INTERNATIONAL TRADE ADMINISTRATION

2016 Top Markets Report Civil Nuclear Country Case Study

Ukraine

Market Type: Newly Emerging

Ukraine possesses a robust civil nuclear energy program, which accounts for almost half of its energy. Ukraine relies heavily on Russia for most aspects of its program. The Ukrainian government, however, is attempting to expand its energy supply by seeking non-Russian sources of nuclear fuel and construction materials for fuel fabrication plants. Ongoing Ukrainian-Russian tension has increased Ukraine's efforts to reduce its dependence on Russia, which could offer opportunities for U.S. industry.

New Builds	30
Existing Reactors	6
Decommissioning	11
Overall Rank	19

U.S. Ambassador to Ukraine: Geoffrey R. Pyatt

Almost half of Ukraine's energy is generated by its 15 Russian-designed nuclear reactors located at four plants: Khmelnitsky, Rivne, South Ukraine and Zaporozhe. The reactors are operated by the country's state-owned nuclear power utility, NNEGC Energoatom. Ukraine is prioritizing foreign involvement in its nuclear sector to reduce dependence on Russia.

Most of Ukraine's nuclear fuel and nuclear services are supplied by Russia. In the last few years, Ukraine has diversified its fuel supply by purchasing fuel from Westinghouse. In April 2015, Energoatom signed a memorandum of understanding with Areva to cooperate on safety upgrades, lifetime extensions and performance optimization of the existing fleet and future nuclear power plants (NPPs). The new Ukrainian government has shown considerable interest in prioritizing Western-designed nuclear reactors. Due to the long construction time required for new reactor construction and high government debt levels, however, refurbishment and lifetime extensions of the current fleet are more likely.

Ukraine expects to increase the share of nuclear power in its electricity mix from 48 percent to 52 percent by 2020. In 2006, following disruptions in its natural gas supply, Ukraine decided to double its nuclear capacity to ensure greater energy security. The new nuclear power strategy focused on finishing construction on Khmelnitsky 3 and 4, which were restarted in 2011 after a contract was signed with Russia's Atomstroyexport. The project was delayed, however, after the intergovernmental agreement was revoked and Parliament repealed the law on construction based on Atomstroyexport's non-performance.

Planned Nuclear Energy Projects

Khmelnitsky Nuclear Power Expansion
Owner: State
Reactor Type: V-392
Capacity: 2000 MWe (2 units, 1000 MWe each)
Value of Project: N/A
Construction Period: N/A
Operation: N/A
Khmelnitsky NPP: Two reactors at the Khmelnitsky site have been under construction since 1986. Construction

This case study is part of a larger Top Markets Report. For additional content, please visit www.trade.gov/topmarkets.
U.S. Department of Commerce | International Trade Administration | **Industry & Analysis**

stopped in 1990 after the Chernobyl accident led to a moratorium on new NPP construction in Ukraine. Construction restarted in 2010 after a new deal was signed with Russia. This deal has since been suspended, and Ukraine is seeking to transfer the contract to the Czech Republic's Skoda JS.

Commercial Opportunities

Services (front-and back-end): Although 3 nuclear plants are scheduled to close in 2016 to 2017, life extensions are more probable. Few decommissioning opportunities exist beyond ongoing Chernobyl activities.

Legal and Consulting Services: Opportunities exist as Ukraine tries to meet new European NPP safety standards and works toward introducing more foreign companies into its nuclear industry.

Design, Construction, and Operation: Opportunities may exist for construction of reactors, particularly with ongoing tension between Ukraine and Russia. Value added can be found in upgrading, rehabilitation and life extension of existing plants.

Fuel: Significant opportunities to supply fuel to Ukraine's current fleet as it seeks diversification away from Russian sources.

Components: Some opportunities exist for supplying the current Russian-designed fleet.

Challenges and Barriers to Exports

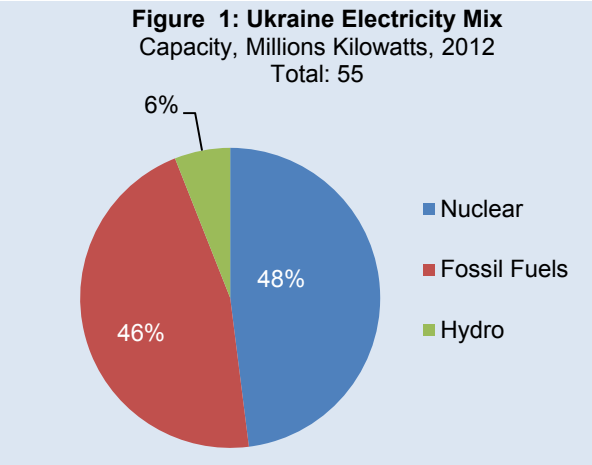
The primary challenge to U.S. civil nuclear exports is the strong presence of Russia in the Ukrainian market. All of Ukraine's 15 reactors are of Russian design, and the country has historically been dependent on Russia for nuclear. The growing Ukrainian government debt may pose a challenge to nuclear exports given that Energoatom is state-owned.

Nuclear Infrastructure

Research reactors: There are two pool type research reactors in Ukraine. The Kyiv research reactor belongs to the Ukrainian Academy of Sciences and has 10 MW nominal capacities. The Sevastopol research reactor belongs to the Sevastopol National University of Nuclear Energy and Industry and has 200kW capacity, but it is located in the disputed territory of Crimea. Energoatom stated that it cannot accept responsibility for the reactor as it no longer has access to it.

Fuel: Ukraine does not convert, enrich or fabricate its own fuel. There are mining and uranium resources, including approximately 2 percent of the world's uranium reserves. Uranium concentrate and zirconium alloy are sent to Russia for enrichment and further production of nuclear fuel, which is then shipped back to Ukraine. Ukraine and Russia have continued this arrangement, though Ukraine has attempted to buy more of its fuel from non-Russian sources.

Waste Management: Ukraine has an open fuel cycle. It has two storage facilities for spent fuel, dry at the Zaporozhye plant and wet at the Chernobyl plant. Spent fuel is also sent back to Russia. Plutonium and high-level waste were expected to be returned to Ukraine from Russia, but this has not yet taken place. In January 2015, Energoatom and U.S. firm Holtec signed a contract to construct a central used fuel storage facility in the Chernobyl Exclusion Zone.



U.S. Government Collaboration

123 Agreement: Ukraine has a 123 Agreement with the United States, which entered into force in May 1999 and is due to expire on May 28, 2029.

Department of Energy-to-Ministry Agreement: The U.S. Department of Energy's Office of Nuclear Energy (DOE/NE) provides assistance to Ukraine through the Ukraine Nuclear Fuel Qualification Project (UNFQP), which started in 1998.

This case study is part of a larger Top Markets Report. For additional content, please visit www.trade.gov/topmarkets.

U.S.-Ukraine Energy Security Working Group: DOE/NE acts as the head of the civil nuclear energy sub-group within the larger working group under the U.S. Department of State and the Ukrainian Ministry of Energy and Coal Industry (MECU).

Memorandum of Understanding: The U.S. and Ukraine have a memorandum of cooperation on several energy issues, including nuclear security.

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

For more information on the commercial opportunities in Ukraine, contact: James Lindley (Senior Commercial Officer in Kiev, james.lindley@trade.gov); Myroslava Myrtsalo (Commercial Specialist, myroslava.myrtsalo@trade.gov); Jonathan Chesebro (I&A Civil Nuclear Team, jonathan.chesebro@trade.gov)

For more information on the civil nuclear industry in Ukraine:

Energoatom: http://www.energoatom.kiev.ua/

SNRC: http://www.snrc.gov.ua/

MECU: http://mpe.kmu.gov.ua/

Sources

CIA Factbook, United Nations, World Nuclear Association, and our contacts at the U.S. Embassy in Kiev.

This case study is part of a larger Top Markets Report. For additional content, please visit www.trade.gov/topmarkets.