

In a trade disrupted world, how vulnerable are solar and wind supply chains?

By Li-Chen Sim

The Arab Gulf states are scaling up the deployment of a solar and wind power plants for a variety of strategic and economic reasons. In so doing, they are highly dependent on Chinese components and contractors. Given that a growing number of developing countries have placed restrictions on the import of Chinese green exports, this article considers the future of renewable power supply chains between the Gulf states and China.

Introduction

China's manufacturing prowess is unparalleled: in 2022, it accounted for 31.2% global manufacturing output or almost twice that of the US and 12 times that of South Korea.¹ At the same time, its export-driven model has cemented its rank, since 2009, as the world's top exporter of goods (14.2% share of global exports) ahead of the US in second-place (8.5%) or South Korea (2.7%).² Consequently, China has been on the receiving end of a growing number of trade restrictions from countries concerned about the impact on local industries and jobs as well as reciprocity of market access.

Countries in north America and Europe have traditionally initiated most of these interventions but more recently, they have been joined by developing countries. China's emphasis since 2023 on the 'new three' – namely solar products, lithium batteries, and electric vehicles– as drivers of economic growth new productive is particularly concerning in view of the impact on decarbonization and energy transition strategies. Within the past year, India has levied customs duties of 20% on Chinese solar cells and modules, Turkey has imposed a 40% import tariff on electric vehicles originating from China, while Vietnam has slapped a 97% duty on wind towers imported from China. Although the Arab Gulf states have not done likewise, they have applied 'anti-dumping' levies of 11.3-42% on certain electrical components on top of prevailing duty rates as well as on specific aluminium products from China.

Current state of Gulf-China solar and wind supply chains

Globally, over 80% of solar and over 60% of wind components are manufactured in China; more specifically, China hosted 79% of global polysilicon capacity, 97% of wafer manufacturing, and 85% of cell production in 2021.³

¹ "China Is the World's Manufacturing Superpower," n.d., accessed 10 April 2024, <https://www.voronoiaapp.com/economy/China-Is-the-Worlds-Manufacturing-Superpower-3521>.

² "Ranked: The World's 30 Largest Exporters," 2024, accessed 10 April 2024, <https://www.visualcapitalist.com/the-worlds-largest-exporters-of-goods/>.

³ Energy Transitions Commission, *Better, Faster, Cleaner: Securing clean energy technology supply chains*, Energy Transitions Commission (London, 2023), https://www.energy-transitions.org/wp-content/uploads/2023/08/ETC_Barriers_SupplyChains_InsightsBriefing.pdf; IEA, *Securing clean energy technology supply chains*, International Energy Agency (Paris, 2022), <https://www.iea.org/reports/securing-clean-energy-technology-supply-chains>.

The Arab Gulf states are not currently exposed to China's monopoly in energy material mining and refining since there is almost no indigenous manufacturing capacity for renewable energy components in these countries that require raw or refined materials as inputs.

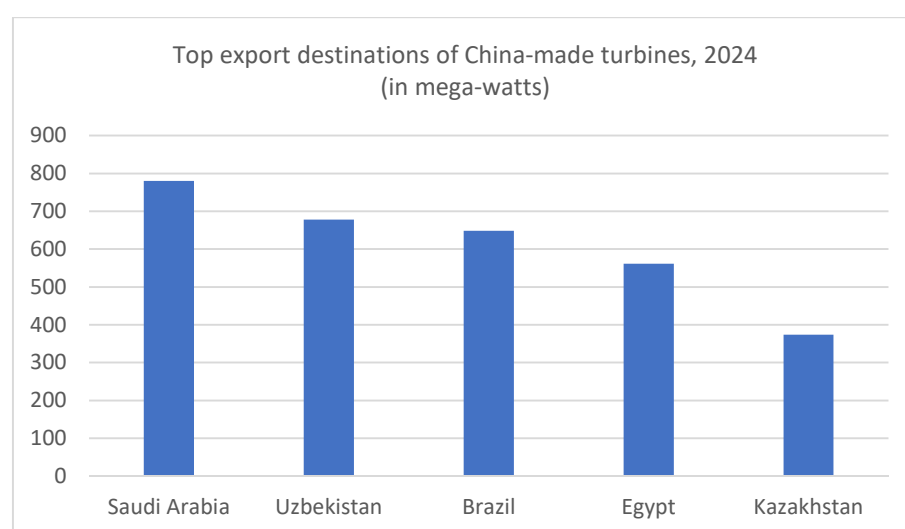
In contrast, China-based companies play very significant roles as suppliers of solar and wind equipment to the Gulf. In 2022 and 2023, for instance, almost all of the solar panels imported by the UAE and Saudi Arabia came from China while in Oman, China's dominance was relatively less marked (Table 1). For China, Saudi Arabia and the UAE are its top two markets in the Middle East, where exports of assembled photovoltaic modules outsell the non-assembled variant by a wide margin.⁴

As for wind energy products, Saudi Arabia and/or UAE were among the top ten export markets for Chinese wind turbines in 2022, 2023, and 2024 (Figure 1); by contrast they were absent in 2019 and 2020. The share of the Gulf states is actually higher given that many wind power projects in Uzbekistan (the second largest market in 2024, see Figure 1) are owned by Gulf developers.

Table 1: Top 3 suppliers of solar modules (assembled and non-assembled) in selected Gulf states, by value of imports⁵

Oman				UAE				Saudi Arabia			
2022	Share (%)	2023	Share (%)	2022	Share (%)	2023	Share (%)	2022	Share (%)	2023	Share (%)
China	78.6	China	83.5	China	99.1	China	98.8	China	98.9	China	99.9
UAE	16.0	UAE	8.4	Vietnam	0.4	Canada	0.17	USA	0.9	Germany	0.04
South Korea	0.2	Denmark	1.5	India	0.16	UK	0.16	Austria	0.04	Austria	0.02

Figure 1: Top five export destinations of China -made turbines in 2024⁶



⁴ Li-Chen Sim and Steve Griffiths, "The Future of China-Gulf Solar and Wind Supply Chains," *Global Policy Journal* (2024), <https://doi.org/10.1111/1758-5899.13478>.

⁵ UN Comtrade, United Nations (New York), <https://comtradeplus.un.org/>.

⁶ Data supplied through personal communication by the Chinese Wind Energy Association, March 2025 .

The service portion of solar and wind supply chains is likewise dominated by Chinese companies. They provide much of the engineering, procurement and construction (EPC) services in the Gulf and in projects owned by Gulf-based developers elsewhere.⁷ This is not surprising since China EPCs are among the largest in the world and are capable of juggling multiple projects simultaneously while offering competitive prices and quality workmanship.

Scenarios for Gulf-China supply chains

To assess the resilience of the thus far robust Gulf-China supply chain described above, two different scenarios were developed through an interplay of ‘demand-pull’ and ‘supply-push’ factors. The former refer to conditions in the host countries of the Gulf that influence choices by Chinese and Gulf companies about the direction of engagement whereas ‘supply-push’ factors refer to Chinese domestic drivers on the same issue. Blue Sky describes an optimistic outcome of stronger China-Gulf supply chains while Sand Storm offers a more pessimistic view of weaker China-Gulf supply chains. Table 2 provides a summary of these scenarios, which are elaborated upon below.

Table 2: Summary of possible trajectories of China-Gulf renewable energy supply chains

BLUE SKY SCENARIO	
Demand Pull Factors	Supply Push Factors
Renewable energy targets	Profit squeeze in China
Expanding non-oil industries	Export potential
China as a trusted partner	
SAND STORM SCENARIO	
Demand Pull Factors	Supply Push Factors
Middle East instability	Uncertainty in Chinese government policy
Competition from Gulf-owned enterprises	

(a) Renewable energy targets

All GCC states have some form of renewable energy target, emissions target, and net zero target.⁸ At the moment, however, there exists a wide gap between current deployment and

⁷ Li-Chen Sim and Steven Griffiths, "Renewable energy supply chains between China and the Gulf states: Resilient or vulnerable?," *Energy Strategy Reviews* 56 (2024), <https://doi.org/10.1016/j.esr.2024.101605>.

⁸ IRENA, *Renewable energy markets: GCC 2023*, International Renewable Energy Agency (Abu Dhabi, 2023), <https://www.irena.org/Publications/2023/Dec/Renewable-energy-market-analysis-GCC>.

announced capacity levels for solar and wind energy projects.⁹ This, in turn, suggests an urgent need to increase the pace of renewable power projects if targets are to be achieved.

Indicative of the political push to meet such targets is the significant recent uptick in the pace of tenders for solar and wind projects in Saudi Arabia, including conducting geographic surveys to identify future sites. And in April 2024, the UAE's Minister of Energy confidently proclaimed that with regard to renewable energy, the country 'can say with certainty that our plans will be reached and maybe we'll reach even higher than tripling the capacity'.¹⁰

China's primacy in the region's renewable energy supply chains is key to delivering renewable power projects in the Gulf on time and on budget. For this purpose, ACWA Power, signed a strategic cooperation agreement in 2022 with Sungrow, a China-based global leader in inverter and energy storage system solution supplier and a framework agreement in 2024 with LONGi to deepen cooperation in high-technology applications in the solar industry.

(b) Expanding the non-oil industry

The Gulf states are eager to encourage foreign direct investment (FDI) from China to provide employment, to create a post-oil economy, and to de-risk the high level of dependence on imported components. Saudi Arabia is perhaps the most interested and best placed for this purpose. Local content requirements are around 18% for international tenders under the National Renewable Energy Program. Qatar and the UAE with comparatively higher capita GDPs, smaller citizen populations, and fewer concerns about unemployment have not mandated local content requirements for renewable energy projects.

Overall FDI into the GCC's manufacturing sector is currently modest and they include two ventures from China, one manufacturing solar glass panels and another making solar modules. Since 2023, however, foreign companies – led by those from China – have announced plans to establish a local presence in the GCC.¹¹ Saudi Arabia, the UAE, and Oman with ambitious targets, bankable projects, local content preferences, and good project implementation record are likely to be recipients of more of such FDI.

(c) China is an established and trusted trade and investment partner

China is among the top five largest import and export partners for most of the Gulf states. For instance, in 2024 China was the largest trade partner for Saudi Arabia (US\$97.7b), the UAE (\$119.6b), and Qatar (\$23.6b), well ahead of the second placed country.¹² China is also a major source of FDI: In Dubai, the region's leading recipient of FDI, China was the sixth largest source

⁹ GEM, *MENA grows renewables by half but clings to risky hydrogen and gas*, Global Energy Monitor (September 2023 2023), <https://globalenergymonitor.org/report/mena-grows-renewables-by-half-but-clings-to-risky-hydrogen-and-gas/#:~:text=MENA%20grows%20renewables%20by%20half%20but%20clings%20to%20risky%20hydrogen%20and%20gas,-Section%20Navigation>.

¹⁰ John Benny, "UAE may surpass goal of tripling renewable energy capacity by 2030, minister says," *The National*, 28 April 2024, <https://www.thenationalnews.com/business/energy/2024/04/28/uae-may-surpass-goal-of-tripling-renewable-energy-capacity-by-2030-minister-says/>.

¹¹ Sim and Griffiths, "The Future of China-Gulf Solar and Wind Supply Chains."

¹² International Monetary Fund, "International Trade in Goods by Partner Country," (2025). <https://data.imf.org/en/dashboards/imt%20dashboard>.

of FDI between 2019 and 2024, accounting for AED17.3 billion or 7.1% of total FDI during that period.¹³ Chinese components and contractors are widely used in renewable power projects in the Gulf and China's Silk Road Fund owns a 49% stake in ACWA Power's renewable energy platform.

At the same time, China also regards the Gulf states as significant and reliable suppliers of hydrocarbons and vowed in 2022 'to continue to import large quantities of crude oil from GCC countries, expand imports of liquefied natural gas'.¹⁴ It has welcomed Saudi Arabia's equity investments in its refineries and petrochemicals, it recently allowed ACWA Power to co-develop solar and wind power plants in China with local companies thereby making ACWA Power one of the few foreign developers operating there, and it applauded the vote of confidence by Qatar to procure multiple LNG vessels from Chinese shipyards.

Illustrative of the depth of such ties is the fact that the UAE (since 2018) Saudi Arabia (2022) have a comprehensive strategic partnership with China, which is the highest form of bilateral engagement accorded by China. The conclusion of the long-awaited China-GCC free trade agreement will only strengthen economic ties and with it, the resilience of China-Gulf supply chains.

(d) Profit squeeze in the solar and wind industries in China

A painful shakeout of the solar, and to a lesser extent wind, industry in China is taking place due to overproduction. Industry insiders like the president of LONGi, the world's largest solar panel manufacturer, noted that the 'recent 'irrational' price of PV modules have been hovering at near cost levels...At this current price it is hard for anybody in the industry chain to make profit. Most companies are barely surviving'.¹⁵ The end of national-level subsidies for new wind projects to reduce government spending will also reduce profit margins for equipment makers.

Consequently, some of China's solar and wind companies seek to capture higher profits offered in overseas markets. While there are numerous China-owned solar-related manufacturing factories in Southeast Asia, their days as tariff-free springboards into north American and European markets are numbered in view of trade frictions over alleged dumping and subsidy practices. The spate of announcements in the past two years about the Gulf states as possible hosts for China's overseas manufacturing facilities is illustrative of this thin king (Table 2). Even if only a quarter of these announcements pan out, they will contribute towards more resilient and less import dependent supply chains.

(e) Middle East instability

Geopolitical tensions in the Middle East could pose operational risks for Chinese investors, contractors, and traders. However, such tensions are offset by the relative security offered in

¹³ "Dubai FDI Monitor," Government of Dubai, n.d, accessed 10 April 2025, <https://www.dubaifdimonitor.ae/>.

¹⁴ Central Committee of CPC International department, "Full text of Xi Jinping's keynote speech at China-GCC Summit," (Beijing) 2022, https://www.idcpc.gov.cn/english2023/tt_xw_5749/202212/t20221229_159171.html.

¹⁵ Xuan Zhao and Kelsey Cheng, "Chinese Solar Firms Feel Squeeze on Profits as Overcapacity Hits," *Caixin Global*, 1 November 2023, <https://www.caixinglobal.com/2023-11-01/chinese-solar-firms-feel-squeeze-on-profits-as-overcapacity-hits-102122754.html>.

the Gulf. In 2021, for example, the Safe Cities Index ranked Abu Dhabi and Dubai the first and second, respectively, in the Middle East in terms of infrastructure and personal security.¹⁶ According to a 2022 PwC study, instability in the wider region has not dampened the attractiveness of the UAE and Saudi Arabia as preferred business locations in the Middle East among existing and future Chinese businesses.¹⁷

(f) Competition from Gulf-owned enterprises

While China has been the continent's leading trade and investment partner for over a decade, the uptick in Gulf-Africa ties of late is driven by considerations of economic diversification, food security, military positioning and general geopolitical rivalry among Middle Eastern countries. This could result in rivalry between China and the Gulf states over Africa's mining, energy, agribusiness and port infrastructure sectors. A case in point was the attempt in 2024 by the UAE's International Holdings Company to acquire Zambia's Lubambe Copper Mine even though China's JCHX had already agreed to buy it. Increasingly fierce competition for Africa's resources, some of which are integral to renewable energy equipment, is a downside risk to China-GCC relations that could spill over into currently robust engagement in renewable energy.

(g) Chinese government policy on overseas renewable energy engagement unclear

Chinese solar and wind companies keen to move production lines overseas need to consider its government's position on the issue and are obliged to seek approvals from two government entities. On the one hand, the previous large-scale crackdown in 2017 on what was deemed 'irrational' and 'unauthentic' overseas investments in real estate and entertainment has abated. On the other hand, export controls over clean energy-related items since 2022 are concerning.

The point is that such reviews of the 'Catalogue for prohibited and restricted export technologies' by China's Ministry of Commerce and the obligation to seek government approvals for overseas investments increase uncertainty and risk over overseas FDI, including into the Gulf.

On balance, the optimistic considerations (Blue Sky scenario) outweigh the pessimistic ones (Sand Storm) with renewable energy supply chains between China and the Gulf currently robust and likely to remain so going forward. Any impact arising from concerns about China's primacy in supply chains is likely to be minimal for the Gulf states, particularly given robust political ties and the momentum towards localizing supply chains to meet local energy transition targets.

¹⁶ The Economist Intelligence Unit, *Safe Cities Index 2021*, The Economist Intelligence Unit (London, 2022), https://impactsafecities.econ-asia.com/projects/safe-cities/wp-content/uploads/2021/09/Safe-Cities-Index-2021_eng.pdf.

¹⁷ PwC, *Report on Chinese Investors' Confidence in the Middle East*, PricewaterhouseCoopers (Beijing, 2022), <https://www.pwc.com/m1/en/publications/documents/report-on-chinese-investors-confidence-in-the-middle-east.pdf>.

Implications for South Korea

South Korean companies have had a negligible footprint in Gulf renewable energy supply chains. It is only in the past two years that Korea Western Power (KOWEPCO), a state-owned operator and owner of power generation assets, has found success in the UAE and Oman as a developer of utility-scale solar power projects in collaboration with France's EDF. With this has come financial support by South Korea's Export Import Bank or KEXIM. Going forward, it is possible that the country's top solar cell maker, Hanwha Q cells, may consider a solar cell or module manufacturing plants in the Gulf or wider Middle East to complement existing facilities in India and the US. The UAE is well-placed in this regard having signed a free trade agreement, known as the Comprehensive Economic Partnership Agreement, with South Korea in mid-2024.