Gulf Research Centre Cambridge
Knowledge for All

Workshop 3

Nuclear Energy for the Gulf: Key Questions and Opportunities

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Abstract

Several countries across the Middle East have recently embarked on establishing nuclear power programmes in the hope of resolving energy security problems, meeting increasing demand for electricity and desalinated water, and promoting economic growth through localisation. The Gulf region is at the centre of the new nuclear build wave with ambitious plans to build nuclear power plants in Iran, Saudi Arabia, and the UAE. This workshop will examine the diverse set of challenges and opportunities associated with the deployment of nuclear power in the Gulf with particular focus on economics and the potential for regional cooperation. The workshop also aims to highlight other key considerations such as safety and security, available vendors and technologies, and emerging trends in project financing.

Description and Rationale

With Iran gaining the international community's acceptance of its nuclear programme, and the UAE currently constructing three of four planned nuclear reactors, nuclear energy has become a reality in the region. The leaders of Saudi Arabia have also announced that the kingdom is embarking on an ambitious energy diversification plan that includes a large share of nuclear power. The multiple accidents at the Fukushima nuclear plant in Japan in 2011, however, have curbed enthusiasm for nuclear energy in Bahrain, Kuwait, Oman, and Qatar, and led these countries to abandon or suspend their nuclear plans.

The official rationale to acquire nuclear power is based on a set of common challenges that face countries across the region such as rising demand for electricity and desalinated water due to economic and population growth, the need to achieve energy security through reducing reliance on energy imports or through diversification of energy sources, and the opportunity cost associated with burning oil and gas to generate electricity instead of diverting these resources for export.

As the presence of nuclear energy in the region grows, the need to better understand the underlying issues becomes essential. Specifically, this workshop aims to discuss the following themes:

• **Status, projections, and resource requirements:** The scale and maturity of the proposed nuclear programmes in the region differ from one country to another. An overview of current status and future projections would be needed for setting the stage to discuss the various issues identified below.

• **Economics:** The economic competitiveness of nuclear power depends on its cost relative to traditional energy sources such as oil and natural gas as well as to alternative energy sources such as wind and solar power. Nuclear projects have suffered some major cost and time overruns, even in countries with high nuclear capacity such as France and the United States. On the other hand, generation costs of solar electricity have dramatically declined over the past decade and are projected to decline further as relevant technologies mature.

• **Nuclear safety:** In the wake of the Fukushima accident in 2011, many countries around the world, including four GCC states, decided to revise their nuclear power plans. There is a need to understand how Fukushima affected the public discourse on nuclear issues and selection criteria for nuclear safety in newcomer countries in the region in terms of technological preferences and expectations.

• **Nuclear security:** The talks over Iran's nuclear programme have highlighted the security risk associated with nuclear power and its relevance to the region. The global expansion of nuclear power is a major challenge to the nuclear non-proliferation regime due to the significant overlap between the technical requirements of a peaceful nuclear power programme and that of a nuclear weapon programme.

• **Prospects for regional cooperation:** The adoption of nuclear power as part of the region's future energy mix could open the door for cooperation opportunities, particularly on sensitive issues such as control of the nuclear fuel cycle activities, including uranium enrichment and management of nuclear waste.

• **The role of small modular reactors:** In recent years, a number of designs called Small Modular reactors (SMRs), with power outputs of less than 300 MWe, are being promoted by nuclear establishments in many countries. SMRs could offer a number of advantages over large reactors such as reduced economic risk and the potential use for some niche industrial applications.

Anticipated Participants

This is an interdisciplinary workshop that aims to discuss a wide variety of technical- and policy-based issues related to deployment of nuclear power in the Gulf. We welcome submissions from academics and experts on the following themes:

- Demand (country perspectives): status, projections, and challenges
- Supply: Technologies and vendors
- Economic competitiveness of nuclear power
- Grid integration of nuclear and renewable energy sources
- Financing of nuclear projects
- Nuclear desalination
- Emerging issues in nuclear safety and security
- Nuclear proliferation
- Regional cooperation
- The role of small modular reactors

Workshop Director Profiles

Dr. Ali Ahmad is a research fellow in Energy Policy at Princeton University's Woodrow Wilson School of Public and International Affairs. He is also a visiting faculty in Energy Studies at the American University of Beirut. Dr. Ahmad's research and teaching

activities cover strategic planning and decision-making associated with national energy systems with focus on the Middle East, energy policy and economics, nuclear security and nonproliferation and the introduction of nuclear power to new markets. A Physics graduate from the Lebanese University in Beirut, Dr. Ahmad holds a Ph.D. in Nuclear Engineering from Cambridge University.

Prof. Nesreen Ghaddar is Qatar Chair of Energy Studies professor and Director of the Munib and Angela Masri Institute of Energy and Natural Resources at the American University of Beirut. Her primary research focus is in the area of heat transfer enhancement for efficient cooling, modeling energy systems, and energy conversion. She is a fellow of the American Society of Mechanical Engineers, the Islamic World Academy of Sciences, and the Lebanese Academy of Science. A mechanical engineering graduate from Kuwait University, Dr. Ghaddar holds a PhD in Mechanical Engineering from Massachusetts Institute of Technology. She has been instrumental in the development of specialized educational programmes and labs in applied energy, energy studies as well as green technologies at AUB. She received the Abdul Hameed Shoman Award for Arab Researchers (Green Engineering) for 2013. In 2014 she was listed by Muslim Science among the top-20 Most Influential Women in Science in the Islamic World and described as the Shaper of Energy Future, Kuwait and Lebanon.

Selected Readings

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