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ANALYSIS

Review of electricity sector reform in five large, oil- and gas-exporting MENA countries: Current status and outlook

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ABSTRACT

Since the early 80s, numerous developed and also developing countries on all continents have embarked on reforms of their national electricity sectors with varying degrees of ambition. The reforms were associated with hopes for accelerated innovation, enhanced customer service and, most importantly, efficiency gains in the operation of the sector and thus lower electricity costs for the consumers.

Sector reform legislation in the five analyzed countries (Algeria, Iran, Kuwait, Saudi Arabia, and the United Arab Emirates) has been enacted rather late, commencing at the end of the 90s. The countries' abundant and cheap energy resources mitigated pressures for reforms and delayed the introduction of market principles in the sector's organization. All five countries have since adopted more market-oriented sector structures, though none have as yet implemented their target sector models. This study reviews past reform efforts, analyzes the different approaches and provides an outlook for the countries' future reform agendas.

1. Introduction

Electricity sector liberalization has been a hotly debated topic ever since initial electricity sector deregulation got under way in Chile and Great Britain more than two decades ago. In the years following these initial reforms and prompted by hopes of enhanced customer service, improved sector efficiency and lower electricity costs, many countries around the globe have followed the example of the early reformers and implemented reforms in their national electricity sectors as well. While a vast body of literature has emerged, covering various aspects such as the economic rationale and theory of sector reform (examples: Refs. [1–3]), the different market design models (examples: Refs. [4,5]), and reviews of reform efforts and outcomes in developed (examples: Refs. [6,7]) and developing countries (examples: Refs. [8–10]), reports about the progress of electricity sector reform in the Middle East and North Africa (MENA) region have been notably scarce—a discrepancy that is somewhat surprising in light of the unparalleled relevance of the region's energy policies for the world's energy markets and thus in turn also for the energy policies and strategies of fossil fuel importing countries.

This document seeks to make a contribution to this gap in the available literature regarding electricity sector reform. A full review of electricity sector reform in the entirety of the MENA region, defined over the course of this study in accordance with the International Energy Agency (IEA)'s regional definition as: the five North African countries (Morocco, Tunisia, Algeria, Libya and Egypt); the Arab countries in the Levant (Lebanon, Syria and Jordan); the eight countries on the Arabian Peninsula (Saudi Arabia, Kuwait, Iraq, Bahrain, Qatar, the United Arab Emirates, Oman and Yemen) and Iran, ranges beyond the scope of the article. Applying a focussed approach, reform efforts in five large, oil- and gas-exporting MENA countries are reviewed and analyzed.

This study's focus countries are Algeria, Iran, Kuwait, Saudi Arabia and the United Arab Emirates (UAE). They were selected drawing on two specific selection criteria. The first of these criterion, domestic electricity generation, was used as a proxy to represent a country's comparative size regarding energy consumption. Although a multitude of indicators lend themselves to that purpose (gross domestic product (GDP) and population as the most obvious ones), electricity generation

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has the advantage of inherently capturing the availability of electricity in a country. Moreover, by focusing on the larger countries in terms of electricity generation, those MENA countries with the highest potential gain from sector reform, as well as those with a sufficiently large electricity system size for the implementation of fully competitive sector models are selected.[2] The second criterion, that being net fuel trade and defined as fuel exports minus fuel imports, represents a country's absolute fuel supply to the world market. The advantage of employing this metric over the use of alternative indicators is that it can be determined with reasonable accuracy drawing from international trade statistics, and in contrast to production or export figures, it also takes account of national resource consumption.

Saudi Arabia leads the MENA countries in terms of domestic electricity generation and net fuel trade. The only country similar in regards to electricity system size is Iran. Iran, however, due to its lower hydrocarbon production and higher domestic consumption exhibits a net fuel trade less than half that of Saudi Arabia's. The three other focus countries in descending order of electricity system size are: the UAE, Kuwait and Algeria. These three countries generate annual revenues from fuel trade between $50B and 70B, and thus effect revenues similar to those of Iran despite their substantially smaller size. Iraq, which is almost identical in size to Algeria in terms of both electricity generation and fuel trade has been deliberately excluded from the study's sample of countries. This remains, even despite the fact that, given the recovery of the Iraqi economy and the reemergence of Iraq in the international oil market following the rehabilitation of production infrastructure, Iraq would be a natural candidate for admission to the group of focus countries. Yet, the authors believe that in light of the country's recent history, characterized by factors such as the long-term rule under the allied coalition forces, the recent political uncertainty following the transition of power to the civilian government and the ongoing problematic security situation, make it a special case that deserves separate analysis. Fig. 1 shows vignettes of the five focus countries as well as a graphical representation of the definition of the MENA region. The five focus countries represent some 60% of the region's total GDP and 40% of its total population—an imbalance which is a self-evident consequence of the study's focus on resource-rich countries. In spite of these comparatively large percentages, the sector reforms observed in these countries must not be generalized in relation to other MENA countries. On the contrary, because these countries by virtue of their resource endowments were faced with differing economic necessities and needs than the region's less resource-blessed constituents, their reform agendas in terms of actions, sequencing and priorities are unlikely to be representative of a region-wide trend.

The article consists of five sections. In the remainder of this introduction, the discussion centers on the role of electricity in MENA as a whole and sheds some light on the reasons for the delayed implementation of sector liberalization in the region. Section 2 presents the electricity sector organization in the five focus countries prior to the launch of the national reform programs. The section also elaborates on some common characteristics of the national electricity systems and addresses the triggers that incited sector reforms at the beginning of the late 90s. Section 3 delivers individual accounts of the national reforms implemented since then and describes the status quo of the current electricity sector models. A uniform value chain representation is used to depict the key sector actors. Section 4 generalizes the results obtained from the national analysis with regards to the current sector models, reform approaches and reform objectives. Section 5 concludes the study.

Electricity is just one of several energy commodities, but it is of particular relevance to MENA, as its importance extends beyond serving as the source of energy for the rapidly growing number of modern microelectronic-controlled energy end-uses. The overwhelmingly vital role of electricity is attributable to the region's arid climate. Sufficiency in the supply of potable water is provided largely through the desalination and purification of (brackish or salt) water, which, depending on the means used, can either be an electricity-hungry process or a complementary technology to electricity generation. The strong interlinkage between electricity and water has come to be known as the energy–water nexus [14]. Likewise, air conditioning, which permits human activity in MENA summers when temperatures reach levels hazardous to health is another highly energy-intensive process using electricity as an energy source. Modern lifestyles in the desert-like areas of the region and the more moderate zones alike would arguably be impossible without the supply of electricity.

Against this background, and in conjunction with growing populations, rapidly developing economies and rising living standards[3] (see Fig. 2), electricity has been the region's fastest growing energy commodity. Since 1980, while the region's total final consumption (TFC) quadrupled, growing from 109 kilo-tonnes of oil equivalent (ktoe) to roughly 480 ktoe in 2008, electricity consumption rose more than sevenfold, skyrocketing from 122 TW (TWh) to 938 TWh over the same period. This absolute growth in electricity demand translates into a (CAGR) of 7.6% or, in comparison to TFC, an annual growth rate more than 2%-points higher. In the last fifteen years alone, electricity consumption has doubled. The absolute growth of electric energy demand is roughly equivalent to the (theoretical) power production of 70 nuclear power plants—or some additional five per year.

Despite the momentous development of the sector, sector reform was absent from the political agenda for a long period of time. By the mid-90s, at a time when a large number of developed and developing countries in Latin America, Eastern Europe and South-East Asia were already in advanced liberalization stages, only a few MENA countries were in the process of taking initial, cautious reform steps. Outside of the MENA region, electricity sector reforms were associated with high expectations regarding their positive impact on the technical and economical performance of the industry.[4] The deregulation and privatization of the electricity sector were thus a response to the urgently felt need for reform. In MENA, the possession of vast amounts of cheap hydrocarbons alleviated these pressures and permitted the satisfaction of the ever growing electricity demand at low actual cost. The case for sector reform was not overly strong in MENA countries endowed with less abundant resources either, as they often benefitted from preferential fuel supply agreements with their Arab neighbors. In summary, the region's abundant fossil fuel resources delayed sector reforms, especially during times of relatively low oil prices. It is not surprising that the first sector reforms in the MENA region—when they finally got under way—were launched by the comparatively resource-poor MENA countries Egypt, Morocco and Jordan amid a period of volatile oil prices. Since then, the proportions of reform to non-reform countries have inverted. Today, nearly every MENA country has embarked in pursuit of reforms of their sectors.

2. Pre-liberalization electricity sectors and systems

In the five analyzed countries, the pre-liberalization sector organizations did not differ significantly from the classical sector model that prevailed in pre-liberalization American and European countries. The legacy sector organization was the vertically integrated, government-owned utility which was endowed with either a statutory

[2] A large electricity system, which implies a large number of potentially competitive generators, is one of the preconditions for the implementation of competitive market models.

[3] In economics, living standard is typically measured in GDP per capita. In MENA, GDP per capita has been consistently rising in the years since 1980 as evidenced in the higher GDP growth rate compared to the population growth rate.

[4] Environmental considerations were no major driving force of reforms at that time.