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King Abdullah Petroleum Studies and Research Center

# Commentary

## Innovation by Gulf Cooperation Council Electricity Startups: A Global Comparison

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Rolando Fuentes and Frank A. Felder

The electric power sector is the cornerstone for achieving the energy transition goals of economic progress, energy security and environmental improvements. Substantial and timely innovations are necessary to accomplish these goals. In this commentary, we investigate innovations in the electric power sector by startups in the Gulf Cooperation Council (GCC) and Middle East and North Africa (MENA) region. We compare their innovations to those of their worldwide counterparts. This comparative analysis can support policymakers in strategic planning and resource allocation. Because innovations in the electricity sector have long lead times, understanding the status of startup innovations can indicate the direction of medium-term technological progress.

We define a startup as a newly created firm that has considerable growth potential and construct a database of 320 startups. The database is publicly available on the KAPSARC Data Portal.[1] Fuentes, Chen, and Felder (2022) describe the methods, limitations and key insights of this database. For example, the innovations pursued by startups tend to differ from those pursued by incumbent firms.

We focus on the GCC countries and the MENA region. Of the 320 startups in the database, 28 are located in GCC and MENA countries. Most of them are based in Saudi Arabia and the United Arab Emirates (UAE). We compare the efforts of startups in this region with megatrends in the electricity sector and the technological domains that characterize innovation. We also compare innovation in this region with the innovations being pursued in the rest of the world.

Three main highlights emerge from our analysis.

**Most of the GCC and MENA innovation is centered on product innovation within the solar photovoltaic (PV) technological domain**

1. **Solar PV dominates GCC and MENA startups.** Most of the GCC and MENA innovation is centered on product innovation within the solar photovoltaic (PV) technological domain. This is in line with our more general finding from the complete data set where the decarbonization megatrend and solar PV technologies were the most popular focus of startups. However, the number of GCC and MENA startups concentrating on solar PV is disproportionately high compared to the rest of the world. Their focus has been on incremental product improvements, which is similar to solar PV startups outside the region. This region could differentiate itself from the rest of the world by adapting solar PV technologies to specific regional challenges. For example, they could focus on dealing with the presence of sand and extreme heat.

2. **GCC and MENA innovation diversification is lagging the rest of the world.** Startup innovation in GCC and MENA companies lacks diversity. The 28 startups that we analyze work on only six technological domains out of the 48 identified in the complete dataset.

[1] https://datasource.kapsarc.org/explore/dataset/startups-leading-innovation-in-the-electricity-sector/table/?disjunctive.firm&disjunctive.expected_outcom.

Moreover, digitalization is the second most important megatrend in our global database, with artificial intelligence as the key technology. However, very few GCC and MENA startups working on digitalization, even though incumbent firms (i.e., utilities) are active in this field. We were also unable to identify GCC and MENA startups working on electrification whose main technological domain is electric vehicles (EV). We did not find firms working on storage technologies either, the key technology for the 'distributed' megatrend (Fuentes, Chen, and Felder 2022).

3. **GCC and MENA energy efficiency startups could accelerate digitalization innovation in the region.** One way of overcoming the lack of diversity in these startups' focus areas is to leverage their work on energy efficiency. We found that the proportion of firms working in this field is greater than in other areas of the world. A clear opportunity exists to combine energy efficiency technologies with digitalization and innovate in the cooling (and lesser extent, heating) space. In other places in the world, this combination of technologies has created disruptive 'comfort' markets with innovative business models.

## Electricity Innovation by GCC and MENA Startups

In this section we map GCC and MENA startup innovation and compare it to our findings from the entire dataset.

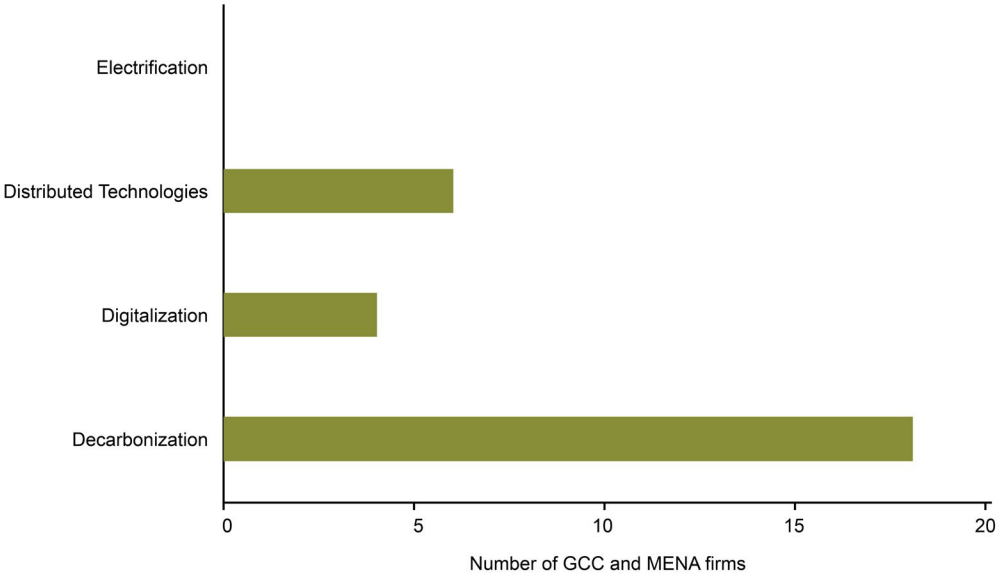
### *Megatrends in the Electricity Innovation Sector*

Four megatrends dominate innovation in the electricity sector: decarbonization, digitalization, distributed technologies and electrification. Innovation by GCC and MENA startups is aligned with global decarbonization efforts, the main megatrend addressed by startups. Worldwide, the second most important megatrend is digitalization. However, the distributed technologies megatrend is the second most important for GCC and MENA startups. We do not identify any electrification-related GCC and MENA startups (see Figure 1).

Decarbonization is pursued far more intensely in GCC countries and the MENA region than in the rest of the world. In our full database, about 40% of all startups focus on decarbonization. However, 64% of GCC and MENA startups are pursuing decarbonization. This difference is solely due to solar PV. In GCC countries and the MENA region, PV technologies are being pursued for other reasons besides decarbonization, including economic diversification, localization and oil use optimization. However, there are substantial gaps for the other megatrends we identified between GCC and MENA startups and those in the rest of the world. The difference is especially acute for the digitalization and electrification megatrends (see Figure 2).

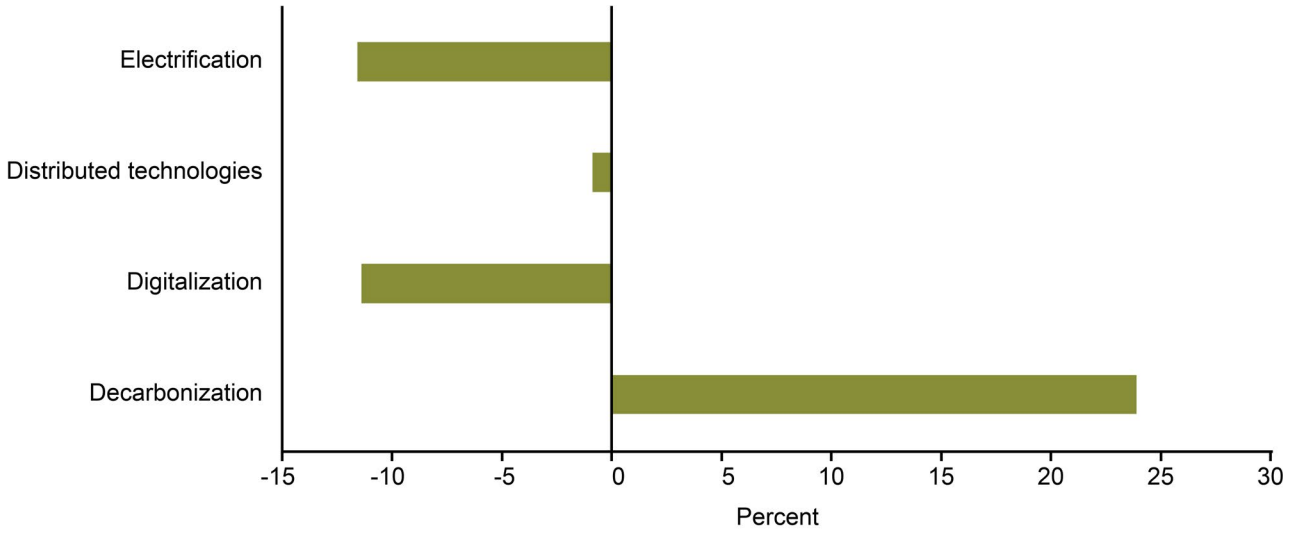
**Decarbonization is pursued far more intensely in GCC countries and the MENA region than in the rest of the world**

**Figure 1.** Number of GCC and MENA firms focused on each megatrend.




Source: KAPSARC Data Portal.

**Figure 2.** Focuses of GCC and MENA startups on megatrends relative to the rest of the world.




Source: KAPSARC Data Portal.
Note: A positive percentage indicates that GCC and MENA startups focus proportionally more on the megatrend relative to startups elsewhere in the world.

### *Lack of Diversity in Technological Domains*

In general, the innovations pursued by GCC and MENA startups lack diversity. The 28 GCC and MENA startups work in six of the 48 technological domains pursued by startups worldwide. These six technological domains are PV solar, energy efficiency, alternative generation, digital platforms, artificial intelligence and energy service provision.

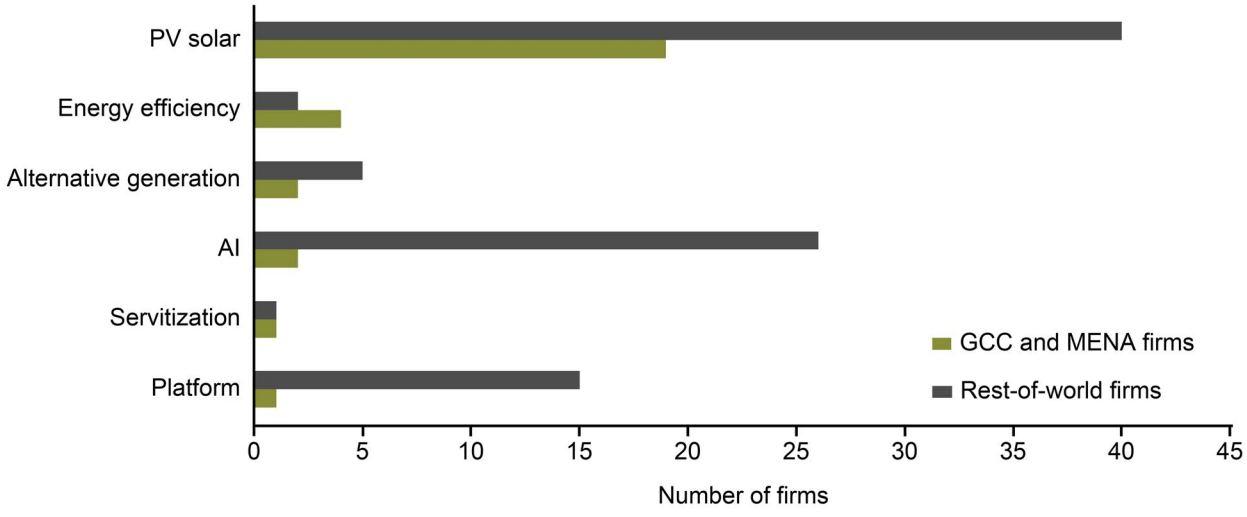
**The innovations pursued by GCC and MENA startups lack diversity. The 28 GCC and MENA startups work in six of the 48 technological domains pursued by startups worldwide**

GCC and MENA startups account for 18 of the 59 firms in our database that we identify as working in the field of solar PV, or about 30% of all firms working in this field. However, only two GCC and MENA startups are working specifically on artificial intelligence. There is only one GCC and MENA startup working on digital platforms. Figure 3 shows the number of firms working on specific domains relative to the total number of firms in the dataset.

One potential area for diversification for GCC and MENA startups is the building sector (i.e., energy efficiency, cooling and heating, and comfort). Saudi Arabia's energy efficiency regulatory measures have had unprecedented results. Salaheddine (2020) describes the impact of the Saudi Energy Efficiency Center on electricity demand.

Some startups are combining energy efficiency technologies with digitalization and distributed energy to create innovative products and disrupt business models and industry structures. For example, startups now offer heating plans that bundle a physical device with services, similar to mobile phone contracts. A replacement heating system may be bundled

**Figure 3.** Focuses of GCC and MENA startups on technological domains relative to the rest of the world.




Source: KAPSARC Data Portal.

with servicing, maintenance and energy costs. Other companies offer fixed and pay-as-you-go heating plans to domestic customers. Under these plans, customers buy hours of warmth in their homes instead of purchasing energy units. This offering is similar to a mobile phone contract that bundles calls, texts and internet data into a single service for a fixed monthly price. Similar innovations may be applied to cooling in GCC countries and the MENA region.

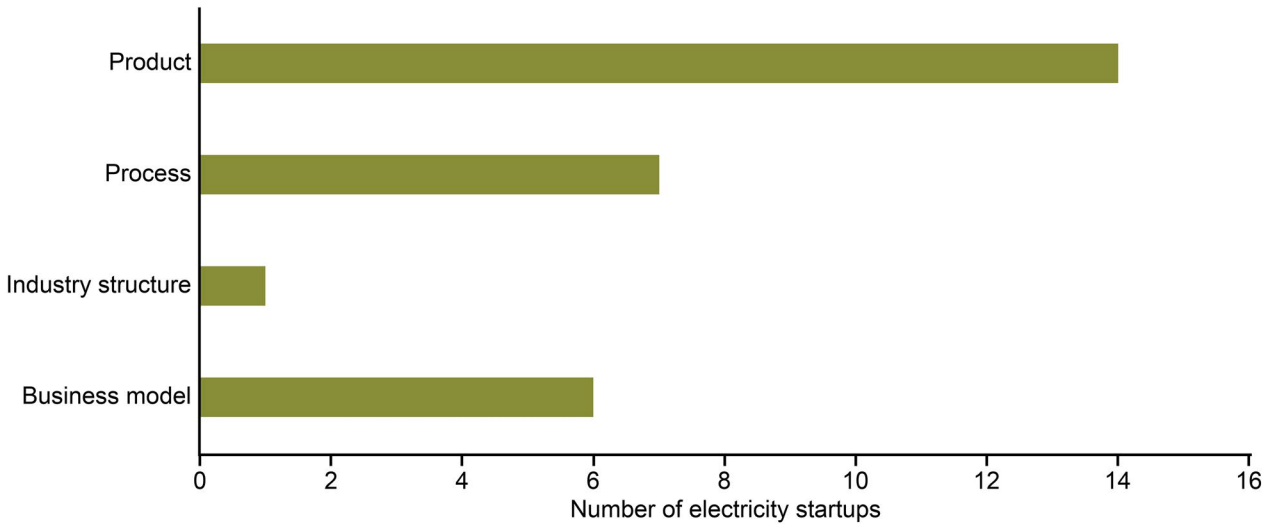
### *Different Types of Innovation*

We distinguish between four types of innovations in our analysis.

- **Product** innovation is a novel implementation or significant improvement of a well-known product (i.e., a good or service).
- **Process** innovation is the development of a new technology to perform a well-known task.
- A **new business model** is an innovative redefinition of products and services and their monetization.
- A **new industry structure** occurs when new technologies lead to a change in the supply chain, with either new actors emerging or old actors becoming obsolete.

Among the different types of innovation, most GCC and MENA startups focus on product innovation (see Figure 4).

**Figure 4.** Types of innovation pursued by GCC and MENA electricity startups.

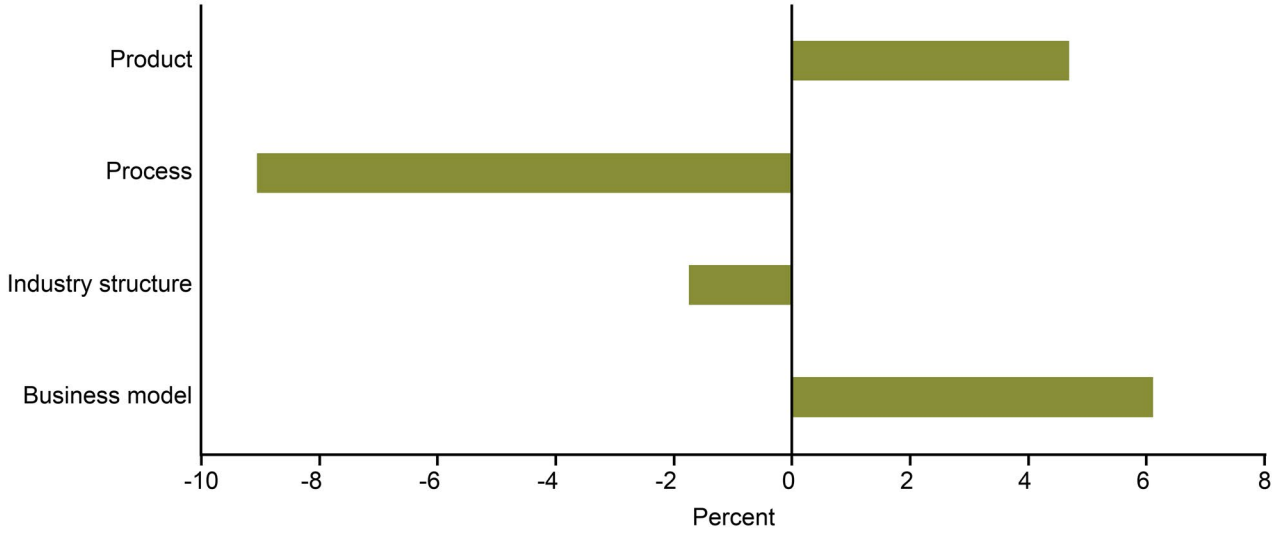



Source: KAPSARC Data Portal.

Compared with the rest of the world, this region has a greater proportion of startups that work on innovating business models. However, it lags behind the rest of the world in innovating processes and industry structures. These innovation types are closely related to the digitalization megatrend. Some applications of digital technologies enable the performance of a well-known process with greater capabilities. Other applications can disrupt the entire value chain and, thus, the industry structure (see Figure 5).

**Compared with the rest of the world, this region has a greater proportion of startups that work on innovating business models.**

**Figure 5.** Innovation types of GCC and MENA startups relative to the rest of the world.

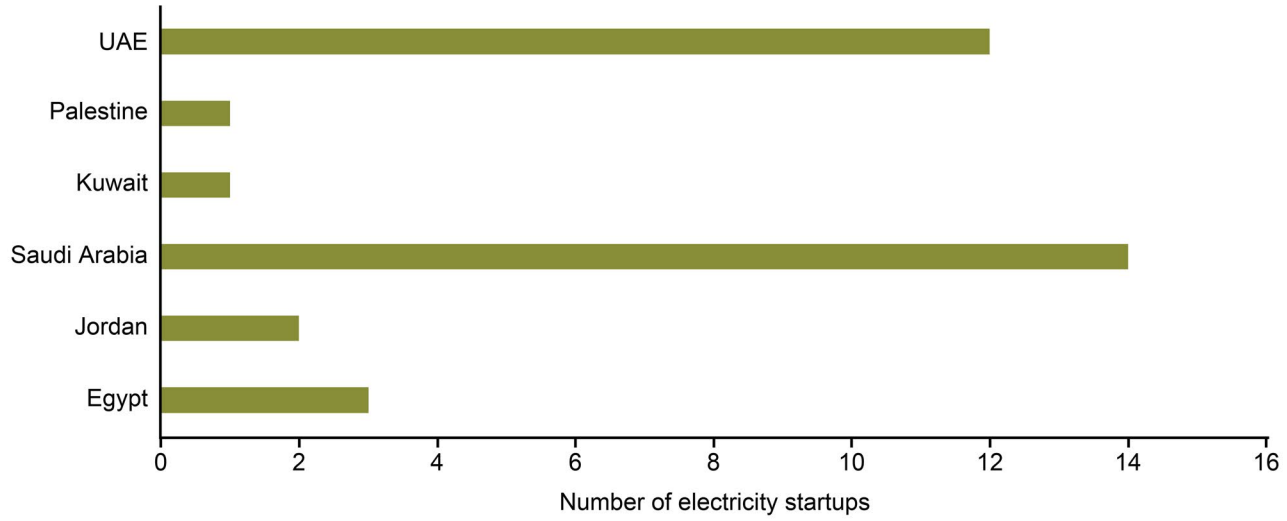



Source: KAPSARC Data Portal.
Note: A positive percentage indicates that GCC and MENA startups focus proportionally more on the megatrend relative to startups elsewhere in the world.

***Saudi Arabia and the UAE Dominate Startups Pursuing Innovation in the GCC Countries and MENA Region***

GCC and MENA electricity sector startups are mostly located in Saudi Arabia and the UAE, as shown in Figure 6.

**Figure 6.** Locations of GCC and MENA electricity startups.




Source: KAPSARC Data Portal.

## Policy Implications

Compared with startups in the rest of the world, GCC and MENA startups focus disproportionally on decarbonization. Thus, our main policy recommendation is for GCC and MENA countries to enact policies that result in more diversification. Digitalization is a good candidate area for startups in this region. Although it is the second most important megatrend and technology in our dataset, very few GCC and MENA firms focus on it. To boost more innovation in digitalization, we suggest three strategies:

1. Encourage collaborations between startups and utilities, especially in the deployment and innovative use of smart meters. Governments can help develop a critical mass that can later trigger bottom-up innovation, as is occurring in Saudi Arabia.

2. Digitalization tends to animate markets by reducing barriers for participation, connecting buyers and sellers through platforms and decreasing inefficiencies. Thus, governments should consider updating their regulatory frameworks to facilitate new applications.

3. Although there are fewer startups focused on the cooling and heating sector than other sectors in our dataset, we observe some interesting developments in the cooling and heating sector in other regions aimed at developing a comfort market. Some startups are innovating by combining digitalization technologies with energy efficiency, a key technology in GCC and MENA countries. This could be another way to kickstart diversification toward digitalization.

## About the Project

This paper is part of the project “Innovations in electricity markets, network regulations, low-carbon investments and technologies” under KAPSARC’s Energy Transitions and Electric Power program. The project aims to provide insights on the transformation of the Saudi electricity sector. This transformation is characterized by a willingness to increase the share of renewables and replace liquid fuels with natural gas. The transformation must also ensure a fiscal balance, expand electricity exports, produce green hydrogen and diversify the Saudi economy through localization. This project provides insights into this transition by discussing and learning from electricity market case studies worldwide.

## About KAPSARC

KAPSARC is an advisory think tank within global energy economics and sustainability providing advisory services to entities and authorities in the Saudi energy sector to advance Saudi Arabia's energy sector and inform global policies through evidence-based advice and applied research.

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