INTERNATIONAL TRADE ADMINISTRATION

2016 Top Markets Report Civil Nuclear Country Case Study

United Kingdom

Market Type: Existing and Expanding

Strong political support and plans for expansion mark the UK as a significant opportunity for U.S. civil nuclear exports. Prospects for services beyond new plant construction, particularly decommissioning, plutonium disposition and advanced reactor development, remain positive and are growing. UK government interest in small modular reactor designs will also be a key opening for U.S. companies. Robust foreign competition and financing are the chief obstacles for U.S. industry.

New Builds	3
Existing Reactors	3
Decommissioning	1
Overall Rank	2

U.S. Ambassador to the United Kingdom: Matthew Barzun
U.S. Commerce Attaché to the United Kingdom: John Simmons (London)

The UK currently has 15 operational nuclear reactors, comprising 10.0 GWe of capacity. Four of these are expected to be shut down by 2024. The UK is planning to build new nuclear reactors to replace its existing fleet and make up for diminishing reserves of oil and natural gas. Though no official targets have been set, UK government officials have called for 16 GWe of installed nuclear capacity by 2030.

France's EDF Energy is planning to build four European Pressurized Reactors (EPRs) at Hinkley Point in Somerset and Sizewell in Suffolk. Startup for the first reactor at Hinkley Point C is expected in 2025, although the beginning of construction is subject to postponement (first by European Community approval, then by delayed follow-through by EDF). China's state-owned China General Nuclear Power Corporation (CGN) will take a 33.5 percent stake of the Hinkley Point C project and 20 percent at the planned EDF controlled Sizewell site. In return, EDF will grant CGN a controlling stake in a third site at Bradwell, where it will build and operate the Chinese designed Hualong One reactor (the first Chinese designed and built nuclear reactor in the West). A final investment decision by EDF is expected in May 2016.

To support the Hinkley Point C project, the UK government agreed to an investment agreement with EDF Energy in October 2013 that included a 35-year Contract for Difference with a guaranteed electricity "strike price" subsidy. In September 2015, the UK government announced a £2 billion loan guarantee to support the project.

The Hitachi-GE-controlled Horizon Nuclear Power consortium plans to build four ABWR reactors at two sites: Wylfa in northern Wales and Oldbury in Gloucestershire. Construction on the first unit at Wylfa is planned for 2019, with startup expected in 2025.

The NuGeneration (NuGen) consortium (60 percent owned by Toshiba and 40 percent by Engie) plans to build three AP1000 reactors at Moreside, just north of the Sellafield site in Cumbria. The first unit is expected to become operational in 2024.

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The British Department of Energy and Climate Change (DECC) is currently examining the feasibility of its policy for managing the UK's large civil plutonium (Pu) stockpile, which involves reuse as mixed oxide fuel (MOX) and would require procurement of a new MOX plant. GE's PRISM fast reactor and Candu's EC6 heavy-water reactor have been proposed as solutions. In January 2014, following the conclusion of a two-year review of disposition options, the Nuclear Decommissioning Authority (NDA) said it will take an additional one to two years to conduct further technical studies and that it may seek a "multi-track" approach. Regardless of the chosen solution, the UK will need to dispose of some Pu in a repository or other long-term storage location because of the various Pu grades it possesses, a portion of which is not suitable for use in any type of reactor.

Small modular reactors (SMRs) have been the subject of recent interest in the UK with the government's March 2016 publishing of the first phase of a competition to identify the best value SMR design for the country. In November 2015, the government announced a £250 million nuclear R&D program through DECC, with half that amount dedicated to the SMR competition. NuScale and Westinghouse are among several parties interested in winning the competition. If the competition is successful, an SMR project could move forward in the next decade.

Planned Nuclear Energy Projects

Hinkley Point C and Sizewell C NPPs
Owner: EDF Energy: EdF majority-owned, 33.5 % CGN, 66.5% EdF; French government owns 85% of EdF, and Chinese government owns all of CGN.
Reactor Type: EPR
Capacity: 3240 MWe (2 units) at each plant
Value of Project: £24.5 billion total ($17.6 billion per plant)
Construction Period: First unit 2019-2025
Operation (tentative): Hinkley C-1 and C-2 are planned for 2025 and 2026, with Sizewell C-1 and C-2 undetermined as of yet.

Wylfa and Oldbury B NPPs
Owner: Horizon: Hitachi-GE-controlled, other investors TBD.
Reactor Type: ABWR
Capacity: 2760 MWe (2 units) at each plant
Value of Project: $13-14 billion per plant
Construction Period: First unit 2019-2025
Operation (tentative): First unit in 2025

Moorside NPP
Owner: NuGen: 60% Toshiba, 40% GDF Suez.
Reactor Type: AP1000
Capacity: 3400 MWe (3 units)
Value of Project: $20-24 billion
Construction Period: First unit 2019-2024
Operation (tentative): First unit in 2024

Bradwell NPP
Owner: Joint Venture (66.5% CGN, 33.5% EDF)
Reactor Type: Hualong One (UK version)
Capacity: 2100 MWe (2 units)
Value of Project: unknown
Construction Period: TBD
Operation (tentative): TBD

Commercial Opportunities

Services (front-and back-end): Potential for back-end services, decommissioning and plutonium disposition

Legal and Consulting Services: Limited potential

Licensing Support: Limited potential

Design, Construction, and Operation: U.S. industry heavily engaged in Wylfa, Oldbury and Moorside plants.

Opportunities in other sub-sectors, such as decommissioning, also exist. In March 2014, for example, Fluor was part of a joint venture that won a 14-year, $11 billion contract to decommission 10 Magnox power plants and two research facilities. Plutonium disposition provides a unique opportunity for U.S. exports but, at this point, is dependent on government policy decisions regarding technology selection. The NDA's draft Strategy and Business Plan (2016 to 2019) earmarked spending of £3.2 billion in financial year 2016/17. The NDA budget accounts for 60 percent of DECC funding and is ring-fenced from cuts.

Challenges and Barriers to U.S. Exports

The UK's extensive plans to build new nuclear reactors have attracted high levels of interest from France, Germany, Japan, China, Russia and the United States. Despite heavy competition, U.S. industry has many opportunities for civil nuclear exports to the UK. This has become more evident as Hitachi and Toshiba have taken majority stakes in Horizon and NuGen, respectively, and will build up to four ABWRs and three AP1000s at three sites.

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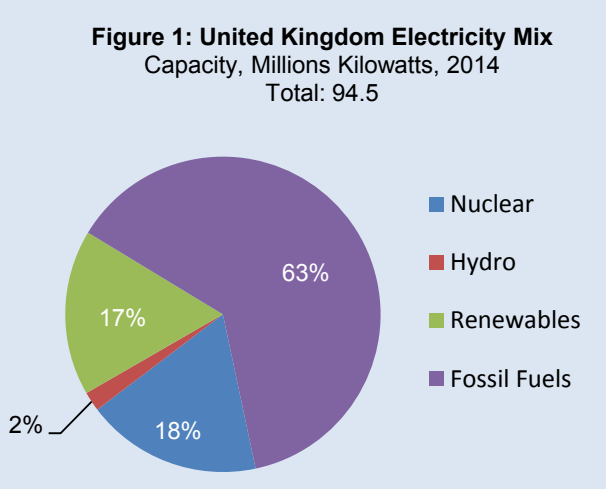
Bipartisan government support has been consistently strong since it adopted a pro-nuclear energy policy in 2006, and public opinion of new nuclear has remained favorable as the UK's plans have become more firm. While political support is strong, finding equity to finance projects without a state-backed nuclear energy corporation has proven difficult.

Nuclear Infrastructure

Research Reactors: Only one research reactor, the Rolls Royce zero-power Neptune reactor in Derby, remains operational. Announced during the rollout of the Hinkley Point plant agreement, the UK and China resolved to cooperate on a £50 million Joint Research and Innovation Center in Cumbria.

Fuel: Apart from raw uranium mining and uranium ore purification, the UK has an independent nuclear fuel cycle capability and offers services domestically and to international markets. The UK has several known small deposits of low-grade uranium, but none have been determined to be economically feasible to mine.

Waste Management: The Radioactive Waste Management Directorate (RWMD) is charged with developing plans for a Geological Disposal Facility (GDF) set to begin operation in 2040. Site selection is expected to take place by 2025.



U.S. Government Collaboration

123 Agreement: The United States has a 123 Agreement with the UK through EURATOM. It will expire in 2026 with rolling five-year extensions from thereafter.

Radioactive Waste Management: The U.S. Department of Energy's (DOE) Office of Environment Management and the British Nuclear Decommissioning Authority cooperate on radioactive waste management technology. This was initiated by a February 2012 Statement of Intent. In 2014, this Statement of Intent was amended to include the UK National Nuclear Laboratory Limited. DOE and DECC also signed an MOU in April 2012 for broader energy-related cooperation.

International Engagement

The UK continues to solicit international partners to achieve its civil nuclear plans. In 2013, it formally gave a Chinese consortium a 33.5 percent stake in Hinkley Point, and in November 2015, it signed a Commercial Strategic Investment Agreement with China that will allow France's EDF and China's CGN to build NPPs at Hinkley Point and two other sites in the UK. In September 2013, the UK and Russia signed a nuclear cooperation agreement, and Russia has expressed interest in UK new build investments. The UK has welcomed international investment for decommissioning and operation of its current reactor fleet.

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Figure 2: Additional Agreements	
Non-Proliferation Treaty	✓
IAEA Comprehensive Safeguards Agreement & Additional Protocol	✓
Joint Convention on Safety of Spent Fuel Management	✓
Convention on Nuclear Safety	✓
Convention on Early Notification of a Nuclear Accident	✓
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	✓
Paris Convention on Third Party Liability in the Field of Nuclear Energy	✓
Vienna Convention on Civil Liability for Nuclear Damage	
Joint Protocol Relating to the Application of the Vienna Convention and Paris Convention	✓
Convention on Supplementary Compensation for Nuclear Damage	
Organization Membership	
IAEA	✓
Nuclear Suppliers Group	✓
OECD/NEA	✓
IFNEC	✓
GenIV International Forum (GIF)	✓

Resources

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For more information on nuclear power in the United Kingdom, see: Nuclear Decommissioning Authority website (https://www.gov.uk/government/organisations/nuclear-decommissioning-authority), Office for Nuclear Regulation website (http://www.onr.org.uk/)

Sources

CIA Factbook, United Nations, World Nuclear Association, Asian Development Bank, and our contacts at U.S. Embassy London.