Overview

China is the world’s largest nuclear power market. As of July 2016, China has 34 operational nuclear power reactors with 20 under construction. More than 30 of the country’s existing reactors were built with reliance on foreign design and technology. In November 2014, the State Council published the “Energy Development Strategy Action Plan (2014-2020)”, which confirmed China’s installed nuclear power capacity will reach 58 gigawatts (GW) compared to 28.3 GW at the end of 2015, and capacity under construction will exceed 30 GW by 2020. The plan calls for the launch of new nuclear power projects on China’s east coast and for feasibility studies on inland nuclear plants. China is also aiming to build over 100 new reactors by 2030 in an effort to ease dependence on fossil fuels and become a major competitor in the global nuclear industry. Over the next three years, six to eight nuclear reactors are to be approved annually.

The country’s nuclear power market is dominated by three state-owned nuclear operators: China General Nuclear Power Group (CGN), China National Nuclear Corporation (CNNC), and State Power Investment Corporation (SPI). CGN is currently the largest producer of nuclear power in China, with a 44 percent market share. This is followed by CNNC with 18 percent and CPI with 10 percent. The remaining 28 percent is held by foreign firms including U.S.-based Westinghouse Electric and French firm Areva SA. In a recent move to compete with global nuclear power companies, CNNC and CGN jointly designed and launched the Hualong One reactor (HPR1000), marking a turnaround for China and its domestic nuclear-power industry. The domestic Chinese reactor has similar specifications to other so-called “Third Generation Reactors” such as Westinghouse’s AP1000, and is equipped with automatic, passive safety systems.
USA-China Nuclear Cooperation Agreement

The U.S. approved the renewal of its bilateral nuclear cooperation agreement (known as the “123 agreement”) with China in 2015. The 1985 agreement provides a comprehensive framework for peaceful nuclear cooperation between the two countries, permitting the transfer of material, equipment (including reactors), components, information, and technology for nuclear research and power production. The direct economic benefit to the U.S. from the renewed agreement could reach up to US $204 billion. It is also expected to boost the U.S. presence in the Chinese nuclear energy market as well as increase China’s adoption of advanced U.S. technology.

Trade Opportunities

Nuclear Fuel/Uranium

China is stepping up efforts to become self-sufficient in nuclear fuel. However, the country still relies heavily on foreign suppliers to feed its reactors. In order to meet increased demand, the CNNC set up a subsidiary, China Nuclear International Uranium Corporation (SinoU), to more effectively acquire equity in uranium resources internationally. According to statistics released by the World Nuclear Association, around 95 percent of China’s natural uranium imports come from six countries: Kazakhstan, Uzbekistan, Canada, Namibia, Niger, and Australia. Ux Consulting, a nuclear fuel price reporter, has said that between 2009 and 2014, China imported over 115,000 tU (tonnes of uranium), and imported a total of 25,000 tU in 2014 alone. Annual consumption is currently about 8000 tU, indicating that most uranium imports are stockpiled. Furthermore, the Shanghai Nuclear Power Office estimated that, assuming a total of 58 operating reactors, China’s uranium demand would reach 11,000 tU in 2020, about 18,500 tU for 100 reactors in 2025, and 24,000 tU for 130 reactors in 2030.

Although not a large exporter of natural uranium resources, the United States still exported US $112 million of uranium (enriched U235) to China in 2015, accounting for around 30 percent of China’s total imports of enriched uranium. This presents an opportunity for U.S. companies specializing in uranium concentration and processing technology, diffusion techniques, and centrifuge techniques.

Nuclear Reactors and Components

Since China’s self-developed third generation Hualong One nuclear reactor has yet to pass final international safety review, nuclear reactors originating from the U.S. and
other mature Western markets are still considered more reliable in the mainstream Chinese market. In addition, about 14 percent of the manufacturing equipment and parts used to build the Hualong One reactor are purchased from foreign suppliers. Last year, China imported US $15.2 million of nuclear reactor parts from the United States – approximately 15 percent of its total imports of these parts worldwide. The demand for small modular reactors (50 or 100MW in output) designed for alternative nuclear applications is also on the rise.

2013-2015 China’s Import of Nuclear Reactors, Boilers, and Machinery (HS Code 84)

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<tr>
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<th>2013</th>
<th>2014</th>
<th>2015</th>
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<tbody>
<tr>
<td>Total Import</td>
<td>170.6</td>
<td>179.4</td>
<td>157.2</td>
</tr>
<tr>
<td>Import from the U.S.</td>
<td>15.5</td>
<td>16.8</td>
<td>15.9</td>
</tr>
<tr>
<td>U.S. Share of the Total Import</td>
<td>9.09%</td>
<td>9.4%</td>
<td>10.1%</td>
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Source: UN Comtrade

Reactors technology

The Chinese government has emphasized the development of technology used in large pressurized water reactors (including the AP1000 and CAP1400 designs), high temperature gas-cooled reactors (HTRs), and fast reactors. Looking ahead, China will start up 20 floating nuclear plants next year, as well as initiate several other advanced-reactor projects, such as a molten-salt reactor fueled by thorium rather than uranium, turning China into a test bed for innovative nuclear power technologies. These reactor initiatives are launched in an attempt to eliminate nuclear waste, a problem which none of the existing or to-be-built reactors in China have yet addressed. This attempt offers lucrative opportunities for U.S. technology firms that have expertise in graphite coating materials, water reactor technology, and spent fuel recycling technology.

Nuclear-related products and technology are included in the U.S. export control regime, meaning that exporters must apply to several U.S. government agencies (including the Department of Energy and Nuclear Regulatory Commission) prior to selling to China’s nuclear industry. A complete guide to the export of civil nuclear technology and services can be found here.