

# **GCC Renewable Energy Development – Road to Meet 2030 Targets**

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## **Overview**

The current war in Europe, the rise in demand for non-Russian energy sources, the reconsideration of coal and nuclear energy sources, the ever-growing concerns surrounding climate change, the 2050 zero-emission targets, to name a few, are all contributing to the extraordinary turmoil that the global energy market is currently experiencing. The massive increase in annual Renewable Energy (RE) deployment worldwide that reach around 300,000 MW in 2021, as well as the rise of emerging clean energy technologies such as Hydrogen fuel and energy storage, have added a new dimension to the challenges confronting traditional energy markets in general and hydrocarbon-based economies in particular. Over the last five decades, GCC economies have experienced numerous energy market crises, most of which were caused by a single cause at a time, such as a war somewhere in the Middle East, fluctuating energy supply and demand, lack of new oil and gas explorations, and many others. Members of the GCC set renewable energy targets of around 28% of production by 2030 on an average. Saudi Arabia and UAE leading GCC stated with 50% and 44% targets by 2050 and 2030 respectively. Although many projects have been completed or are in various stages of development in the region, the road to achieve RE set targets is still in its early stages, with many challenges and obstacles waiting the ambitious plans to reduce reliance on hydrocarbons economy and increase non-hydrocarbon share of GDP.

## **Methods**

Today's energy transition shifted from theory to implementation with announcement of policies, strategies, action plans, and performance measures by many developed and developing countries. Taking GCC as a case for study, this paper analyzes the strategic position of GCC economies in containing external and internal energy market forces under three RE technology mix scenarios by 2030 and beyond, the Diverse (Scenario 1), which examines a broader selection of RE mature technologies to prevent a single technology from dominating the sector. The Low-cost (Scenario 2) technology mix that ensures the lowest required investment (capital cost), resulting in the lowest LCOE. Finally, the Yield (Scenario 3) where an optimum technology mix is selected to guarantee maximum annual energy production with respect to total annual consumption of GCC.

The impact of these scenarios on GCC economies are evaluated based on number of key factors such as investment size, local content and value chain, ability to attract foreign capital and impact on electricity grid stability. Other important factors, such as fuel offset and CO<sub>2</sub> emission prevention are equally achieved by the three examined scenarios thus, they are not included in the assessment.

## **Results**

Based on the above methodology and the announced RE targets by each of the six GCC states, the analysis projected that the required RE installed capacity is approximately 84,000 MW by 2030 to 2035, starting with 3,600 MW installed in 2021 which is approximately 4% of the 2030 compound targets. Today, the UAE led GCC market with approximately 2,706 MW followed by Saudi Arabia with approximately 443 MW installed capacity. Oman and Qatar followed with 211 and 143 MW respectively. Kuwait and Bahrain have 106 MW and 12 MW of installed capacity respectively. To meet GCC RE targets, UAE is required to add 15,500 MW by 2030 while Saudi Arabia must add 58,000 MW. To meet the RE targets, the other four GCC countries, they must add a total of 8,500 MW by 2030.

Five RE technologies are selected to examine the three scenarios: Photovoltaic (PV utility scale), Photovoltaic (PV rooftop and distributed generation), Concentrated Solar Thermal Power (CSP),

Onshore Wind Energy and Others small-scale technologies such as biomass and waste to energy. Investment required by each country for each technology are identified for each of the three scenarios. PV dominating the technology use in the six GCC states due to its maturity, low LCOE and low operation and maintenance costs. Wind energy came second due to abundant resources and low production costs mainly in Saudi Arabia northeastern desert and along the Oman shoreline. Despite the high solar direct radiations in the region and the high potential production capacity of solar thermal technology, the technology share of CSP is low in the three examined scenarios due to high capital cost and operation and maintenance costs. CSP share might increase once LCOE competes with PV and Wind technologies.

The required investment per technology per country is projected based on current actual market installation costs for each of the technology mix segments. All scenarios examined shows that GCC will need to invest 100-130 B\$ over the next 10 years to achieve RE targets. Utility scale PV led the technology with about 40 B\$ followed by Wind with around 30 B\$. Due to the size of required RE deployment, Saudi Arabia projected to invest 70-90 B\$ depending on the technology mix scenario selected. The UAE came in second with approximately 20 B\$, followed by the rest of GCC countries with approximately 14 B\$ in required investment collectively.

### Conclusions

The paper concluded that for GCC to diversify national economies and sustain development growth with less reliance on the hydrocarbon revenue, an implementation of inhouse value chain of RE industry is essential to maximize the investment circulation within GCC markets. Another critical issue is the geographic distribution of RE projects across GCC close to high consumption areas such as large cities and industrial zones to avoid losses on long distance transmission lines and make a balance to decentralize power generation.

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