Electricity Markets in the Resource-Rich Countries of the MENA: Adapting for the Transition Era

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1. Motivations underlying the research

The Middle East and North Africa's (MENA) resource-rich economies are pursuing two parallel strategies in their electricity sectors: (i) increasing and integrating renewables into their power generation mix to mitigate the impact of rising domestic oil and gas demand on their economies and boost hydrocarbon export capacities; and (ii) undertaking power sector reforms to attract investment in generation capacity and networks, remove subsidies, and improve operational efficiency. These goals imply that the design of reforms needs to be carried out with a view to a rising share of non-dispatchable resources. The lack of an integrated approach to simultaneously address these two strategies is likely to lead to several misalignments between renewables and various components of future electricity markets, as the share of intermittent resources increases in the generation mix. The key challenge is that the 'ultimate model' capable of reconciling these two goals is as yet unknown, and is still evolving, due to uncertainties around the development of technologies, institutions, and consumer preferences. Failure to find the right model is likely to frustrate reform efforts and governments may find themselves in need of making significant changes to the electricity market at later stages. For example, inadequate tariff structure design , following the removal of subsidies, could lead to difficulty in recovering the power systems' fixed costs, and also to the regressive distribution of costs among ratepayers. Furthermore, introducing significant renewables without a proportionate increase in power system flexibility (both in generation and in the grid) typically leads to curtailment and/or lower system reliability. Moreover, integrating demand-side resources faces a significant hurdle when ownership and operation of the national electricity grid are not decoupled. The tension between liberalization and decarbonization in pioneering electricity markets, such as in the EU, has arisen partly because renewables were imposed upon a market designed for conventional fossil fuel electricity. Resource-rich MENA countries, by contrast, could design their electricity markets around the incorporation of renewables at the outset and tap into years of international experience gained through trial and error.

2. A short account of the research performed

We argue that resource-rich MENA countries can move towards adopting a transition model of electricity markets, the individual elements of which can be adapted to suit either *centralized* or *decentralized* future electricity sector outcomes. Such a model needs to:

- combine the effective features of various successful designs;
- balance the roles of the market versus the government;
- be compatible with the current technology mix and institutions in the region;
- allow for the further development of renewables;
- be flexible enough to adapt to future developments in the electricity sector;
- encourage efficiency and security of supply; and
- promote consumer preference.

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We focus on major resource-rich MENA economies which are locked into a cycle of dependency on fossil fuels, due to two primary interconnected factors: rising domestic hydrocarbon consumption on the back of under-priced and plentiful fossil fuel reserves (oil/gas); and, rising dependence on oil and gas export revenues to finance domestic economic activities and maintain rent distribution. We identify six resource-rich countries which form the focus of the analysis in the paper: Algeria, Kuwait, Iran, Qatar, Saudi Arabia and United Arab Emirates (UAE). We review the current status of renewables in these countries as well as their future renewable targets, and we identify and describe five key features related to the region's electricity sector that will affect not only the design of instruments to achieve renewable targets but also future developments of these countries' power sectors. These include: the organisation of the electricity sector around vertically-integrated structures, slow progress of electricity reform implementation despite ambitious legislation, strong state presence in the electricity sector, highly subsidised tariffs, and mismatch between end user load profile and renewable resources generation profile due to high inefficiency of consumption. Against this context, we assess the state-of-the-art in electricity reform in the six countries. We then outline the key components of our transition model for the wholesale market, retail market, and network regulation, considering governments' objectives and the specific contexts of the countries in the region.

3. The main conclusions, application and policy implications

We show that resource-rich MENA countries can adopt market structures that avoid the risk of market breakdown under fully liberalized electricity systems with a high share of non-dispatchable resources. On wholesale market design, we argue that a hybrid structure of short-term coordination (through energy-only spot markets) combined with fixed-price long-term contracts is proved to be the way forward for resource-rich MENA countries during the transition period, particularly given the contexts within which they operate (for example, the rapid demand growth and the difficulty of obtaining sufficient revenues from customers along with rigid governance structures). This can be in the form of mandated requirements for electricity suppliers to purchase certain percentages of their final demand in the forward market in advance of the delivery. Alternatively, it can be a capacity market in which long term capacity contracts are allocated in an auction with a central agency as the counterparty. For the network segment, these countries can adopt an innovation-oriented regulatory model, in order to balance between efficient utilisation of existing resources versus building more networks. Such an approach also allows these countries to benefit significantly from regional integration of their power markets and electricity trade. The retail market can be opened to competition for large consumers, but for small users it can be regulated without the government distorting retail prices through subsidies. The structure of final electricity prices must not lead to inequitable distribution of system fixed costs or encourage grid defection. Finally, the advent of prosumers, along with fall in the cost of batteries and advances in information and communication technology, may open up a new path for consumer involvement in the electricity sector. It also may provide a new design for restructuring the power sector in the form of prosumer-network-prosumer as an alternative or complement to the traditional liberalization model of wholesale-network-retail. Finally, there is no one path to market liberalization for MENA hydrocarbon economies, as combinations of technological advances, consumer preference, and institutional changes can offer alternative or complementary approaches to the 'classical' model of power sector reform.