



ASSOCIATION OF POWER EXCHANGES

APEX Objective

To facilitate the development and communication of ideas and practices in the operation of global competitive electricity markets. One of its primary intentions is to provide a platform for the sharing of information between its members.

In the Spotlight

A “REGIONAL ENERGY HUB” FOR A GLOBAL TRANSITION TO A LOW-CARBON ECONOMY

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Abstract

The global transition to a low-carbon energy economy needs to capture the flexibility of technological developments (from solar PV development and battery storage to the deployment of small modular reactors) but also the changes in the social, environmental, and governmental requirements for a sustainable energy future. We capture this transition from a broad perspective that includes geopolitical, economic, environmental, and financial parameters of a newly-defined concept known as the Regional Energy Hub (REH).

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Ahmed Al-Ebrahim

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As the world started attempting to get back to near-normal situation this year following the two-year COVID-19 Pandemic situation, there are yet more challenges that we all need to overcome. The after-effects of the COVID-19 era and major conflicts in Europe are shaping our business environment worldwide. Those conditions are so profound that it may also change governments policies and priorities. However, we in the electricity sector need to turn our focus to having sustainable and inclusive growth of our business.

The GCCIA 400kV Super-Grid connecting the six GCC States: Saudi Arabia, Kuwait, United Arab Emirates, Qatar, Bahrain and Oman, has proven during the past 13 years since the start of operations, its value in avoiding large power outages, providing cumulative economic savings in excess of US\$ 3.0 billion for the six Member States, and creating the GCC power market with increasing trade volumes of 15-20% annually. The GCC Power Market includes currently the six GCC countries with a cumulative generation capacity of more than 120 GW. The fuel mix has been basically fossil fuel, but new and renewable energy resources are being developed at a very rapid rate in the GCC, not only to diversify the fuel mix towards sustainability, but also to meet net-zero carbon targets to be reached by 2050-2060.

GCCIA has a vision to open up new markets by expanding beyond its region, and has been planning such opportunities for the past few years. Last July 2022, GCCIA and Iraq Republic signed a historical Agreement under which GCCIA will build a 400 kV Interconnection to the south of Iraq connecting it to the GCC countries. The Interconnector which is planned to start

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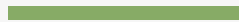
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operation in 2024, will allow Iraq to be part of the GCC market and can access available generation in the GCC to satisfy Iraq electricity needs and avoid power shortages. Another prominent interconnection project is the 3000 MW HVDC interconnection between Saudi Arabia and Egypt which is expected to start operations within 3-4 years. Other interconnectors are also being planned between GCC, Jordan and Egypt, between Central Iraq and Saudi Arabia, and between Jordan and Saudi Arabia. Those interconnections will enable the start of the Pan Arab Electricity Market (PAEM) which is in an advanced development stage under the League of Arab States and in line with a Memorandum of Understanding defining the structure and the framework for PAEM. As we see markets grow and evolve towards being coupled regionally, PAEM is likely to be coupled with further markets in Asia and Europe and Africa.

Our active participation and keen interest in the Association of Power Exchanges APEX, stems from our comprehension of the added-value that APEX brings to its members as a platform for exchange of experiences and information about power markets, and attaining support from other partners towards growing our business. We look forward to meet again in our Annual APEX conference in Croatia in October 2022 to discuss important subjects influencing our business.

Eng. Ahmed Al-Ebrahim is the Chief Executive Officer of GCCIA and has been a driving force in development of the electricity market for the GCC region since 2010. Eng. Al-Ebrahim also advocates for greater penetration of clean and renewable energy in the GCC grids for which GCCIA super-grid can provides resiliency, reliability & flexibility services and foster an electricity market with competitive prices, especially in light of the expansion of the current GCC Interconnector between the six members as well as beyond to neighboring countries and regions.



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A “Regional Energy Hub” For A Global Transition To A Low-Carbon Economy

The global transition to a low-carbon energy economy needs to capture the flexibility of technological developments (from solar PV development and battery storage to the deployment of small modular reactors) but also the changes in the social, environmental, and governmental requirements for a sustainable energy future. We capture this transition from a broad perspective that includes geopolitical, economic, environmental, and financial parameters of a newly-defined concept known as the Regional Energy Hub (REH). The global energy sector is facing two overarching long-term energy policy requirements for this transition:

1. Enabling the transition to a low-carbon energy economy
2. Evolving global electricity markets to support a range of cost-effective technological options at a regional level beyond the confines and constraints of one jurisdiction or country.

When a group of countries in a contiguous geographical region can operate through an integrated, enabling market with a long view (i.e. beyond ten years and longer), we see an opportunity for new value creation and a cost-effective transition to a low-carbon energy economy.

The REH Framework enables these neighboring countries integrated through markets to invest in common interest assets (such as an interconnector), bringing to practical realization the most capable options for a region. This type of “common interest” but market-driven asset development cycle can be achieved for developing and developed markets.

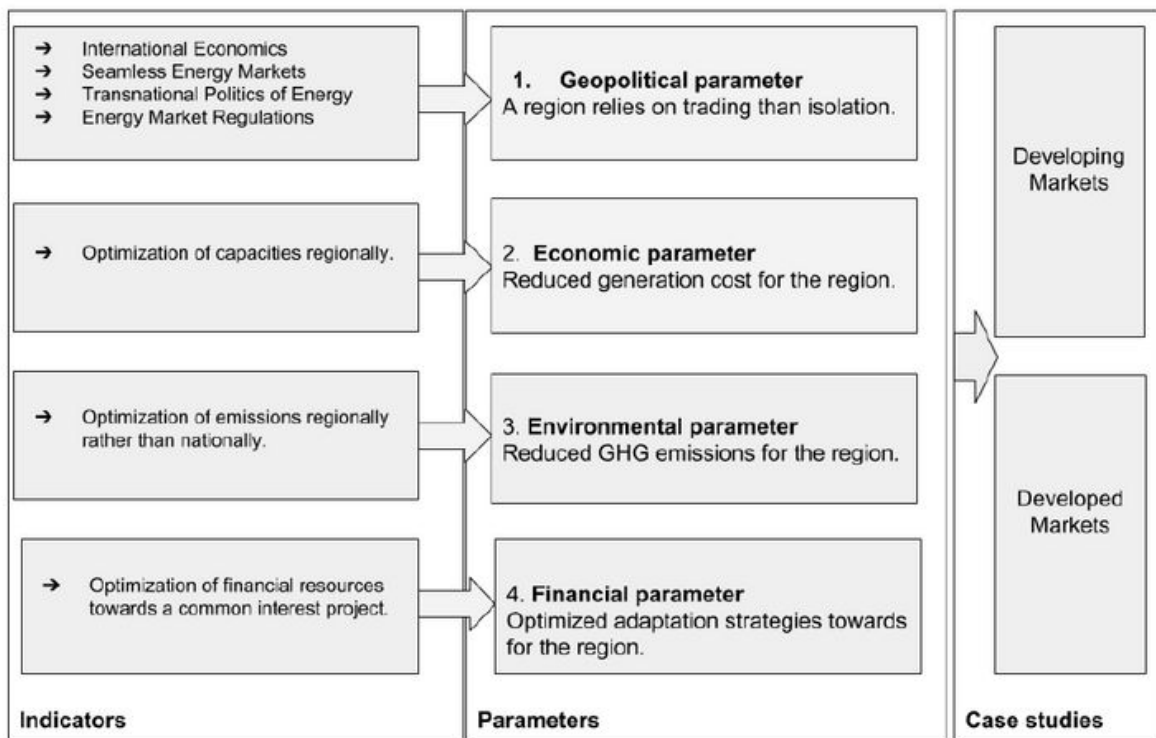


Figure 1. The Regional Energy Hub Framework

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The REH Framework, Figure 1, achieves this by employing four major parameters: geopolitical, economic, environmental, and financial. The geopolitical parameter allows countries, markets, and provinces to form broader alliances and essentially enforces them to rely more on trading than isolation among themselves. Additionally, this geopolitical parameter rests upon four indicators:

- (i) international economics
- (ii) climate change with respect to transnational energy policies
- (iii) seamless energy markets, and
- (iv) energy market regulations to capture the global energy sector related to institutional knowledge.

The geopolitical parameter enables REHs to be formed for a region's benefits developing out of these indicators. On the other hand, the economic parameter optimizes the power generation mixes of this newly-formed REH that results in a cost reduction for the region. Meanwhile, the environmental parameter optimizes the region's emissions rather than one nation's emissions, which effectively helps the management of carbon reductions to be able to meet the Paris agreement commitments. Finally, the financial parameter ultimately optimizes and potentially mobilizes resources toward a common interest project. Hence, the REH Framework manages the transition towards a low-carbon energy economy for the interest of energy policymakers, investors, and the public.

Once the corresponding REH is selected and evaluated, a common interest project for the REH can be achieved. Overall net benefit from these REH factors would lead to an investment decision while unlocking the region's potential as a REH. In this context, we propose a formal definition of REH as follows:

A regional energy hub is an intersection point of all energy (electricity) supply and demand routes geographically originating, transiting, and ending (centralizing) in a pre-defined region where there is an ultimate net benefit for that region from the following perspectives: geopolitical, economic, environmental, and financial. When the net benefit is evaluated (e.g., it is positive), there is a need for a transmission investment for that region.

Tomorrow's grid will need to be highly "flexible" and resilient in order to maneuver around short-term challenges posed by extreme weather events such as hurricanes, floods, storms, and extreme heat but also meet the long-term challenge of greenhouse gas mitigation through effective optimization of the energy supply mix at the regional level.

The framework's ultimate aim is to standardize/enable electricity markets globally through governance, investment, and trading, leading to either opening markets or further sophisticating them for the benefit of Paris Agreement signatories. We believe that markets are our assets and are further enabled by transmission investment.

We highlight the potential winners of an REH concept: transmission /interconnector investments and distributed generation, clean & baseload providers of low carbon energy, and large-scale storage for enablement of the intermittency of renewables (wind and solar).

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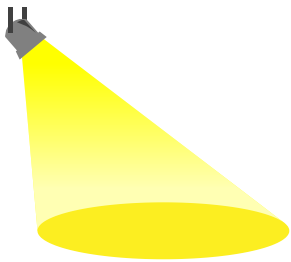
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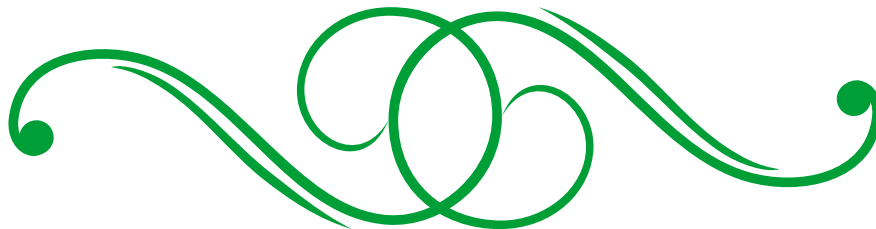
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