

# Transitioning to Liberalized Energy Markets

## **About KAPSARC**

The King Abdullah Petroleum Studies and Research Center (KAPSARC) is a non-profit global institution dedicated to independent research into energy economics, policy, technology and the environment, across all types of energy. KAPSARC's mandate is to advance the understanding of energy challenges and opportunities facing the world today and tomorrow, through unbiased, independent, and high-caliber research for the benefit of society. KAPSARC is located in Riyadh, Saudi Arabia.

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# Key Points

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**S**ome countries have successfully navigated the transition to using a free market to provide energy more efficiently, while others are only just embarking on this journey. This transition is a lengthy, costly and complex process. Consequently, lessons learned from their experiences can help improve policy formulation in Gulf Cooperation Council (GCC) countries that are themselves at various stages of the reform process. KAPSARC's workshop focused on the electricity sector and offered the following policy insights.

Successful reform requires institutions as well as institutional capabilities to manage the transition process, and an adequate market size for a competitive market to function. For example, it is unclear whether the individual GCC members' power markets are large enough to support competitive trading and if they have developed the institutional capabilities to make it work.

The single buyer model market structure is seen as the way to improve the security and reliability of electricity supply. However, this comes with a risk that power producers may over invest in generation capacity because they are receiving state guaranteed returns on capacity additions, thereby creating long-term fiscal liabilities.

Alternatively, a hybrid reform model that, along with an entity buying a major portion of electricity, allows independent power producers (IPPs) to sell electricity directly to end-consumers through bilateral contracts and a spot market can minimize government intervention and thus fiscal risk. But this hybrid reform model has higher implementation costs.

Reforms in the GCC region have several objectives: improving the power sector's efficiency, attracting new investments and removing fuel subsidies. The reform agenda in the GCC presents new opportunities, such as intra-regional electricity trading among GCC countries. It also offers challenges, including providing incentives to invest in renewables, managing reliable electricity supply and balancing fiscal budgets.

# Summary for Policymakers

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In the late 1980s, it became accepted economic orthodoxy that liberalized energy markets would deliver lower costs and increase service quality. After three decades of experience, the resulting reforms have delivered mixed outcomes. Several countries have successfully transitioned to liberalized markets from mandated or regulated pricing and monopoly utilities. In many others, reforms are either still ongoing or circumstances have dictated different routes than initially intended. Then there are those where privatization plans were put on hold and utilities were re-bundled in the face of dwindling opportunities for a competitive spot market.

Power sector liberalization is a lengthy, complex and costly process. The reform's objectives can change over time before the liberalization process is completed, as such reforms may have to address new constraints and altered policy objectives. Market liberalization is not an objective in itself. Rather, liberalization is best viewed as a means to achieve improved service levels and more efficient performance in the sector in the long term.

Restructuring the power sector does not inherently increase efficiency and consumer welfare. Its primary purpose is to create an environment into which competition can be introduced along with involvement of the private sector.

Institutions, institutional capabilities and a competitive market platform are key ingredients for a successful transition to liberalized markets. Experience suggests that before unbundling a national utility, it is important to first create an independent regulatory body that is complemented by a competitive market platform. In the absence of

these institutional requirements, pragmatism may lead to the creation of informal institutions that fill the vacuum, creating short-term fixes that derail the overall objectives.

The single buyer model is the most common form of power market structure pursued in the Gulf Cooperation Council (GCC) where independent power producers (IPPs) sell electricity to the national utility (also a major power generator). It is normally proposed as the best method to improve the security and reliability of electricity supply. However, this model has its disadvantages. For example, IPPs selling power to a state-owned national utility company need state guaranteed returns to build capacities and this may create overinvestment and long-term fiscal liabilities.

A hybrid reform model in which a single buyer competes with IPPs who can also sell electricity directly to consumers through bilateral contracts and a spot market can minimize government intervention, since investment decisions and associated risks are left to private investors. The greater economic benefits in the long term, however, may come at the expense of higher costs during implementation.

Reforms in GCC countries have several, sometimes competing, key objectives: improve the power sector's efficiency, attract new investments and remove fuel subsidies. This latter objective requires intervention to address the impacts of increased tariff on consumers. Reform in the region can lead to new opportunities such as intra-regional electricity trading among GCC members. It also creates new challenges such as attracting investments in renewables, managing reliable electricity supply and balancing fiscal budgets.

# Background to the Workshop

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**T**his workshop was held on January 11, 2017, at KAPSARC in Riyadh. Participants discussed lessons learned from the experiences of countries that have transitioned to liberalized energy markets. The sessions focused on key questions about the transition process: What has and has

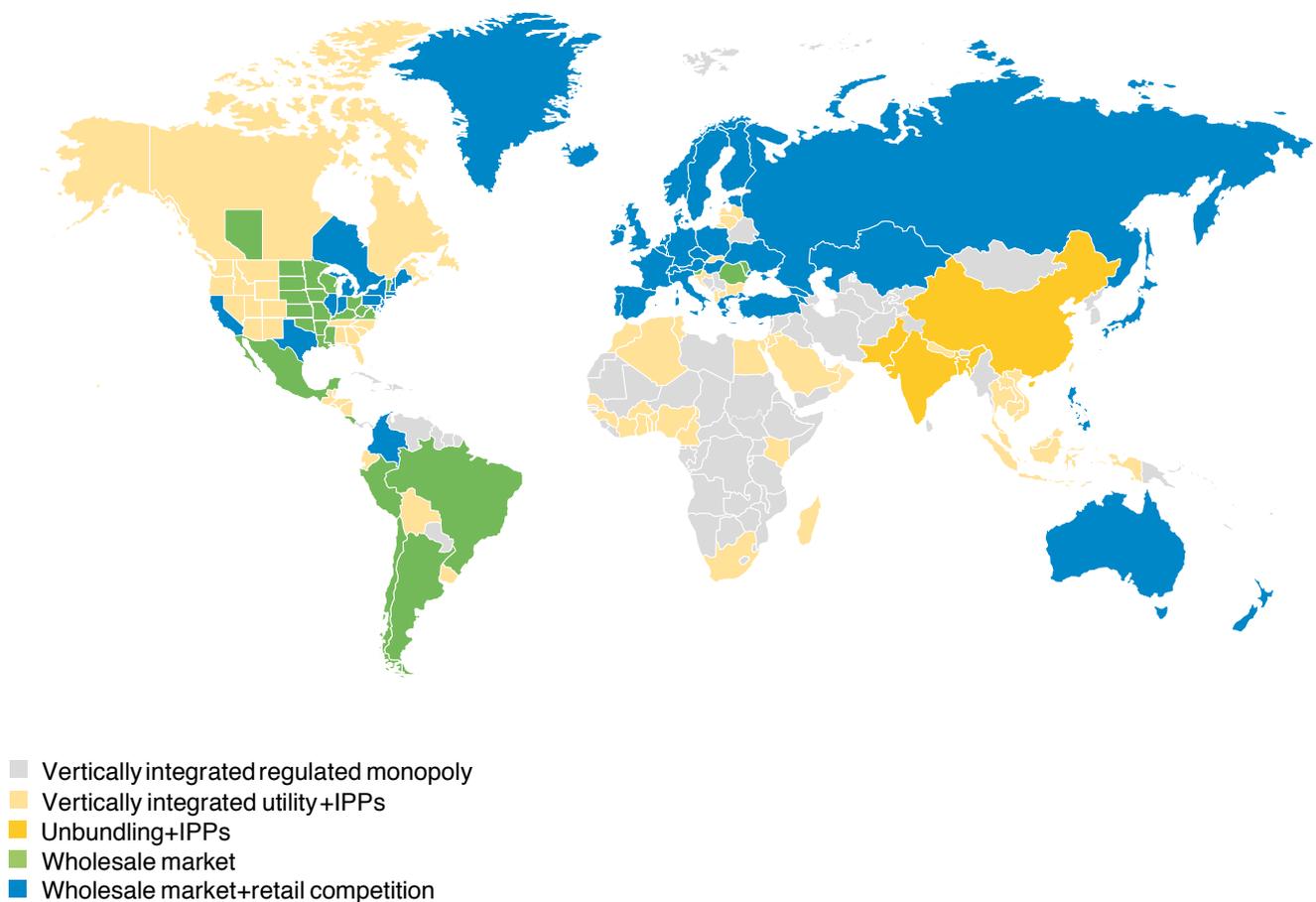
not worked in countries that have transitioned to liberalized markets? How did implementation differ from planning? How were energy and environmental policies coordinated with liberalization and how are these experiences relevant to those who are transitioning or embarking on reforms?

# Power Sector Reform Trend

The successful privatization of the Chilean electricity sector in 1982 may have marked the start of a global trend toward energy sector reforms. After nearly three decades of reforms, there is renewed interest in understanding the costs and benefits because the outcomes have been mixed.

The International Energy Agency (IEA) finds that most countries have undergone some form of

liberalization in the power sector (Figure 1), and electricity supplied from pure monopolies has been reduced to 6 percent of the world energy consumption in 2012. In most countries including several developing states, the basic reform step taken is to minimize the price-cost gap by removing fuel-subsidy. Introducing IPPs is the other major reform step. Unbundling the power sector from its vertically integrated monopoly structure and privatizing national utility companies are the reform



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

**Figure 1.** Status of global power sector liberalization.

Source: IEA and Renewable Energy and Efficiency Partnership (REEP) Policy Database 2012-2013.

Note: The map may not reflect recent changes in power market structures in some countries, especially in Africa and South Asia.

measures that many OECD countries including European and some states in the U.S. have taken.

The well-known 'scorecard' published by the Energy Sector Management Assistance Program of the World Bank includes a snapshot of the standard reform process/progress for developing and transitioning countries. The key steps in a reform process are establishing electricity laws,

regulators and IPPs; restructuring, unbundling and privatizing national utilities; and creating spot trading markets. Using these steps, several countries have successfully transitioned to a market system but in many others, reforms are either still ongoing or different paths than initially intended were taken. In some countries, privatization plans were put on hold as utilities were re-bundled amid dwindling chance for the creation of a competitive spot market.

# Managing the Transition Period

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**T**ransition from national monopolist to a competitive environment requires three key steps: 1) create an independent regulatory body, 2) unbundle the national utility and 3) launch a competitive market platform. Lessons from Europe show that the time sequence of these key steps is crucial. First, the regulator's specialist personnel must be hired and trained, then new operators, which typically belong to the former national monopolist, must be empowered with new missions and new business strategies. Finally, the competitive market must start immediately. While creating a regulatory body and market platform can be done simultaneously, unbundling the national utility should not be attempted until adequate progress has been made in implementing the first two activities. Otherwise, in the absence of a fully functioning market, tacit forms of collusions will arise.

An example of a poorly designed transition outcome is the delay to the start of Italy's power market. During the transition period, new legally

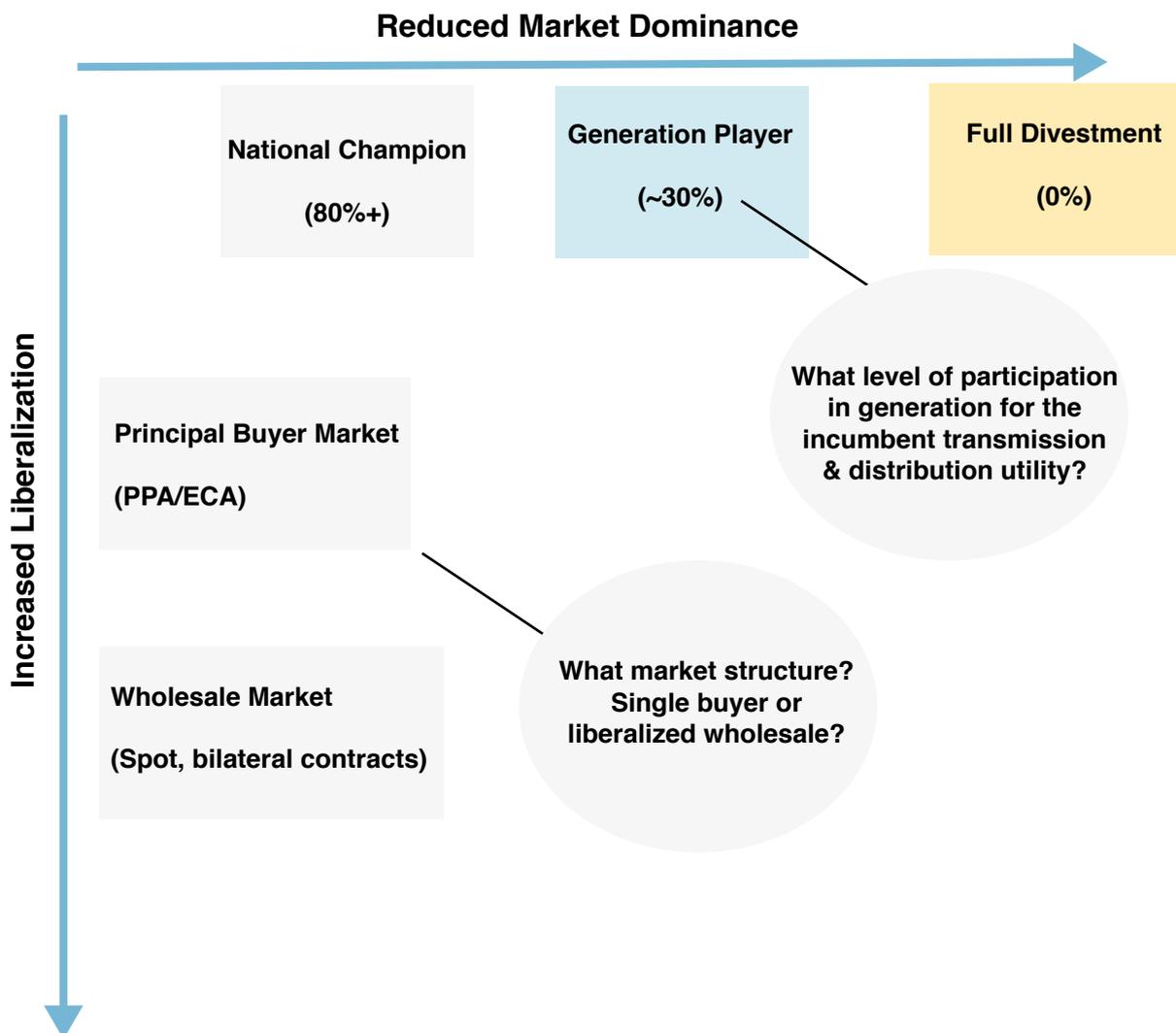
independent generators were active but the market platform was not ready. Pragmatism led to the formation of an informal coordination council drawn from representatives of the major utilities, with the task of ensuring a viable daily economic merit order plant dispatch. However, the practice of setting daily prices – by fixing the dispatch ordering of existing plants – turned out to be anti-competitive. This illustrates the point that liberalization before careful institutional design is made can have unintended consequences.

Power sector liberalization is a lengthy, complex and costly process. The reform may have to address new objectives while still in the transition process; for example, strengthening economies of scale to enhance competition. In Europe, utilities had to reorganize including merging with gas companies to bring more competition into the market. Market liberalization is not an objective by itself but rather a means to achieve better and more efficient long-term performance in the sector.

# Restructuring the Power Sector in Transition

**R**estructuring the power sector is often seen as a reform process that improves the industry's efficiency and consumer welfare. Yet, the primary purpose of restructuring is to create an environment for reform to take place. Thus, restructuring is a step toward reform and this reform can only materialize if the industry is made competitive with the private sector's involvement (see Figure 2).

The common structure of the power sector, in most countries that are in transition, is a single buyer model. In this model, IPPs sell electricity to a national utility company that also is a major power producer. The national utility company guarantees long-term returns to IPPs by signing power purchase agreements (PPAs). Also, the national utility company controls the transmission and distribution of electricity. The single buyer model improves



**Figure 2.** Private sector's potential role in generation.

Source: SEC.

## Restructuring the Power Sector in Transition

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the security and reliability of electricity supply but, if not carefully planned, the model may create overinvestment and long-term risks. For example, strong financial incentives for IPPs to add capacities may create overinvestment and long-term fiscal liabilities. Furthermore, if the national utility company has no strong motive for profit, it may hinder cross-border electricity trades.

In some Latin American countries, in India and the UAE, for example, hybrid reform models are employed. In these hybrid reform models, along with an entity purchasing a major portion of electricity, IPPs can sell electricity to distributors through bilateral contracts, and also directly to consumers, who are usually large entities. Consumers can also purchase electricity from a

spot market. The existence of strong competition in the hybrid reform model minimizes government intervention and brings swift price responses to any market-related effects. The model also presents opportunities for cross-border electricity trading. However, there are higher short-term costs in implementing a hybrid reform model.

In other countries and regions, innovative terms and policies have been successfully implemented. For example, in New Delhi, PPAs were awarded via auctions and the auction included a bid parameter that targets transmission and distribution (T&D) losses. The auction process allowed the market to allocate a multiyear tariff that removes long-term pricing uncertainty, and the T&D loss-bid parameter incentivized private companies to reduce T&D losses.

# Power Sector Reforms in GCC Countries

**P**ower sector reforms in GCC countries are at various stages of implementation with some states well ahead in the process. Oman, for example, is planning for a spot market to trade electricity while Saudi Arabia has just approved plans for the unbundling of its national utility. The organizational structure of the sector in the region is predominantly that of a single buyer model, with state-owned utilities playing a major role.

Reform plans of GCC members have several objectives and these are often challenged by other impending needs, constraints and new opportunities. Among the key objectives are the need to improve the power sector's efficiency, remove fuel subsidies and attract new investments.

Often these are challenged by the need to consider the impacts of increased tariff on consumer welfare and the fiscal budget. Private investments in renewables are another challenge since renewables are often subsidized, including solar power which has a significant potential in the region. Having renewables in the GCC's reform plans raises the following challenges:

- Providing incentives to the private sector for investment in renewables.
- Providing reliable electricity supply in the region.
- Meeting the region's sustainable development agenda.

Power sector reform status in GCC countries.

While governments play a significant role in the generation, transmission and distribution of electricity in the region, GCC countries are in different stages of reforming their power sectors. Every GCC country has independent power and water producers (IPWPs) and is pursuing a structure where a single buyer buys electricity from generators. However, some member states are much further along the reform process:

**Bahrain** — The power sector was vertically integrated until 2016 when the government privatized its generation plants. The Ministry of Electricity and Water Affairs, through the Electricity and Water Authority oversees the generation, transmission and distribution of electricity in the Kingdom. In March 2016, the ministry reduced subsidies to electricity and water consumption through an adjustment resolution of the electricity and water tariff.

**Kuwait** — The Ministry of Electricity and Water is mostly responsible for the production, transmission and distribution of electricity. In 2013, the Az-Zour North gas-fired power plant became the country's first independent power plant in which the Kuwaiti government holds a major share (60 percent).

**Oman** — Market reform was introduced through legislation under the Regulation and Privatization of Electricity and Related Water Sector in 2004 (known as the Sectoral Law) with the aim of unbundling the state-run power industry. Currently, IPWPs sell to the Oman Power and Water Procurement Company (OPWP). Oman Electricity Transmission Company has the sole responsibility for transmission, while distribution is carried out by three companies: Muscat Electricity Distribution Company (MEDC), Majan and Mazoon electricity companies. While OPWP buys electricity from the IPWPs by entering into power purchase agreements, the transmission company is regulated by price controls and no subsidies are involved. Direct subsidies for residents are channeled through the distribution companies.

**Qatar** — The power sector was reformed in 2000 by separating power generation and water production from transmission and distribution. Currently, power generation and water production are carried out by Qatar Electricity and Water Company (QEWC) and some independent power and water producers. QEWC holds shares in these IPWPs with most being more than 50 percent. QEWC is responsible for almost all electricity generation and water supply, and its shares are publicly traded. The transmission and distribution of electricity and water are the sole responsibility of the government corporation: Qatar General Electricity and Water Corporation (QGEWC), which is also known as KAHRAMAA. In addition to the transmission and distribution of electricity in Qatar, QGEWC is actively involved in initiating and negotiating with IPWPs for the construction of additional production capacity to meet future electricity and water demand.

**Saudi Arabia** — The Electricity and Cogeneration Regulatory Authority (ECRA), the independent regulatory authority, oversees the electricity and water desalination industries in the Kingdom. ECRA has approved plans for the unbundling of the power market structure, which is currently vertically integrated. At present, the Saudi Electricity Company (SEC) is the utility company responsible for the generation, transmission and distribution of electricity. The company's stocks are publicly traded and more than 81 percent of SEC shares are owned by the Saudi government and Saudi Aramco (the state-owned oil company responsible for supplying oil and gas in the Kingdom). There are also a few independent power and water producers that sell their electricity to SEC. Large industrial consumers also generate their own electricity and can sell their surplus power to SEC by connecting to its transmission grid. At the end of December 2015, the government announced tariff reforms.

**U.A.E.** — The power sector consists of regional autonomous entities that independently manage their electricity needs. However, these regional entities, except Abu Dhabi, have nearly vertically integrated power structures. In Abu Dhabi, generation, transmission and distribution function separately under an independent regulator. Almost 96 percent of Abu Dhabi's power comes from IPPs. Abu Dhabi Water and Electricity Company buys power from IPPs under PPAs through a bidding process, while the distribution companies are subsidized for lower tariff by the government. Transmission of electricity and water is carried out by the Abu Dhabi Transmission and Dispatch Company. Distribution is carried out by Abu Dhabi Distribution Company and Al Ain Distribution Company.

In the near future, significant capacity additions in power generation are expected in the region including nuclear power plants in Abu Dhabi that will come online in the next few years.

Qatar, on the other hand, has large natural gas reserves that could easily be tapped to build new generation plants. Oman, for its part, is planning a spot electricity market for domestic trades.

These foreseeable developments will require any reform agenda in the region to undergo a careful evaluation.

Reforms in the region offer an environment to trade electricity regionally. The electricity trade presents an opportunity to address growing power demand and better utilize excess capacity. Surplus power capacity can release electricity for trading using the GCC Interconnector, managed by the Gulf Cooperation Council Interconnection Authority (GCCIA). The Interconnector was completed in 2011 and to date has provided reliable services, while electricity trading has been limited. GCCIA has a 2020 roadmap to transition the system to a

fully operational market modeled on the Nord Pool system in northern Europe, which encompasses nine countries.

In 2016, GCCIA initiated a pilot program to experiment the building and operation of an electricity trading market. Over the course of the year, 1.3 TWh were traded among five states in-kind and for cash. The value of traded electricity reached

as much as \$192 million when assuming a peak tariff agreed by the five states. Moving forward, GCCIA sees three potential scenarios to integrate the Interconnector with local power markets. These scenarios are presented in Table 1.

Given the challenges facing the region, GCCIA sees Scenario 3 as the most strategically preferable option.

**Table 1.** Potential scenarios for GCCIA to integrate with the local power markets.

Scenario 1	Scenario 2	Scenario 3
<i>GCCIA as a market coupling mechanism</i>	<i>GCCIA as a regional market and provider of technology and best practices</i>	<i>GCCIA as a nucleus for intra-country markets</i>
<ul style="list-style-type: none"> <li>• States would create their own markets.</li> <li>• The GCC Exchange will act as a market coupling mechanism.</li> <li>• However, this scenario may postpone the creation of a competitive and transparent GCC energy market because most of the countries are too small to develop internal competition and market liquidity.</li> </ul>	<ul style="list-style-type: none"> <li>• The GCC Exchange will act as a technology and best practices provider for local markets through a market coupling mechanism.</li> <li>• This scenario is faster and more effective than Scenario 1.</li> <li>• However, Scenario 2 does not deal with the main challenges facing the region such as removing subsidies and attracting new investments.</li> </ul>	<ul style="list-style-type: none"> <li>• Market reforms and expansion of the GCC Exchange into individual country markets (following the Nord Pool model).</li> <li>• An integrated GCC market to provide maximum competition and liquidity.</li> <li>• A regional regulator would need to be established.</li> </ul>

Source: GCCIA.

# About the Workshop

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**K**APSARC organized this one-day workshop on January 11, 2017, with an attendance of more than 38 experts from the private sector, research institutes, government and academia from the U.S., Europe, Middle East, China, India, Saudi Arabia, Sri Lanka and Nepal. The workshop was held under a modified version of the Chatham House Rule. Under the rule, participants consented to be listed below, but none of the content in this briefing is attributed to any individual attendee.

**Fahad Abu-Haimaed** – Executive Director, Strategic Planning, Saudi Electricity Company

**Mohamed Al-Hamad** – Power Trade Senior Executive, GCC Interconnection Authority

**Essam Al-Ammar** – Governor’s Advisor, Electricity and Co-Generating Regulatory Authority (ECRA)

**Samer Al-Ashgar** – Former President, KAPSARC

**Ziad Al-Jendel** – Accelerated Strategic Transformation Program, Saudi Electricity Company

**Ahmed Al-Jogaiman** – Consultant, Saudi Electricity Company

**Abdullah AlKathiri** – Saudi Electricity Company

**Nader AlKathiri** – Research Associate, KAPSARC

**Faisal Al-Kathiry** – Saudi Electricity Company

**Saleh Al-Olya** – Executive Director, Regulation and Performance Sector, Saudi Electricity Company

**Abdullah Alsubaie** – Researcher, King Abdulaziz City for Science and Technology (KACST)

**Mustafa Babiker** – Senior Research Fellow, Saudi Aramco

**Andy Barrett** – Senior Associate, IHS Energy

**Sudhir Bhat** – Senior Planning & Programs Analyst, Saudi Aramco

**Andrea Bollino** – Professor, University of Perugia

**Anne-Sophie Corbeau** – Research Fellow, KAPSARC

**Mohammad Dashash** – Consultant, Ministry of Petroleum and Mineral Resources

**Rolando Fuentes** – Research Fellow, KAPSARC

**Udaya Gunturu** – Research Scientist, King Abdullah University of Science and Technology (KAUST)

**Shahid Hasan** – Research Fellow, KAPSARC

**David Hobbs** – Head of Research, KAPSARC

**Damitha Kumarasinghe** – Director General, Public Utilities Commission of Sri Lanka

**Noura Mansouri** – Senior Research Associate, KAPSARC

**Ceyhun Mikayilov** – Professor of the World Economy Department, Qafqaz University

**Paul Mollet** – Visiting Fellow, KAPSARC

**Fred Murphy** – Visiting Fellow, KAPSARC

**Grzegorz Onichimowski** – Manager of Market Operations, GCC Interconnection Authority

**Axel Pierru** – Program Director, KAPSARC

**Shreekar Pradhan** – Senior Research Associate, KAPSARC

## About the Workshop

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**Zhang Qi, Professor** – China University of Petroleum-Beijing (CUPB)

**V. Ranganathan** – Mentor Faculty and Professor, Indian Institute of Management, Kashipur

**Ratna Sansar Shrestha** – Executive Committee Member, Nepal Water Conservation Foundation

**Didier Sire** – Senior Advisor to the Secretary General, World Energy Council

**Govinda Timilsina** – Senior Economist, World Bank

**Dennis Volk** – Independent Consultant, UAE

**Bert Williams-Rioux** – Senior Research Associate, KAPSARC

**David Wogan** – Research Associate, KAPSARC

## About the Team



### **Amro Elshurafa**

Amro is a research fellow at KAPSARC. His research interests lie in renewable energy policy. Previously, he was a research fellow at King Abdullah University of Science and Technology (KAUST), a registered professional engineer in Canada and a senior member of the IEEE. Amro is the author of 40+ papers and reports, and the inventor of several patents. He holds a Ph.D. in Electrical Engineering and an MBA in Finance.



### **Noura Mansouri**

Noura is a senior research associate at KAPSARC. Previously, she was a post-doctoral research fellow in the mechanical engineering department at MIT, the manager of strategy and marketing at AREVA and a research assistant at the Center for Global Energy Studies in London. Noura holds a Ph.D. in Sustainable Energy Transition and an MBA specialized in sustainable energy technology management from Queen Mary University of London.



### **Walid Matar**

Walid is a senior research associate developing energy systems models at KAPSARC. He holds a master's degree in mechanical engineering from North Carolina State University, and a bachelor's degree in mechanical engineering from the University of South Carolina.



### **Axel Pierru**

Axel Pierru leads the Energy Systems and Macroeconomics program at KAPSARC. He has published more than 30 papers in peer-reviewed journals. Before joining KAPSARC, he worked for 15 years at IFP Energies Nouvelles in France. Axel holds a Ph.D. in Economics from Pantheon-Sorbonne University in Paris.



### **Shreekar Pradhan**

Shreekar is a senior research associate at KAPSARC. His research interests include evaluating energy policies in an integrated energy-economic modeling environment with a focus on international trade and environment. He holds a Ph.D. in Economics from the University of Tennessee at Knoxville and an M.S. in Renewable Energy Engineering from the Tribhuvan University in Kathmandu.



### **David Wogan**

David Wogan is a research associate at KAPSARC. His research focuses on modeling the economics of integrated energy systems, with a focus on Saudi Arabia and the surrounding Gulf countries. David holds a Master of Science in Mechanical Engineering and a Master of Public Affairs from the University of Texas in Austin.

## **About the Project**

The workshop series Energy System Modeling provides a forum to discuss the role of models in formulating and analyzing energy policies. The workshop series has been focusing on timely themes that are both technical and policy-relevant. Insights from these workshops are expected to help foster a common understanding among creators and consumers of models, enriching our future research direction.



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