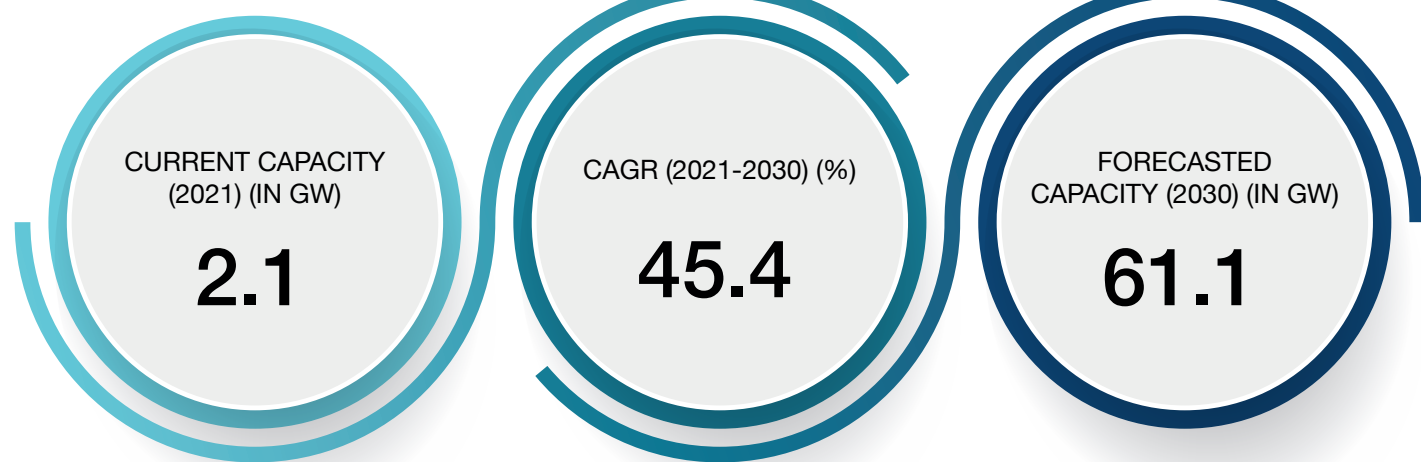
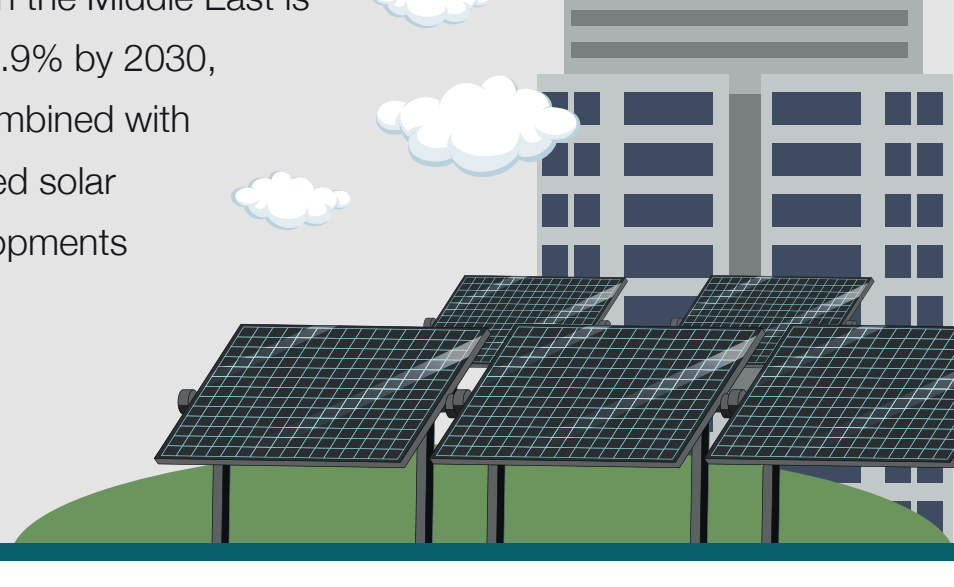


THE OPPORTUNITY FOR SOLAR ENERGY IN THE MIDDLE EAST REGION

AN EXCLUSIVE REPORT FOR THE WORLD FUTURE ENERGY SUMMIT BY FROST & SULLIVAN

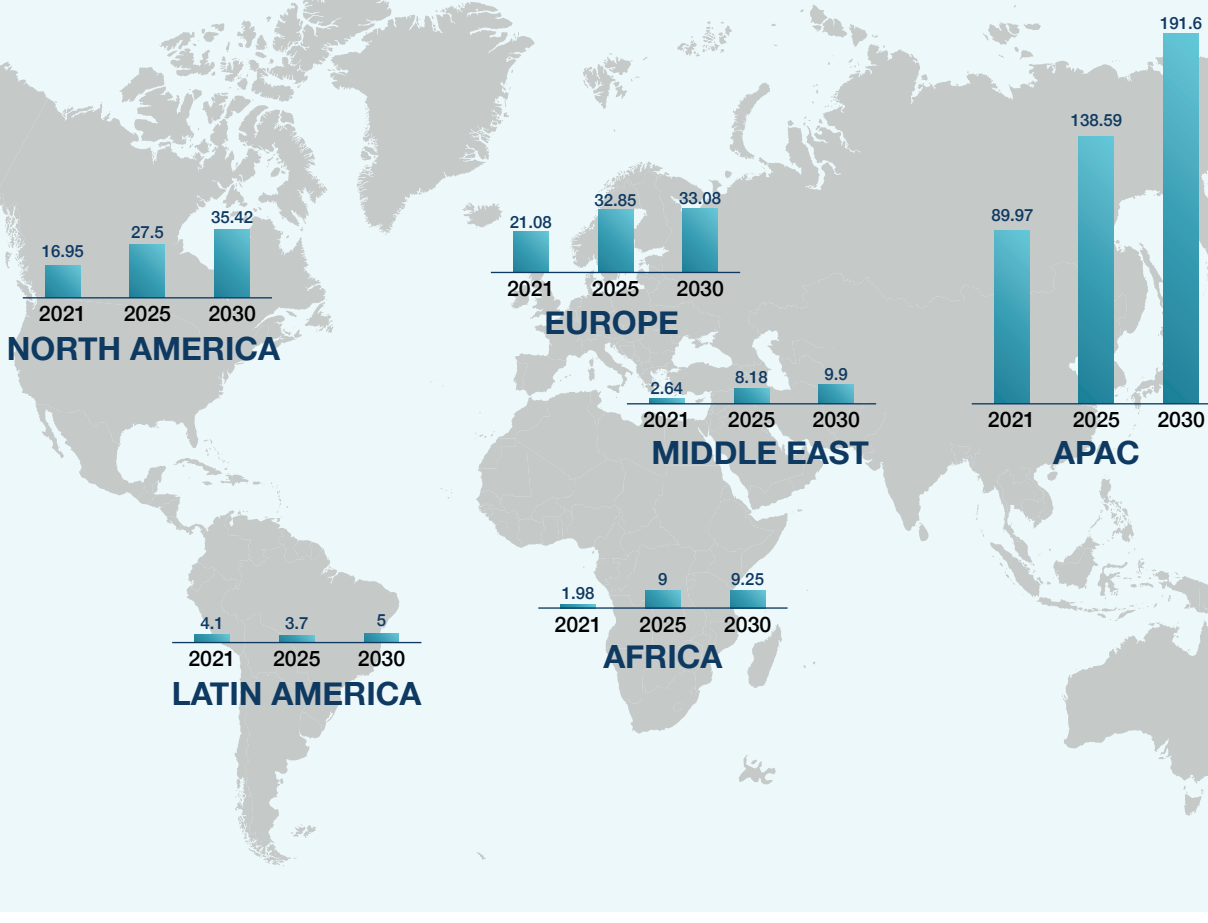
Grid connected solar PV capacity in the Middle East is expected to grow at a CAGR of 12.9% by 2030, one of the highest globally. This combined with ongoing initiatives around distributed solar and other renewable project developments could result in the region emerging as an epicenter for global energy transition.



This is based on the renewable energy targets proposed by the GCC countries

SOLAR PV CAPACITY FORECASTS BY REGION

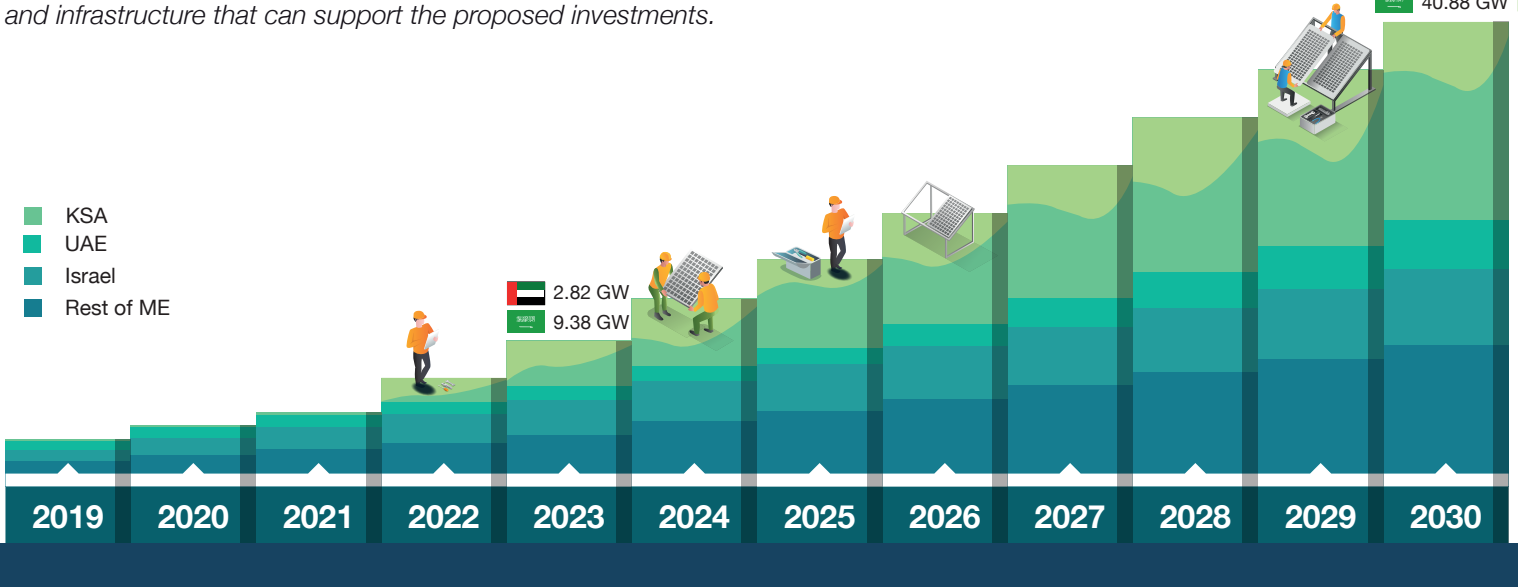
The Middle East is expected to emerge as the second fastest growth center at a CAGR of 15.8% globally. Strong growth prospects in the Middle East augur well for the development of an ecosystem that comprises of demand for products, solutions and services which would result in opportunities and participation from global and local companies.



REGIONAL OUTLOOK

KSA is expected to outperform all other countries in the Middle East region for installed solar PV capacity at an anticipated CAGR of 63.4%.

Note: The anticipated growth will have a strong dependency on evolution of regulatory frameworks and infrastructure that can support the proposed investments.



Solar PV Market: Cumulative Installed Capacity Forecast by Region, Middle East, 2019–2030 (GW)

SOLAR GROWTH OPPORTUNITIES

- BIPV (Building-Integrated Photovoltaics):** Opportunity to integrate with ongoing and proposed commercial projects and developments.
- Solar Rooftops:** Rising grid tariffs and reducing technology costs will result in an uptick in rooftop solar projects. However, this would also entail an investment in grid modernization to ensure grid flexibility and reliability to accommodate highly variable solar power.
- Electric Vehicles Charging Infrastructure:** The growth of electric vehicles presents opportunities for solar based charging stations, thereby reducing carbon emissions in the transportation segment.
- Energy Storage:** High amounts of utility and rooftop solar PV would necessitate installation of energy storage solutions (especially battery based energy storage) across different stages of the electricity value chain.
- Green Hydrogen:** Strong solar irradiation coupled with consistent wind resource potential across select locations provides an opportunity for green hydrogen production that can be cost competitive at a global scale.
- Solar Powered Heating Equipment in Manufacturing and Industrial Sector:** Solar-powered heating equipment in manufacturing and industry sectors reduces reliance on fossil fuels, contributing to cleaner operations. Ideally suited for low to medium grade heat requirements across process operations.
- Off-Grid Project Deployments:** Off-grid solar projects can provide electricity to remote areas which currently lack access to the main grid, thereby improving energy access and promoting self-sufficiency. Such projects can either use standalone distributed solar systems or can use a combination of solar PV, diesel generators and battery storage to meet electricity requirements.

HOW TECHNOLOGY WILL PLAY A ROLE IN THE MIDDLE EAST'S GROWTH PLANS

- Trackers:** Solar trackers are mechanisms that angle solar panels to follow the sun's path thereby optimizing their exposure to sunlight and maximizing energy generation. Existing focus should be around local assembly / manufacturing of trackers in the region.
- Advanced Inverters:** Advanced inverters include silicon carbide (SiC) or gallium nitride (GaN) switching devices, compatible with larger modules and higher voltage systems. They enhance grid management, support energy storage, and improve system efficiency.
- Aerial Thermography:** Aerial thermography uses thermal imaging techniques deployed via drones to identify temperature variations in solar panels, thereby enabling detection of potential issues and optimization of performance.
- Bifacial Panels:** Bifacial solar panels capture sunlight from both the front and rear sides, eliminating the need for back-sheets, thereby enhancing the efficiency as compared to traditional mono-facial panels.
- Building Integrated PV:** Building Integrated Photovoltaics (BIPV) involve integrating solar panels directly into the design and structure of buildings, blending energy generation with architectural aesthetics.
- Water-Free Robotic Solar Panel Cleaners:** Robotic cleaners remove dirt and debris from solar panels, improving the efficiency of solar power generation while reducing water consumption compared to traditional cleaning methods.
- Internet of Things (IoT), AI, and Advanced Data Analytics:** IoT, AI, and data analytics are leveraged for predictive and preventive maintenance of solar systems by utilizing real-time data for efficient operation and performance optimization.

CONCLUSION

The Gulf Cooperation Council (GCC) region is undergoing a significant transformation in its energy landscape, driven by ambitious goals, government policies and strategic initiatives. While implementing diversification schemes to reduce fossil fuel dependency, the GCC countries will witness a substantial growth in solar photovoltaic (PV) installations.

The ongoing and proposed energy transition in the Middle East and more specifically in the GCC region is an opportunity for project developers, technology providers and value chain stakeholders to participate in. Driven by the overall vision for energy transition and local value chain development, there will continue to be direct and allied opportunities that can be explored by global and local companies to enhance their revenue streams and achieve strategic growth objectives.

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