US$4.6 billion-$7.7 billion) and the six Bruce units for C$15 billion, Yeremian said in her presentation. The eight-unit, 3,244-MW Pickering is slated to shut in 2020, she said.

Yeremian, in a July 27 email, said her company "sees opportunities for vendors" during the periods when multiple units are shut for refurbishment "when the Canadian supply chain may experience a 'pinch' in terms of capacity."

She said SNC Lavalin Nuclear and Aecon "have already been chosen as the key vendor[s] for the Darlington refurbishment." She said the "same companies (along with some additional partners) are expected to play a leading role in the Bruce refurbishment."

This situation, she said, "may result from nuclear suppliers in Canada being spread too thin, particularly with regard to engineering services, component manufacturing, project management and other nuclear related services."

In a separate email that day, Yeremian declined to identify vendors "who could help out during the pinch period."

Decommissioning

Starting in the mid-2020s, decommissioning will become "an increasingly important segment" of the nuclear power industry, according to Edward Davis, president and CEO of the Pegasus Group, a Washington consulting firm specializing in energy and environmental issues.

Davis noted in a presentation at the conference July 22 that at the end of 2013 there were 392 GW, or 424 power reactors, of nuclear generating capacity globally, producing 11% of the world's electricity. Eighty percent of that capacity is in OECD countries and of that, more than three-fourths of those reactors are older than 25 years, he said.

Decommissioning costs in six countries combined are projected to total $150 billion by 2040, according to a slide in Davis' presentation. The US, which has 31 power reactors more than 40 years old; Germany and Japan, excluding costs associated with Fukushima I; have the highest projected decommissioning costs at $30 billion apiece, according to information on the slide. It showed that these countries are followed by France with a projected decommissioning cost total of $25 billion by 2040, the UK with $20 billion and Russia with $15 billion.

Based on US data, the cost of decommissioning a power reactor is estimated at $750 million to $1 billion per 1,000 MW, Davis said. He added, however, that if there is "an immediate increase in decommissioning services, prices will likely increase."

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