



2016 Top Markets Report **Civil Nuclear** Country Case Study

Turkey

Market Type: Newly Emerging

Turkey is planning to build 12 reactors at three sites. A Russian consortium was chosen to build the first four reactors on a build-own-operate model, and a Mitsubishi-Areva consortium is in discussions for the next four reactors. China’s SNPTC and U.S. firm Westinghouse are in discussions for the third project. The potential for U.S. exports will depend on Turkey’s plans for its third plant.

New Builds

7

Existing Reactors

N/A

Decommissioning

N/A

Overall Rank

10

U.S. Ambassador to Turkey: John R. Bass
U.S. Commercial Counselor: Larry Farris

Turkey currently has no operating nuclear power plants, but it plans to begin construction in order to meet growing electricity demand and reduce dependence on imported energy (largely coming from Russia and Iran). It is currently planning 12 reactors at three sites: Akkuyu on the Mediterranean coast, Sinop on the Black Sea coast and İğneada near the Bulgarian border

A Russian consortium will build four VVER-1200 reactors at Akkuyu on a build-own-operate (BOO) model to include fuel supply and spent fuel take-back. Russia has pledged to fully finance the project at over \$20 billion. In April 2015, the groundbreaking for Akkuyu took place. While the first unit was expected to go online in 2022, tension in Russia-Turkey relations has delayed the project, and it is unlikely to begin operation by then.

Turkey is working with a consortium led by Mitsubishi and Areva to build four Atmea1 reactors at Sinop, totaling 4800 MWe. Construction on the first unit could

begin in 2017 with operation in 2023. Feasibility studies and due diligence are still in progress.

On November 24, 2014, Westinghouse (WEC) signed an agreement with China’s State Nuclear Power Technology Corporation (SNPTC) and Electricity Generation Company (EÜAŞ), Turkey’s largest electric power company, to enter into “exclusive negotiations” to develop and construct an additional nuclear power station in Turkey. It is assumed that the first two units at the plant will be AP-1000 reactors, with Chinese CAP-1400 reactor technology being utilized for the subsequent two units. In October 2015, the likely site was identified as İğneada, a town on the Black Sea near the Bulgarian border, although other sites are still under evaluation.

Planned Nuclear Energy Projects

Akkuyu Nuclear Power Plant

Owner: Akkuyu NPP JSC (Russia majority controlled as a BOO model)

Reactor Type: VVER-1200 (AES-2006) with a 60-year lifetime

Capacity: 4800 MWe (4 units, 1200 MWe each) Value of Project: \$20-25 billion dollars; \$1.3 billion was budgeted for 2013

Construction Period: 2015-2023 (four-year construction period per reactor according to recent estimate by Turkish government)

Operation: 2023

Agreements with Russia Regarding Akkuyu: Russia will be responsible for obtaining licenses and permits, financing, training of Turkish personnel, design, construction, operation and maintenance, supply of equipment and material, and supply of nuclear fuel. There is a take-back option for the reprocessing of spent fuel by Russia. Turkey is responsible for the allocation of the plant site with its current license without any cost and purchasing electricity according to a Power Purchase Agreement. The Rosatom agreement for Akkuyu also provides for setting up a fuel fabrication plant in Turkey. Recent tension over the geopolitical crises in Ukraine and Syria have raised questions about the future of cooperation on this project. In April, Rosatom announced that it was selling up to 49 percent of its shares in Akkuyu given its financial struggles.

Sinop Nuclear Power Plant

Owner: Mitsubishi (Japan)-AREVA (France) joint venture: both companies are state-owned; GdF-Suez would be the operator of the eventual plant

Reactor Type: ATMEA1 with a 60 year lifetime; these will likely be the first ATMEA1 units built

Capacity: 4800 MWe (4 units)

Value of Project: \$22-25 billion

Construction Period: First unit 2017-2023; other units TBD.

Operation (tentative): First unit in 2023

Agreements with Mitsubishi-AREVA Regarding Sinop: Turkey signed an agreement with Japan in 2013 giving Japanese government exclusive negotiating rights for building the plant. The agreement was approved by Turkish President Erdoğan in April 2015 after being ratified by the Parliament a month earlier.

İğneada NPP

Owner: TBD. Turkish utility EÜAŞ is in discussions with China's SNPTC and U.S. firm Westinghouse.

Reactor Type: TBD. Early indications are for two WEC AP1000s and two SNPTC CAP1400s.

Capacity: 4800 MWe (4 units)

Value of Project: Unknown

Construction Period: Unknown

Operation: Unknown

Agreements with SNPTC and WEC Regarding İğneada: In November 2014, SNPTC, WEC and EÜAŞ signed an agreement to begin "exclusive negotiations". During a March 2016 visit to China, Turkish Energy Minister Albayrak toured the AP1000 under construction in Haiyang and was briefed on the CAP1400 design. Discussions are ongoing.

Commercial Opportunities

Services (front-and back-end): Limited potential for site selection or other advisory services

Legal and Consulting Services: Moderate potential for regulatory consulting related to Akkuyu project

Licensing Support: Moderate potential to support the Turkish Atomic Energy Agency (TAEK), Turkey's nuclear safety regulator

Design, Construction, and Operation: Opportunities exist for site surveys, preliminary and detailed design, environmental impact assessment study, feasibility study, financing and auxiliary equipment production and supply.

Fuel Management: None currently

Waste Management: None currently

Challenges and Barriers to Exports

Despite Turkey's new build plans, opportunities for U.S. industry have been limited. Turkey's insistence on a spent fuel take-back option for Akkuyu forced out all competitors except the Rosatom consortium that eventually won the bid. For Sinop, Turkey has negotiated directly with countries or companies rather than launch an open bid. These have included Korea and Canada (both of whom withdrew over financing issues), China and Mitsubishi-Areva, who is now expected to build the plant. The November 24, 2014 agreement between WEC, SNPTC and EÜAŞ is a positive development for U.S. industry participation in Turkey's third plant. Turkey presence on USTR's 301 Watch List due to lack of IPR enforcement puts an additional strain on civil nuclear exports and U.S.-Turkey trade in general.

Turkish government support for new builds is strong, though Turkey is taking a measured pace toward projects beyond Akkuyu and Sinop. A 123 Agreement

exists between the United States and Turkey, and Turkey is party to the Paris Convention for nuclear liability.

Financing, however, is a challenge. Turkey has limited means for financing nuclear power projects on its own, as evidenced by the BOO model it has agreed to for Akkuyu. U.S. Ex-Im Bank financing will be challenging, given Turkey's low score on Ex-Im's long-term exposure fee level. In addition to financing issues, there are concerns about earthquake damage to reactors and political instability in eastern Turkey.

Nuclear Infrastructure

Research Reactor: Turkey has a small Triga research reactor at Istanbul Technical University. It has operated since 1979 and is regulated by the Turkish Atomic Energy Authority.

Fuel: Turkey possesses approximately 7,400 tU of uranium resources. The government is evaluating the mining operation license application of a U.S. firm which has found reserves of uranium in the province of Sivas. Developing its own domestic resources has been an emphasis of the Turkish government. Production at the Temrezli uranium project could begin in late 2016.

Waste Management: Waste management is mainly limited to radioactive waste arising from the industrial and medical applications of nuclear technologies, and there is a facility for interim storage of these wastes. This storage facility was built and has been operating, since 1989, in the ÇNAEM. Compaction, cementation and precipitation processes have been carried out at this facility.

U.S. Government Collaboration

123 Agreement: The 123 Agreement with the United States will expire in June 2023 with rolling five-year extensions to follow.

Regulatory Cooperation: The NRC and the Turkish Atomic Energy Authority (TAEK) signed an Arrangement for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters in 2012.

International Engagement

Turkey has voluntarily accepted to join the EU stress tests program, demonstrating Turkey's commitment to the adoption and implementation of the most rigorous safety standards in the construction and operation of its nuclear power plants. In June 2010, Turkey and Korea signed a nuclear cooperation agreement, and in April 2012, two such agreements with China were signed. The Turkish Atomic Energy Authority (TAEK) is participating in the IAEA-coordinated International Project on Innovative Nuclear Reactor Technologies and Fuel Cycles (INPRO). TAEK also contributes to the studies and projects of the OECD/NEA working groups. Turkey has an observer status for CERN, the European Organization for Nuclear Research, which is the world's leading laboratory for particle physics. All activities in Turkey are coordinated and sponsored by TAEK. Turkey is a member of the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME), an international scientific research center under construction near Amman, Jordan.

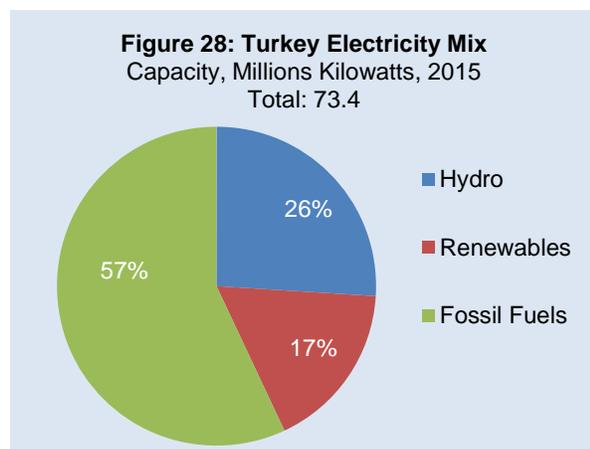


Figure 2: Additional Agreements	
Non-Proliferation Treaty	✓
IAEA Comprehensive Safeguards Agreement & Additional Protocol	✓
Joint Convention on Safety of Spent Fuel Management	
Convention on Nuclear Safety	✓
Convention on Early Notification of a Nuclear Accident	✓
Convention on Assistance in the Case 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 the civil nuclear industry in Turkey, see: EÜAŞ website (<http://www.euas.gov.tr/>); ETKB website (<http://www.enerji.gov.tr/>); TAEK (<http://www.taek.gov.tr/>)

Sources

CIA Factbook, United Nations, World Nuclear Association and the U.S. embassy in Ankara.