

Towards safe and secure use of nuclear energy in Turkey

By Adem Mutluer

“As it develops its nuclear power programme, Turkey is committed to moving forward in a safe, secure and safeguarded way.”

— Emine Birnur Fertekligil,
Turkey's Representative to the IAEA

Nuclear power will play a key role in Turkey's future energy strategy as the country moves toward achieving supply security while also meeting the challenge of limiting emissions that contribute to climate change.

Every year demand for electricity in Turkey's bustling economy is growing by more than five per cent, yet the country depends on imported resources to meet 73 per cent of its current energy needs. Turkey's new nuclear power programme aims to provide at least 10 per cent of the country's energy by 2023, according to Turkey's Ministry of Energy and Natural Resources.

programme, Fertekligil said. “As it develops its nuclear power programme, Turkey is committed to moving forward in a safe, secure and safeguarded way,” she said.

In 2013, an IAEA Integrated Nuclear Infrastructure Review (INIR) provided a team of international experts to help Turkey assess its readiness for developing a nuclear power programme. The mission involved 25 Turkish institutions and provided recommendations and suggestions, and identified several good practices.

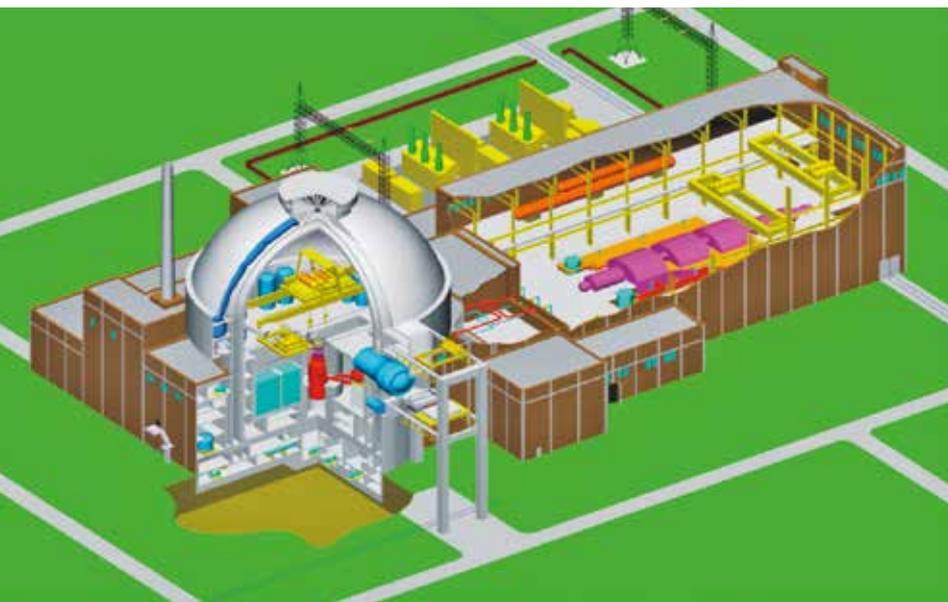
“The 2013 INIR mission provided insightful recommendations that Turkey used to develop a national action plan,” said Necati Yamaç, Head, Department of Nuclear Energy Project Implementation, Ministry of Energy and Natural Resources. “Amending or drafting new laws requires a huge amount of preparation, and in the case of Turkey, it has taken around two years. The INIR mission sparked discussions between various ministries and helped us identify new approaches and concepts,” he said.

INIR missions are designed to help IAEA Member States measure how far they have progressed towards meeting the requirements for a safe and secure nuclear power programme. They review all facets of a nuclear power programme, from the establishment of a regulatory body, and other legal requirements, to the utility operating the power plant, and the relevant Government stakeholders involved.

A look in the mirror

One of the benefits of an INIR mission is an initial self-evaluation the country undertakes before the mission begins.

Self-evaluation is a useful process because it involves interactions and discussions among the organizations involved in infrastructure development, said Anne Starz, Acting Head of the Nuclear Infrastructure Development Section at the IAEA. For Turkey, there were 25 organizations involved, she added.



The layout of the WWER-1200 pressurized water reactor. Four similar units are planned to be built at Akkuyu.

(Image: Gidropress)

The energy strategy includes two nuclear power plants with a total of eight reactor units to be in operation by 2028, and a third plant to be under construction by 2023, said Emine Birnur Fertekligil, Turkey's Representative to the IAEA. “The peaceful applications of nuclear technology are very important, not only in the energy field but also in other areas of sustainable development.”

Taking the required steps

Turkey has turned to the IAEA for advice on and assistance with taking the steps required for developing a safe nuclear energy



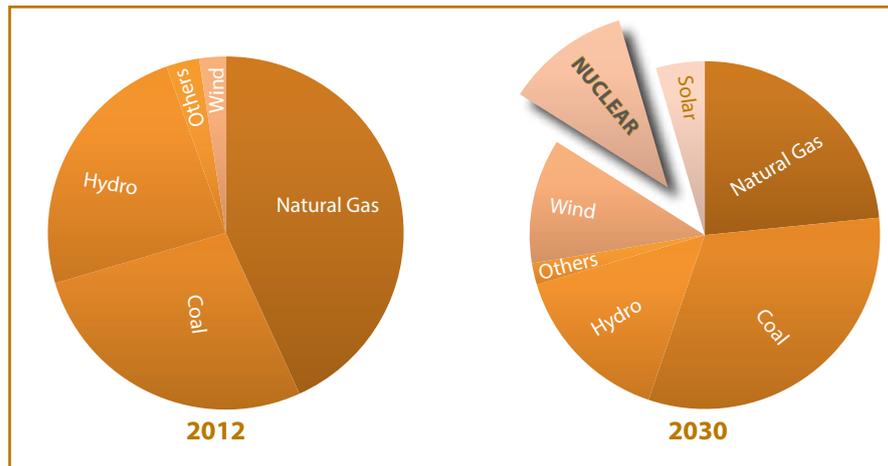
This process has “helped us realize how big a role the government still plays even in a BOO [build-own-operate] project,” said Yamaç. The BOO approach for developing a nuclear power programme means the host country’s plant will be owned entirely by the investors who provide both financing and the technology.

The road toward a nuclear power programme

Turkey’s path to its first nuclear power plant has four previous plans to introduce nuclear power in its wake. The first was in the late 1970s, when a site at Akkuyu on the eastern Mediterranean coast was licensed, and the last in 2008 when Turkey issued a request for bids.

In 2010, Turkey and the Russian Federation signed an agreement for the construction and operation of a nuclear power plant at the Akkuyu site, and three years later, an intergovernmental agreement with Japan was signed to develop a second nuclear power plant project at the Sinop site on the Black Sea.

Most recently, in addition to the INIR mission, Turkey’s draft nuclear energy laws have also been reviewed by the IAEA. Turkey’s nuclear law addresses safety, security and safeguards. A separate law for civil liability for nuclear



Turkey's yearly electricity generation by resources in 2012 and 2030

Source: Dr. Z Demircan/GDEA, TEIAS

damage was submitted to the IAEA for review in August 2014.

As Turkey goes further down the road toward a nuclear power programme, it has sought to learn from other countries. Through organizing several technical visits to other countries that are using nuclear energy, Turkey can gain a better understanding of as well as solutions for challenges faced in the area of nuclear technology, said Yamaç. “Looking at the experience of other countries is a good way for us to learn,” he said.

Peter Rickwood also contributed to this article.

THE SCIENCE

Nuclear power plant

A nuclear power plant generates electricity using heat from a controlled chain of nuclear reactions — a process whereby a single nuclear reaction spurs a series of subsequent nuclear reactions that result in large amounts of energy being released. The reactions occur inside the nuclear reactor, which is a device that is designed to initiate and control a sustained nuclear chain reaction. There are many types of nuclear reactors. Each has different designs and uses different mechanisms, water or gas, to generate power.

The reactor type to be used in Turkey’s power plant at the Akkuyu site is a water cooled water moderated power reactor (WWER). This reactor type uses heat produced from the nuclear chain reaction to heat water circulating through a separate compartment

inside the reactor. Once heated, the reactor-heated water is pressurized and then pumped through hundreds or thousands of tubes in a steam generator, where the reactor-heated water heats an adjacent compartment containing water. This causes the adjacent water to boil and produce steam. The reactor-heated water returns to its compartment in the reactor to cycle through the process again, while the steam is delivered to steam-powered turbines that drive electrical generators connected to an electric grid designed for electricity distribution. After passing through the turbine, the steam is cooled down and converted back to liquid inside a condenser to be sent through the process again. The electricity produced through this process is known as nuclear power.