

## PROSPECTS FOR NUCLEAR POWER IN THE MIDDLE EAST AFTER FUKUSHIMA AND THE ARAB SPRING

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As of September 2010 there were 441 nuclear power reactors in operation in 29 countries according to the IAEA. The share of nuclear energy in overall electricity generation was the highest in Western Europe (almost 27%); it was zero in the Middle East. The IAEA report in question also stated that 65 countries had announced their interest in developing nuclear energy<sup>2</sup>. About a fifth of these countries were in the Middle East. The nuclear energy option was being looked at not only by the countries that have considered that option for decades (such as Egypt and Turkey), but also by new countries such as Jordan. Only Lebanon had not expressed any interest in the peaceful use of nuclear energy.

Twelve nuclear energy reactors were halted in Japan and other countries in 2011 as a result of the Fukushima accident. On a global scale, the installed nuclear generation capacity went down from 375GW to 368GW, and the number of energy reactors in operation fell to 435 as of September 2012.<sup>3</sup> But according to IAEA projections, the nuclear incident in Japan will merely slow down the growth of the nuclear energy industry as opposed to reversing it.<sup>4</sup> In his September 2012 report IAEA Director-General Yukiya Amano said that 18 months after the accident it was clear that nuclear energy would remain an important option for many countries. The latest IAEA projections show a steady rise in the number of nuclear power plants in the world over the next 20 years.<sup>5</sup> According to the IAEA, most of the nuclear energy newcomers, i.e. countries considering the possibility of building their first nuclear power plant, are planning to press ahead with the implementation of these programmes.

In this context it would be interesting to look at the impact of the Fukushima accident on the Middle Eastern countries' nuclear energy plans. Another thing to consider is the effects of the processes and transformations that began in the region in late 2010–early 2011, known collectively as the Arab Spring.

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- 1 This article is based on early results of the study "Prospects for Nuclear Power in the Middle East after Fukushima and the Arab Spring. Challenges and Opportunities for Russia", which is being conducted by the Center for Energy and Security Studies (CENESS) with the support of the Foundation for Development and Support of the Valdai Discussion Club.
  - 2 IAEA, *International Status and Prospects of Nuclear Power*, 2011, p. 4.
  - 3 IAEA, *International Status and Prospects of Nuclear Power 2012*, document GOV/INF/2012/12-GC(56)/INF/6, August 2012, p. 1.
  - 4 Ibid.
  - 5 Statement to Fifty-Sixth Regular Session of IAEA General Conference 2012 by IAEA Director General Yukiya Amano, Vienna, 17 September 2012, <[www.iaea.org/newscenter/statements/2012/amsp2012n012.html](http://www.iaea.org/newscenter/statements/2012/amsp2012n012.html)>.

## Nuclear energy: current state and plans

The Middle East is showing the fastest progress in nuclear energy development among the newcomer countries. In a way, Middle Eastern states are now spearheading nuclear energy development in the newcomer countries on a global scale. In September 2011 Iran became the first country in the past 15 years and the fourth since the Chernobyl accident in 1986 to launch its first power reactor.<sup>6</sup> In July 2012 the United Arab Emirates became the first country in the past 27 years to start building its first nuclear power plant.<sup>7</sup>

Active preparations are also under way in Turkey, where the license to build the country's first nuclear energy reactor is expected to be issued in late 2014. By the end of the first quarter of 2013 Jordan plans to choose the supplier of the technology for building its first nuclear power plant. Meanwhile, it is expected that Egypt will announce a tender for the construction of a nuclear power plant in 2014.

Of all the nuclear newcomer countries, Middle Eastern states have some of the most ambitious plans for building nuclear power plants (although questions remain as to whether those plans can be implemented in the allotted time frame). In less than 20 years, the Islamic Republic of Iran wants to build 20 energy reactors, Turkey 23 and Saudi Arabia 16.

The projects being considered or implemented in the region rely on some of the most advanced technological, financial and organizational solutions. In the United Arab Emirates, the Republic of Korea's Kepco consortium has begun to build four APR-1400 third-generation reactors. The reference reactor is scheduled for launch in the Republic of Korea at Shin-Kori-2 nuclear power plant in 2013. Meanwhile, the Russian Federation is proposing its AES-2006 reactor design (Generation 3+) for the Akkuyu nuclear power plant project in Turkey. According to Russian Prime Minister Dmitry Medvedev, the reactor is designed to withstand a direct impact by a 400-tonne aircraft (which is equivalent to the full take-off weight of a Boeing 747, or the landing weight of an Airbus A-380). The reference AES-2006 reactor is scheduled for launch in 2014 at the Novovoronezhskaya-2 nuclear power plant. The first nuclear reactor of the Bushehr nuclear power plant is a unique project that integrates Russian and German technology.<sup>8</sup>

Jordan, which is one of the world's 10 driest countries, and which is also facing energy shortages, plans to use treated sewage for cooling its future reactors. At present, the only nuclear power plant that uses this technology is the Palo Verde plant in Arizona in the United States.

Given the specifics of the Middle Eastern region and its individual countries, the nuclear power plant projects here rely not only on advanced technology but also on innovative financial solutions. For example, the Akkuyu nuclear power plant project in Turkey uses the BOO scheme, under which the contractor not only *builds*, but also *owns* and *operates* the nuclear power plant. Akkuyu is the first nuclear power project in the world to make

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6 The commercial launch of Romania's first energy reactor at the Cernavoda nuclear power plant took place on 2 December 1996.

7 China started building its first energy reactor in 1985. At present there are 14 nuclear energy reactors in operation in the country; another 27 are under construction.

8 For more details, see Anton Khlopkov and Anna Lutkova, "The Bushehr Nuclear Power Plant: Why Did It Take So Long?", *Yaderny Klub*, no. 1, 2010, p. 6–12 (in Russian).

use of such a scheme; up until now it has only been used (including in the Middle East) for power plants working on fossil fuel. The same scheme is also being considered by Jordan.

In addition, the Russian Federation is proposing innovative organizational solutions for nuclear projects in the Middle East. These are aimed at reducing the need for the region's countries to develop their own nuclear fuel cycle and its most proliferation-sensitive stages, i.e. uranium enrichment and spent nuclear fuel reprocessing. For example, in the Iranian, Turkish, and Jordanian projects (provided that the Russian Federation wins the Jordanian contract), the Russian Federation will not only supply fresh nuclear fuel throughout the entire life of the nuclear power plants in question, but also remove spent nuclear fuel.

Since the Middle Eastern countries do not have experience in nuclear power plant operation, the running of new nuclear power plants in these countries will rely heavily on specialists from the countries that supply the nuclear power plant technology—at least until local specialists can be trained to adequate standards. For example, under the current plans, during the early stages only a third of the specialists working at the Akkuyu nuclear power plant in Turkey will be Turkish. Some 300 Russian specialists will also continue to work at the Bushehr nuclear power plant in the Islamic Republic of Iran after the facility is fully handed over in March 2013, making up about a half of the plant's workforce. Jordan expects that for at least the first five years its new nuclear power plants will be run by experienced foreign specialists. As a result, nuclear safety in the Middle East will be strengthened by operators who already have a lot of experience in other countries and regions.

## **The impact of the Fukushima accident**

The effects of the Fukushima accident on the Middle Eastern countries' nuclear energy plans can be grouped into three main categories.

1. The two smallest countries in the region, Bahrain and Oman, as well as Kuwait, have abandoned their plans for nuclear energy development. (The official position in Bahrain is that those plans have been suspended indefinitely.) In Kuwait, the government has abolished the agency in charge of nuclear energy plans, the National Nuclear Energy Committee. The main reasons for these decisions include concerns related to the compact sizes of these countries' territories, and their inability properly to protect the population if the nuclear power plants are built.
2. Several countries in the region have adjusted their nuclear energy plans to make them leaner and more realistic in terms of the expectations from the future nuclear power plants. For example, during its early feasibility studies Jordan viewed an energy reactor as a multirole facility to produce electricity, desalinate water, and make hydrogen (for use as fuel in hydrogen cars). At present, however, the country has limited its ambitions for nuclear energy to producing electricity, although the power generated by an nuclear power plant could then be used for water desalination, which is very energy intensive. (As already mentioned, Jordan's water resources are very scarce, so the country is looking into building desalination plants; several desalination projects have already been implemented in other Middle Eastern countries.)

3. The Fukushima accident has resulted in more stringent requirements for nuclear safety and, consequently, for nuclear technologies being offered by international suppliers to their customers. The bar has been raised, and third-generation reactors have now become the lowest level of technology customers are prepared to accept. As a result, China is no longer viewed as a competitive nuclear exporter for the next five to 10 years. The best it can currently offer is second-generation nuclear reactor technology. Back in 2010 that technology, combined with China's advantage of cheap labour, was sufficient to enable Beijing to compete with the traditional nuclear suppliers in the Middle Eastern market—but that is no longer the case. The nuclear suppliers that are the most active in the region—i.e. France, Japan, the Russian Federation, and the Republic of Korea—are all offering Generation III and III+ reactors.

## The impact of the Arab Spring

The effects of the political turmoil in the Middle East on the region's nuclear energy plans can also be grouped into three categories.

1. Events in the region have caused Middle Eastern countries to postpone decisions on implementing various mega-projects, including the construction of nuclear power plants. There have been good reasons for that, including the change of leadership and the arrival of new governments in these countries. To illustrate, in August 2010 Egypt concluded preparations for a tender to choose the supplier of reactor technology for the country's first nuclear power plant. But following a wave of protests and the ensuing change of government in 2011 the tender was postponed, and work on the project was suspended due to unrest in the country.

Jordan is not ruling out that growing instability on the country's borders and rising numbers of refugees will force the government to postpone the nuclear power plant project.

2. Events in the Middle East, which is a major exporter of hydrocarbons, have exacerbated energy security concerns in countries that rely on imports from that region. That has strengthened the argument in favour of developing nuclear energy, including in the Middle Eastern countries themselves.

Since the change of government in Egypt, the pipeline supplying natural gas from that country to Jordan (as well as to Israel) has been blown up on 15 separate occasions. As a result, according to various sources, Jordan has received only 10–25% of the gas it had agreed to buy from Egypt. In addition, the new Egyptian government has changed the financial terms of these supplies and substantially raised prices. All of this has strengthened the argument in favour of building nuclear power plants in Jordan, which currently imports 98% of its primary energy, but has substantial reserves of uranium.

Another example is Turkey. Relations between Turkey and the Islamic Republic of Iran have soured over events in Syria. Gas imports account for about a third of Turkey's total energy consumption, and about a third of those imports come from the Islamic Republic of Iran, so energy security is once again high on the Turkish agenda. In 2008 the country faced a serious problem caused by its dependence on Iranian gas imports, when supplies from the Islamic Republic of Iran stopped completely for a

time because Tehran introduced a ban on gas exports. Turkey is therefore very eager to diversify its energy sources and to develop nuclear energy at a rapid pace.

3. In the wake of the Arab Spring, public opinion has become a more important factor for governments in the region to take into account as they formulate their nuclear energy plans. In some cases, real public concerns are being given greater consideration; in others, some political forces are merely trying to exploit the nuclear issue so as to earn political dividends. For example, it is becoming popular in Jordan to criticize the plans for building nuclear power plants because those plans have the backing of the king.

In Egypt, meanwhile, after the arrival of the new government local residents in the town of El Dabaa have seized the site chosen back in the 1980s for the construction of the country's first nuclear power plant. It was previously thought that the issue had already been settled, and the people who owned homes and lands in the exclusion zone of the future nuclear power plant had made an agreement with the government on amount and order of compensation. The site was approved by IAEA specialists. Egyptian experts believe that if the latest developments force the government to look for a new site, the existing plans for building the nuclear power plant will have to be pushed back by four or five years.

## Conclusion

The first nuclear power plant in the Middle East, the Bushehr nuclear power plant in Iran, was launched in 2011. The construction of the region's second nuclear power plant (Braka, United Arab Emirates) began in 2012. It is safe to assume that in the foreseeable future most of the nuclear energy newcomers will be from the Middle East—including the United Arab Emirates, Turkey, and Jordan. The first reactor of the Barakah nuclear power plant in the United Arab Emirates is expected to be launched in 2017. The first Turkish nuclear power plant—Akkuyu—should follow in 2019. At the same time, the current plans regarding the number of future reactors and the time frame allotted for their construction in the longer term will have to be adjusted and brought into line with the technological and financial capabilities of these countries (the Islamic Republic of Iran, the United Arab Emirates, Turkey, and Saudi Arabia), as well as with the real scale of their economies' demand for nuclear energy.

On the whole, the Fukushima accident has had mostly positive effects on the Middle Eastern countries' nuclear energy plans. It has served to make plans more feasible and realistic, without removing the fundamental reasons for these countries' interest in nuclear energy, such as their growing demand for energy, the volatility of oil and gas prices, environmental challenges, and energy security concerns.

The effects of the Arab Spring on the regional nuclear energy plans have been more ambiguous. For the countries that depend on energy imports, turmoil in the region has strengthened the argument in favour of bolstering their energy security and developing a nuclear energy industry. But in several countries—especially those that have gone through a change of government—the ongoing instability could result in the existing nuclear power plant plans being postponed.

**Table 1: Status of Nuclear Power in the Middle East**

STAGE OF DEVELOPMENT	COUNTRIES
First nuclear power plant operation started	Islamic Republic of Iran
Construction work started	United Arab Emirates
Contracts for nuclear power plant signed, legal and regulatory infrastructure well-developed, licensing process started	Turkey
Committed plans, nuclear power plant procurement process initiated, legal and regulatory infrastructure developing	Jordan
Well-developed plans and legal and regulatory infrastructure, but commitment pending	Egypt
Developing plans	Saudi Arabia
Considered civil nuclear power as an option but no immediate prospects for development	Qatar
No plans	Bahrain, Kuwait, Oman

The table is based on Charles Ebinger et al, *Models for Aspirant Civil Nuclear Energy Nations in the Middle East*, Policy Brief 11-01, Brookings Institution, September 2011, p. 65, fig. 8-1: Status of Nuclear Power in the Middle East.



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