Japan

Market Type: Maturing and Decommissioning

Japan’s civil nuclear program has undergone tremendous changes since the March 2011 Fukushima Daiichi accident. All of Japan’s 43 operational reactors are offline as of early 2016, and the government is struggling to find a politically acceptable plan for restarting them. While new builds do not appear likely in the near-term, viable opportunities for U.S. exports exist for decontamination and remediation services at Fukushima, decommissioning, as well as other goods/services for Japan’s existing reactor fleet.

Japan has 43 operational reactors, according to the IAEA Power Reactor Information System (PRIS) database, making up a net capacity of 42.6 GWe, but following the March 2011 Fukushima accident, all reactors were taken offline as Japan revised its nuclear safety regulations. Subtracting out the six reactors on the Fukushima Daiichi site, Japan has 43 reactors potentially available for restart.

Loss of nuclear power has caused hardship to Japan’s trade balance, energy security and economy. To make up for the loss of nuclear generated electricity, Japan was forced to boost imports of oil and gas, and its dependency on fossil fuels rose from 60 percent before the earthquake to 90 percent afterward. As a result, in 2011, Japan had a trade deficit for the first time in over 30 years, and the deficit has increased each year since then. Recent estimates have placed Fukushima related losses for the Japanese nuclear industry at $50 billion.

Given these challenges, the Government of Japan (GOJ) has prioritized restarting part of its nuclear reactor fleet. The government’s fourth Strategic Energy Plan, released in April 2014, recognized the role that nuclear energy must play in a diversified, secure and efficient energy supply. Though it did not specify targets for nuclear energy or renewables, it explicitly stated the government’s intention to focus on restarting reactors in the near-term while also noting the need to reduce dependence on nuclear energy. Several plants have applied for restart but are currently facing legal and public opinion challenges. On July 16, 2014, Japan’s Nuclear Regulatory Authority (NRA), set up in 2012 to replace the Nuclear and Industrial Safety Agency (NISA) and the Nuclear Safety Commission (NSC) to oversee nuclear safety regulation, approved the restart of the Sendai plant in Kagoshima Prefecture. On November 7, 2014, regional authorities approved the restart, and it resumed operation on August 11, 2015.

Aside from reactor restarts, the government’s main focus has been the cleanup and policy response to the Fukushima accident. The International Research Institute for Nuclear Decommissioning (IRID) was established in August 2013 to research and develop technologies to assist with nuclear decommissioning, promote cooperation with international and domestic organizations on nuclear decommissioning and develop
human resources for R&D. Over the past year, the GOJ has increasingly sought international assistance to address contaminated water issues at the Fukushima Daiichi Nuclear Power Station and advice on decommissioning and decontamination projects.

Japan is building several fuel cycle facilities in an attempt to achieve commercial-scale capabilities in all aspects of the fuel cycle. Current construction projects include a MOX fuel fabrication plant at the Rokkasho site. After years of delay, Japan recently completed construction of the Rokkasho commercial-scale reprocessing facility, although it has yet to begin commercial operation. Japan has converted several reactors to be MOX fuel bearing and plans to convert others. The government has operated a prototype fast reactor, Monju, though it was recently placed in long-term shutdown, so its future is uncertain.

**Commercial opportunities**

**Services (front-and back-end):** Advisory services for decommissioning and decontamination and assistance with safety upgrades to reactor fleet.

**Legal and Consulting Services:** Advisory assistance with Fukushima cleanup and public relations in line with NRA guidelines.

**Design, Construction, and Operation:** Limited due to post-Fukushima halt of new nuclear construction.

**Licensing Support:** Potential for advisory assistance to electric utilities.

**Fuel Management:** Limited potential.

**Waste Management:** Limited potential.

**Challenges and Barriers to Exports**

Reduced market access, government policy and public opinion are significant challenges to U.S. civil nuclear exports to Japan. In its response to the Fukushima accident, Japan has shown a limited inclination to seek help from industry abroad, preferring to keep tight control on managing contaminated water leaks and other challenges related to the decontamination and decommissioning of the site. Recently, Japan has made more of an effort to seek international assistance, which could result in more opportunities for U.S. industry involvement.

The restart of Japanese reactors could produce export opportunities for U.S. goods and services, particularly as Japanese reactors undergo safety improvements and the nation continues to adapt to its post-Fukushima regulatory and safety policies. While the current government is in favor of reactor restarts, opposition from the Japanese public, often acting in tandem with the courts, has caused significant delays, and it is unclear how successful the government’s restart policy will be. Even if Japan overcomes these hurdles to revitalizing its civil nuclear program, U.S. content for civil nuclear projects in Japan will be limited due to the strength, experience and capability of Japan’s industry. U.S. industry also faces strong competition from other countries, such as France and Russia, for other areas of the fuel cycle, such as fast reactors, MOX facilities and reprocessing technology.

Japan scores highly in nearly all financial and infrastructure indicators. The November 2014 Diet ratification of the CSC liability regime and the implementing legislation are positive developments.

Despite the above challenges, the U.S. and Japanese civil nuclear industries remain highly integrated and have years of experience collaborating on projects. Japan is and will remain an important partner for the United States in the civil nuclear sector. USG support for U.S. civil nuclear exports is essential, particularly as Japan continues to pursue its post-Fukushima priorities.

**Nuclear Infrastructure**

**Research Reactor:** The Japan Atomic Energy Agency (JAEA) manages an extensive R&D program throughout the country and runs several research reactors and experimental test facilities.

**Fuel:** Japan has no indigenous uranium. Uranium imports come primarily from Australia, Canada and Kazakhstan; Japanese companies are increasingly taking equity in oversees uranium projects, including in Kazakhstan, Australia and Namibia.

**Fuel Cycle:** Japan has fuel cycle facilities, though not yet at commercial scale. Japan Nuclear Fuel Ltd (JNFL) operates a commercial enrichment plant at Rokkasho, though much enrichment is still imported. A new enrichment plant in Japan using Russian centrifuge technology is planned under an agreement between Rosatom and Toshiba.
Several fuel fabrication facilities exist to supply Japan’s fleet of PWRs, BWRs and, in a limited capacity, HTRs, as well as a MOX fuel-bearing reactor for R&D purposes. A new 600 tU/yr plant is planned by Areva and Mitsubishi Nuclear Fuel (MNF). JNFL is building a MOX fuel fabrication plant in Rokkasho, known as J-MOX, though due to construction delays most MOX is fabricated in France using Japanese fuel.

A commercial scale reprocessing facility at Rokkasho has recently finished construction but is awaiting the start of commercial operation. The Japan Atomic Energy Agency (JAEA) recently announced that it will permanently shut down the Tokai pilot reprocessing plant, which has stood idle since 2006.

**Waste Management:** Japan’s first high-level waste (HLW) interim storage facility opened in Rokkasho-mura in 1995. A permanent HLW storage facility is part of the 2014 energy strategy. Facility siting is a major challenge.

**U.S. Government Collaboration**

**123 Agreement:** Japan’s 123 Agreement with the United States will expire on July 30, 2018 but will remain in force until terminated by either party.

**U.S.-Japan Fukushima Recovery Forum:** In February 2015, the U.S. and Japan organized the third Fukushima Recovery Forum in Tokyo to identify bilateral activities for the U.S. to assist Japan in its decommissioning, decontamination, and remediation efforts.

**U.S.-Japan Bilateral Commission on Civil Nuclear Energy Cooperation (BLC):** Established in April 2012, the BLC serves as a forum to foster a strategic dialogue and joint activities related to the safe and secure use of civil nuclear energy and the response to Fukushima. The BLC includes five working groups: (1) Nuclear security, (2) Civil nuclear energy research and development, (3) Safety and regulatory issues, (4) Emergency management, and (5) Decommissioning and environmental management.

**Regulatory Cooperation:** The U.S. NRC and Japan’s NRA have a long-standing arrangement for the exchange of technical information and cooperation in nuclear safety and security matters. In addition, the NRC and NRA have semiannual Steering Committee meetings to provide direction for upcoming collaborative activities between U.S. and Japanese national nuclear regulatory agencies, facilitate information sharing related to mutually beneficial nuclear safety and security regulatory issues, and incorporate lessons learned from the Fukushima-Daiichi accident.

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<th>Figure 2: Additional Agreements</th>
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<td>Non-Proliferation Treaty</td>
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<td>IAEA Comprehensive Safeguards Agreement &amp; Additional Protocol</td>
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<td>Convention on Nuclear Safety</td>
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<th>Organization Membership</th>
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<td>GenIV International Forum (GIF)</td>
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International Engagement

Japanese government officials have been actively marketing Japanese reactors around the world during diplomatic visits, particularly in regions such as Southeast Asia, Africa and the Middle East.

In October 2010, Japan and Vietnam signed an agreement for construction of a nuclear power plant in Vietnam at Vinh Hai in Ninh Thuan province. In July 2011, Hitachi was chosen to build Lithuania’s proposed nuclear reactor at Visaginas. In 2011, JAPC signed agreements with Electricity of Vietnam to build two nuclear reactors in Ninh Thuan province.

Japan’s civil nuclear industry has extensive ties to U.S. and French industry. Toshiba owns 87 percent of Westinghouse Electric Company; Hitachi and GE have a joint venture partnership, and MHI partners with Areva.

Japan engages with many countries on advanced civil nuclear R&D in all parts of the fuel cycle, including laboratory-to-laboratory R&D as well as planning and constructing test and demonstration facilities.

For more information on the civil nuclear industry in Japan, see:


JAEA: http://www.jaea.go.jp/

NRA: http://www.nsr.go.jp/

IRID: http://irid.or.jp/en/

Sources


Resources

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