

Advancing Market Integration and Decarbonization: How to Ensure a Smooth Transition?

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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

Connecting power systems and electricity markets is not new, but the growing interest in decarbonizing the electricity sector is placing renewed interest in advancing electricity market integration to achieve economic efficiency, security of supply, and sustainability. The future proliferation of renewable and clean energy technologies is expected to provide a new impetus for cross-border cooperation and electricity trade to address renewable intermittency issues, achieve climate policy goals, and decrease air emissions.

In the Middle East and North Africa (MENA) region, market integration can offer significant economic benefits and facilitate decarbonization at a lower cost than would occur otherwise. To further explore these issues and advance the discussion, the joint KAPSARC-Centre on Regulation in Europe (CERRE) workshop on this topic yielded the following insights:

- Achieving climate neutrality by 2050 will require an overarching vision, massive investments for electrifying a vital part of the economy, and enhanced cooperation among countries. Such efforts have to be backed up by designing and implementing the frameworks needed to promote electricity market integration, the hydrogen economy, and the use of carbon capture and storage (CCS).
- To successfully create a common electricity market, participating countries have to (i) accept competition from their neighbors, (ii) harmonize their regulatory frameworks, especially in the functioning of national wholesale electricity markets, and (iii) agree to joint regulatory coordination in the context of market coupling.
- Policies and mechanisms should be designed to anticipate the distributional effects of market integration and mitigate them effectively should they arise.
- Aligning economic objectives with political objectives is challenging but essential for maximizing efficiency through an integrated electricity market. This requires strong political support from national governments and the presence of strong independent regulators.
- Creating an independent regional regulator is both an ideal solution and a challenging goal. The cooperation of national regulators through a centralized agency may be the best alternative.
- The role of distribution system operators (DSOs) needs to be further articulated as more intermittent and decentralized generation is added to the distribution network.
- Rationalizing the current practices of electricity pricing and rate design and encouraging carbon pricing and emissions trading schemes (ETS) is crucial for achieving net-zero greenhouse gas (GHG) emissions by 2050. Ensuring price transparency is also vital for facilitating cross-border electricity trade and promoting consumer interests.

Background to the Workshop

The concept of connecting electricity markets, which started with the sole objective of maximizing economic gains, is now being increasingly expanded to fulfill other policy objectives, primarily to support the low-carbon future energy system. The importance of clearly articulating policies, designing innovative regulations, and the presence of a local/regional institution to facilitate this change cannot be overstated.

In this context, KAPSARC and CERRE jointly organized a virtual workshop on the topic of “Advancing market integration and decarbonization: How to ensure a smooth transition?” with the following objectives:

To gain a better appreciation of the key policy, regulatory and pricing issues impacting the effective integration of the electricity markets and decarbonization in the European Union, the MENA and other regions.

To understand the new developments and experiences of energy diplomacy in other markets, especially in the context of developing a common electricity market and decarbonization pathways.

To identify and suggest good practices for accelerating market integration and decarbonization.

To draw lessons for policymakers and other stakeholders for achieving an effective energy transition and rapid decarbonization.

This workshop summary highlights the key issues and challenges of connecting electricity markets. These include articulating a clear and supportive policy framework, timely regulation, and tariff design for electricity market integration and decarbonization.

Setting Clear Policy Goals to Drive Regional Energy Cooperation

Many power systems and national electricity markets around the world have coupled to form subnational and international markets. These markets aimed to achieve higher economic efficiency, increased security of supply, and improved consumer welfare. In recent times, advancing market integration is also seen as an essential tool for promoting environmental sustainability objectives, especially when renewables are making significant inroads into the supply mix due to their declining costs. This provides a new impetus for cross-border cooperation and electricity trade, especially in addressing intermittency issues and achieving climate policy goals collectively by combining markets.

The European Union (EU) has set an EU-wide net-zero greenhouse gas (GHG) emissions reduction target of at least 55% by 2030 (compared with 1990 levels) and aims to achieve climate neutrality by 2050. A profound transformation of the energy system will be necessary to deliver on these goals. Further, the electricity sector will also require massive investments to strengthen the grid and enhance cooperation among the EU member states, alongside an overarching vision to drive the whole process. According to a study by the European Commission, the benefits of the internal energy market through electricity market couplings were estimated to be between €12.5–€40 billion per year by 2030 (Koch 2020). However, with renewables now becoming a more dominant force, these benefits could be even higher.

In the MENA region, market integration can offer significant economic benefits and facilitate decarbonization in the region at a lower cost. The World Bank has estimated that, from 2018–2038, coordinated investment and trade in

the MENA region could produce cost savings of US\$107–US\$196 billion, and an integrated Pan-Arab Electricity Market (PAEM) could produce US\$32–US\$150 billion of shared economic benefits (Alsuraih 2020). Moreover, the integration of the electricity market is likely to catalyze private investments in renewable energy technologies. Discussions held during the workshop produced the following observations and suggestions related to the effective integration of electricity markets:

A uniform harmonization of national energy policies/legislation is neither possible nor a precondition for creating an integrated electricity market. However, some degree of harmonization in legislation and regulation, especially in the functioning of national wholesale electricity markets, could accelerate the development of a common electricity market. The experience gained so far in electricity market integration underlines the need for a clear articulation of the objectives and goals of regional market integration. Policies and mechanisms should be designed to anticipate the distributional effects of market integration and mitigate them effectively as they arise.

Europe has created one of the largest joint electricity and gas markets globally, spanning over 27 independent member states. To successfully create a common market, countries have to agree to relinquish their sovereignty to a certain extent to coordinate electricity market integration under market coupling.

With the ongoing renewable energy revolution with variable energy generation, coupling electricity markets across countries and regions will be the most efficient way to achieve lower costs. This approach has been effective in

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encouraging cross-border electricity trading in Europe, but it requires close regulatory cooperation. To organize a genuinely effective and integrated market, countries have to accept competition from their neighbors. It will be difficult to operate such a market without an independent regulator dealing with the economic interests of local incumbent players (especially large power producers).

Creating an independent regulator at the regional level is often challenging. However, cooperation between national regulators through a central agency, such as the Agency for the Cooperation of Energy Regulators (ACER) in Europe, may be the best solution.

Ensuring non-discriminatory access to market players is crucial for market development and would require regulatory intervention and oversight.

Calibrating Regulations to Support Integration and Decarbonization

Fossil fuels still dominate the energy landscape, but falling costs of renewables have resulted in their increasing share in the supply side of electricity. The deployment of renewables is crucial for achieving climate goals. The benefits of integrated markets are obvious, but they are becoming more relevant, especially with the current and planned massive renewable energy deployment in the near future. However, achieving climate goals requires additional innovations on all frontiers, including energy system integration, the circular carbon economy, and emissions trading. The clean energy transitions toward achieving the goal of net-zero GHG emissions by 2050, set by the EU member states and other countries, would require integrated electricity markets over a wide area. Discussions held during the workshop produced the following observations and suggestions related to innovation and regulation:

Reaching a net-zero GHG economy by 2050 involves making commitments to an integrated electricity market over a wide area, using wind and solar generation, hydrogen for transportation, capturing emissions from fossil fuels, and the use of carbon capture and storage (CCS).

The distribution system operators (DSOs), which may be at the forefront of the energy transition, must have their roles redefined as more intermittent and decentralized generation is added to the distribution network.

The introduction of a new trading system to manage the evolution of an energy portfolio with low marginal costs will be inevitable. Rapid technological innovations in grid technologies like internet-of-things (IoT) smart devices, a social movement toward more consumer

choices, and a democratization of the energy supply through the growth of distributed energy resources (DERs) will necessitate such changes.

Regulation should support initiatives that attach a market value to carbon and avoid subsidies that put independent system operators (ISOs)/ transmission system operators (TSOs) on a slippery slope toward unraveling the benefits of competitive energy markets. Regulations should ensure that system planning, operations and market practices are harmonized across the MENA region.

The development of a regional market could confer substantial economic benefits on the region as a whole. Aligning economic and political objectives is challenging but essential for achieving maximum efficiency in an integrated electricity market.

As the energy sector is increasingly being relied upon to achieve environmental objectives, integrating energy and environmental regulations needs to be explored. The convergence of the power sector with other sectors and markets is also likely to trigger design, equity, and distributional issues, which need to be addressed through innovative regulation.

Rethinking Tariff Design

Electricity pricing, both wholesale and retail, can be a powerful tool for influencing consumer behavior. Energy price subsidies do not help consumers fully appreciate the value of energy, and they incentivize the inefficient use of electricity. Flat rate tariffs do not motivate consumers to change their consumption behavior when the cost of delivering electricity and the environmental impact of consuming that electricity is high. Similarly, fossil-fuel subsidies at the supply end can make the task of integrating electricity markets especially difficult, as distortions in wholesale prices can lead to wealth transfer through cross-border electricity trading. Thus, there is a growing recognition of the importance of economically sound pricing to achieve seamlessly integrated electricity markets.

Additional investments in grid infrastructure may be needed to increase its resilience and meet rising demand. Moreover, new production and consumption patterns relying increasingly on distributed and alternative sources with digitized solutions will also require economic investments from grid operators. All these tasks and challenges not only present business opportunities, but they also place a final burden on electricity ratepayers. Discussions held during the workshop produced the following observations and suggestions related to electricity pricing and tariff design:

Carbon pricing and emissions trading schemes are crucial for achieving net-zero GHG emissions by 2050. The current scope of emissions trading schemes should be increasingly expanded to include transport and buildings to reach climate goals (e.g., the EU emissions trading system [EU ETS]). However, managing the political impact of higher electricity prices because of the net-zero commitment will be challenging and will test the resilience of the net-zero policy.

In many jurisdictions, DERs are subsidized for various reasons. However, for a market-based approach to the energy transition, placing a price on carbon emissions may be more efficient than subsidies that aim to make low-carbon activities cheaper.

Ensuring price transparency is vital for encouraging cross-border electricity trade. Robust and transparent regulations are essential for producing efficient wholesale prices, and would give confidence to neighboring countries when trading electricity with one another.

The right tariff design can facilitate and promote cross-border electricity trade, decentralized generation and, ultimately, decarbonization. This applies to generation as well as transmission and wheeling charges. Tariffs should be designed to reflect the costs of generation, balance the interests of generators, network operators, consumers and other market players, and provide commercial and behavioral incentives to these players for the desired outcome – that is, the production and use of cost-effective and environmentally friendly electricity. Electricity pricing should be reviewed regularly so that it aligns with the continuously evolving energy system, consumer demands and technological advancements.

The new market models need to reflect the real value of flexibility and enable DSOs to facilitate the adoption of new business models and use the network efficiently.

References

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About the Workshop

This workshop was held virtually on December 8, 2020. It brought together the following experts to discuss the opportunities and challenges related to electricity market integration and decarbonization in the Arabian Gulf and globally.

List of participants

Adam Sieminski – President, KAPSARC, Saudi Arabia

Aftab Raza – Head of Sector Financial Management, Department of Abu Dhabi, Government of Abu Dhabi, UAE

Bruno Liebhaberg – Director General, CERRE, Belgium

Dr. Alex Papalexopoulos – President & CEO, ECCO International, Inc., U.S.A.

Dr. Fahad Alturki – Vice President, Head of Research, KAPSARC, Saudi Arabia

Dr. Frank Felder – Director, Energy Transitions and Electric Power, KAPSARC, Saudi Arabia

Jens Lundgren – Deputy Chief Economist at the Energimarknadsinspektionen – Energy Market Inspectorate (Ei), Sweden

Máximo Miccinilli – Energy & Climate Director, CERRE, Belgium

Olivier Koch – Deputy Head of Unit – (ENER.B.2), Wholesale markets; electricity and gas, DG ENER, European Commission, Belgium

Professor Catherine Banet – University of Oslo and CERRE Research Fellow, Norway

Professor Michael Pollitt – University of Cambridge and CERRE Academic Co-Director, United Kingdom

Shahid Hasan – Research Fellow, KAPSARC, Saudi Arabia

Waleed Saleh Alsuraih – Lead Energy Specialist, The World Bank, UAE

About the Team



Shahid Hasan

Shahid is a research fellow at KAPSARC, where his current research focuses on electricity sector transitions in the Gulf Cooperation Council (GCC) member states and the development of a regional electricity market in the GCC and the Middle East and North Africa (MENA) region. He previously consulted extensively on policy, regulatory, and market design issues for governments, electricity regulators, public utilities and the electricity industries in India and Southeast Asia.



Hatem Al Atawi

Hatem is a senior research associate at KAPSARC. His interests lie in renewable energy policy, electricity markets, and energy modeling. He holds a master's degree in power system economics, with a focus on electricity markets, from the KTH Royal Institute of Technology, Sweden.



Máximo Miccinilli

Máximo is Director, Energy & Climate at the Centre on Regulation in Europe (CERRE). He leads the think tank's research and activities related to energy and climate. He previously led the public affairs and communications activities of European Aluminium, where he managed international campaigns on energy and climate matters. Prior to this, he was a manager in the energy and climate practice at Burson-Marsteller Brussels (now BCW), a leading global public affairs and public relations agency. Earlier in his career, he worked for the Italian Ministry of European Affairs and the European Commission on single market and external policies. He represents One Policy Lab SRL.

About the Project

KAPSARC has initiated a regional electricity market integration research project to explore the potential opportunities that could be harnessed by developing a common electricity market in the GCC and wider MENA region. The initiative examines a range of issues related to electricity market integration, including how power pools have been developed in other regions and their potential application in the MENA region. The project focuses on understanding and examining electricity market policy, regulation, legislation, market design, market structure, and system operations to identify best practices and provide insights into policy issues. It will produce reports and other findings intended to fill existing knowledge gaps and facilitate ongoing efforts toward regional electricity market integration.



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