Time for a Safety Check: China's Nuclear Power Sector after Fukushima

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In the wake of the March earthquake/tsunami that devastated Japan and precipitated the worst nuclear accident since Chernobyl, China's State Council announced on March 16, 2011 it would suspend approval of new nuclear plant construction until a thorough safety review could be completed. With the review as yet incomplete at the time of writing, what do these events mean for the future of China's nuclear power sector?

The temporary suspension is merely a "strategic pause" in the expansion of China's nuclear power program. China already has the world's most robust nuclear power plant construction program. In practice, the safety review means that new plants that have not yet been approved cannot *yet* go forward while the 24 existing plants under construction and existing plants will be subject to a safety review and new safety standards. Plants already approved can continue construction.[1] Nonetheless, the pause in new plant approvals pending the review is welcome for a sector that has been growing quickly, outstripping the regulatory authority's capacity.

China's Expanding Nuclear Power Sector

China's nuclear power construction has grown rapidly as the country sought to diversify away from coal and also address its soaring greenhouse gas emissions and air pollution problems. As of April 2011, China had 13 nuclear reactors in operation, most of it

[1] For example, two weeks before Japan's earthquake, China approved a project to build two reactors on a peninsula overlooking the Yellow Sea at Shidao, about 30 miles from the city of Rongcheng, based on experimental pebble bed nuclear technology. Pebble bed designs have been tried before by South Africa, Germany, and the United States but suffered from technical problems and cost overruns. Bradsher 2011. Work on nuclear plants already under construction has continued. In late April 2011, the reactor building dome was installed at the Yangjiang nuclear power plant while the second ring of the containment vessel at the Haiyung Plant was lifted into place. World Nuclear Association 2011.

concentrated along the south and eastern coasts, far from country's interior coal reserves.[2] Of the 61 nuclear reactors under construction around the world, 27 of them – 44% – were being built in China. Beyond the reactors currently under construction, China prior to the Fukushima accident had ambitious plans and proposals to build as many as 160 additional nuclear reactors over the next fifteen years.[3]

In terms of China's overall power needs, coal dominates, supplying more than 2/3 of China's needs. Together, all of China's nuclear plants provide slightly more than half the power provided by the Three Gorges Dam.[4] In 2010, nuclear power provided 10.8 GWe, slightly more than 1% of China's electricity generating capacity of 762GWe.[5] The draft of China's 12th Fifth Year Plan (for the period 2011-2015) released in March 2011 targeted 40 additional gigawatts from nuclear power by 2015,[6] with non-fossil fuel sources intended to provide 11.4% of the country's primary energy consumption by 2015.[7] Robust growth in the nuclear sector has led the Chinese government to increase their 2020 nuclear targets, to as much as 86GW Observers have suggested that the pause in new plant approval might modestly slow the pace of construction, leading to installed capacity more in the range of 75GW.[8]

[2] There are two reactors in operation at Daya Bay, six at Qinshan, three at Ling Ao, and two at Tianwen.
[3] Planned reactors are those that have approval, funding or a major commitment and are likely to be built in 8 to 10 years and proposed ones are those that are likely to be built within fifteen years. China had 50 planned reactors, of which 34 already had approval in April 2011 and another 110 proposed reactors. Some nuclear plants have multiple reactors at a single complex. World Nuclear Association 2011.
[4] Biello 2011.
[5] World Nuclear Association 2011.
[6] Seligsohn and Hsu 2011.
[7] Non-fossil in 2010 provided about 8% of primary energy. China Daily 2011. For nuclear, this would mean an increase to about 5% of the country's electricity supply and 3% of primary energy. Froggatt 2011.
[8] Reuters 2011.

How Safe are China's Reactors?

In the wake of Fukushima, China's authorities sought to allay public and international fears about their nuclear power sector, noting that Chinese nuclear plants are based on new American and French designs that already have stronger safety features such as passive cooling that do not depend on external power. As one Chinese official argued in the wake of Fukushima, China's third generation nuclear designs will operate "just like the flush toilet, no power is needed."[9]

Despite these assurances, a number of events in China have raised concerns among internal and external observers. Though the country has not experienced a major nuclear power plant accident, the head of the country's China's National Nuclear Safety Administration warned in a 2009 speech that the country might have difficulty with construction and operational safety if it was not careful. In a country that had already experienced scandal for inadequate oversight in drugs, toys, and food, such a warning raised international concern. In October 2009, China's premier announced that the country would increase the number of nuclear safety inspectors from around 200 to more than 1,000.[10] The World Nuclear Association suggested that the country needs four times that number by 2020.[11] One study suggested that China's National Nuclear Safety Agency still only had about 300 employees in 2010, with expansion slow due to low salaries. With many of China's nuclear plants located near large coastal cites like Shanghai, Guangzhou-Hong Kong, and Dalian and new reactors

[9] Barta and Spegele 2011.
[10] Bradsher 2009.
[11] World Nuclear Association 2011.

poised to be located in the earthquake prone interior, a more robust nuclear safety regulator, with greater independence from the industry, is seen as necessary.[12]

Corruption among a number of top officials involved in large-scale infrastructure projects, including the nuclear sector, also has raised concerns about contracting for such major projects. In August 2009, the president of China National Nuclear Corporation's was detained in a $260 million corruption scandal related to rigged bids for contracts.[13] Other large-scale infrastructure projects, namely China's much-vaunted high-speed rail network, have been subject to similar corruption scandals, with fears that haste and shoddy workmanship may have undermined the network's safety.[14]

While observers credit China's nuclear sector with a willingness to embrace a safety culture,[15] others fault China for its lack of transparency surrounding international reporting standards for nuclear sector safety. The country has not released its national report related to its obligations under the International Atomic Energy Agency's Convention on Nuclear Safety, nor has the country made public its national report to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.[16]

Chinese Public Reactions to Fukushima

As an authoritarian country, China has less need to take into account the attitudes of its citizens with respect to new nuclear power plant construction than democratic countries.[17] Indeed, with plans to build nuclear plants and related nuclear processing facilities increasingly in

[12] Kong and Lampton 2011.
[13] Bradsher 2009.
[14] Osnos 2011.
[15] Notably, Andrew Kadak from MIT, who worked on the Daya Bay plant, lauded China for its receptiveness of safety goals. Ibid.
[16] Froggatt 2011.
[17] Matthew Fuhrmann finds non-democracies much more likely to build new nuclear plants than democracies. Fuhrmann 2011.

China's poor interior, there has been some willingness by communities in the vicinity of nuclear plants to see nuclear sector construction as good for the local economy.[18] In terms of the Fukushima nuclear accident itself, the reaction by the Chinese public has been difficult for analysts to read. Some observers suggested that people's fears were muted with little on-line commentary, suggesting some degree of government censorship.[19] Others, by contrast, observed greater public alarm both on blogs and in terms of behavior; some of the Chinese public stocked up on salts in the belief that it would protect them from radiation poisoning[20]while others wore paper masks as a precaution.[21]

To allay whatever modest public fears persisted, the Chinese Ministry of Environmental Protection posted radiation in major Chinese cities on-line which showed no impact of Japanese on Chinese cities.[22] As a precaution, however, the Chinese governments temporarily suspended imports of Japanese fish and agriculture products from the areas around the Fukushima plants.[23] Despite these concerns, it does not yet appear that the events in Japan have created major fears among the Chinese public about nuclear power more broadly. That said, the Chinese government is currently engaged in a broader move to tamp down on domestic dissent in the wake of the Arab spring, so any anti-nuclear dissent may be further muted.

[18] A spent fuel uranium recycling facility being constructed in the remote Gansu province in northwest China near the city of Jiayuguan has been welcomed by local officials. Ying and Haotong 2011. That said, some protest activity with respect to nuclear is not unknown to China, as the plant constructed at Daya Bay in Hong Kong was subject to protests before and after the transfer of Hong Kong back to China. The Daya Bay plant, which came online in 1993, reported a "small" radiation leak in 2010, which generated some public fear. Bradsher 2010, Dengke 2010.
[19] Economy 2011.
[20] Bristow 2011.
[21] Zhou 2011.
[22] See http://cot.ag/h1M3kZ
[23] Jacobs 2011.

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