FOCUS

# Implication of Energy Transition on West Asian Stability

Soumya Chaturvedi*

Energy is the lifeblood of any economy. Throughout history, wood and coal were the primary fuels that powered societies. However, the discovery of oil, due to its efficiency and ease of transportation, revolutionised the energy landscape, positioning oil as the dominant energy source. The increasing pace of industrialisation and the World Wars intensified the race to secure energy resources, making energy security a pivotal element in global politics. With soaring global demands and a finite supply, oil, often termed 'black gold,' acquired immense strategic value. Consequently, ensuring reliable access to sufficient and affordable energy became a cornerstone of national strategies worldwide.

In recent years, global conversations have increasingly centred on collective action to address the climate crisis. A critical step in this direction has been the call for a shift to cleaner and greener energy sources. There is near-unanimous agreement on transitioning from non-renewable to renewable energy resources, prompting most nations to develop and implement comprehensive energy transition plans.

In the West Asian context, this transition is particularly significant due to the region's status as a major oil and gas rentier. Home to some of the largest reserves of oil and natural gas, West Asian economies are heavily dependent on energy-based export revenues, profoundly influencing governance and societal structures. Unlike the scarce nature of oil and natural gas, renewable energy sources are abundant. This could reduce the global relevance of West Asian oil and gas rentiers and significantly impact regional stability.

Despite the slow and uncertain pace of the energy transition, the strategic importance of energy resources and the historical geopolitics of oil and gas raise significant concerns about the transition's impact on West Asian geopolitics and stability. This article examines these concerns by first providing an overview of the West Asian energy landscape and the region's oil geopolitics. It then explores the broader geopolitics of the energy transition, focusing on how these changes may affect peace and stability in West Asia. Particular attention is given to the roles of climate technology and critical mineral supply chains in shaping the future geopolitical dynamics of the region.

West Asian Energy: Stocktake and Aspirations

West Asia holds a pivotal position in the global energy landscape, producing nearly 30% of the world's oil[1] and possessing 48% of global oil reserves.[2] Key oil producers in the region include Saudi Arabia, Iraq, the United Arab Emirates (UAE), Iran, Kuwait, Qatar, and Oman. The hydrocarbon sector is vital to these economies,

*Soumya Chaturvedi is a Visiting Fellow at India Foundation. Previously, she has worked as a Consultant at the G20 Division, Indian Ministry of External Affairs and as Senior Research Fellow at India Foundation. A lawyer by education, she holds a Master's degree in International Relations from India and a specialisation in Asia Pacific Security from the UK.

comprising 87% of Saudi Arabia's export revenues, 95% of Iraq's, 90% of Kuwait's, 81% of Qatar's, and 60% of the UAE's. This underscores the significant role oil and natural gas play in influencing the economic stability and prosperity of West Asian nations.

However, when the global call for addressing the climate crisis by reducing greenhouse gas emissions was given, some of the key West Asian oil-producing countries responded positively knowing fully well that the first step would be to reduce and eventually shift from oil to cleaner and greener energy sources. With regards to the net zero target pledges, West Asian oil-rentiers to have committed themselves in policy documents include UAE (by 2050), Oman (by 2050), and Saudi Arabia (by 2060). Other states such as Kuwait and Bahrain have pledged to reach the net zero target by 2060.[3] On the other hand, while Iran, Iraq, and Qatar have not declared net zero targets, Qatar aims to reduce its greenhouse gas emissions by 25% by 2030.

UAE's renewable energy endeavours include designing Masdar City – an environmentally sustainable city, multiple solar parks, including Noor Abu Dhabi Solar Park and Mohammed bin Rashid Al Maktoum Solar Park in Dubai, launching a wind energy programme, and upscaling green hydrogen production.[4] Kuwait also plans to award its first large-scale contract for a solar photovoltaic project by the end of 2024, along with projects in wind and concentrated solar power. Saudi Arabia has installed a renewable capacity of 2.8 GW, Qatar 800 MW, and Oman 500 MW.[5]

West Asian states are often referred to as rentier states due to their substantial dependence on external rents from oil. Scholars like Hazem Beblawi[6] argue that rentier economies shape the politics and societies of these states. In such economies, the government, as the principal rentier, becomes the most influential actor. With redistribution in the hands of the government, citizenship becomes a source of economic benefit. Since the government is not dependent on taxes, any act by the state is seen as benevolence and not a duty. The absence of taxes also reduces political participation by the citizenry. Although more recently, it has been observed that the oil-rentier states have been providing adequate public goods and services to their citizens, demanding accountability or transparency by the citizens continues to be disincentivised.

The hydrocarbon economy has deeply shaped the politics, society, and economy of West Asian oil-rentier states, granting rulers significant autonomy with minimal resistance from citizens. However, the global shift away from oil and gas could potentially disrupt this model. As the demand for these resources decreases, so too will the oil rents, forcing these states to either find new external revenue sources or transform their domestic economies. This energy transition could set off a series of transformative changes within these states, with far-reaching implications for regional stability.

## Geopolitics of West Asian Oil

One of the most significant events that shaped contemporary world history was the discovery of commercial quantities of oil and gas in the Persian Gulf region. This discovery in a relatively fragile region prompted Western powers, beneficiaries of the first industrialisation phase, to maximise and

secure their interests. In doing so, they introduced foreign influence into West Asia, exacerbating socio-political fissures within regional communities—a dynamic that continues to impact contemporary West Asian stability.

The first large oil deposit in the West Asian region was discovered in Iran in 1908. Through the Anglo-Persian Oil Company, the British were the first imperialists to capitalise on this opportunity.[7] The importance of oil in British strategic thinking became evident through their actions in Ottoman territories and the subsequent Sykes-Picot Agreement with France, which ensured access to rich oil fields and led to the arbitrary creation of nation-states.[8] By 1925, Britain, France, and the US had secured their oil interests in Iraq, discovering one of the world's largest oil fields by 1927.[9]

Recognising the strategic and economic importance of oil, the US invested in oil exploration in Saudi Arabia in 1933. By the 1940s, America had secured its interests in Saudi oil through military and economic aid to the Kingdom.[10] In 1956, Egyptian President Nasser nationalised the Suez Canal, weaponising access to West Asian oil. This crisis altered the regional balance of power, leading to Nasser's military defeat, Israel's territorial changes, the withdrawal of France and Britain from the area, and a temporary rift between the US and other Western powers.[11]

In 1973, the support of Western powers for Israel during the Yom Kippur War led the Arab oil coalition to announce a total oil embargo. The ensuing 'oil crisis,' marked by a significant surge in oil prices, caused severe economic and political distress in the US. The embargo ended in mid-1974 after the US administration promised a more balanced approach to the Israel-Arab conflict, resumed arms trade with Saudi Arabia,[12] and Israel limited its territorial ambitions. This period also saw the birth of 'Petrodollars,'[13] significantly contributing to the continuation of American hegemony.

Less than six years later, the Iranian Revolution of 1979 triggered a second oil crisis, marked by constrained oil supply and soaring prices. The revolution caused a collapse in US-Iran relations, prompting the US to rely on Saudi Arabia to meet its domestic demands and strengthen ties with Iran's regional adversaries.[14] Over the next decade, two major wars occurred in the region: the Iran-Iraq War and the Gulf War (between Iraq and the US-led 42-country coalition, which started with Iraq's invasion of Kuwait), both with significant implications for oil security. Although political differences were the primary triggers, securing oil reserves was a key focus of Iraq, the aggressor in both conflicts.

Over the years, US involvement and, arguably, interference in West Asia increased, leading to a growing dependence of most West Asian states on the US. While partially motivated by its strategic location, the importance of West Asian oil for the American economy, politics, and hegemony could not be discounted. However, the discovery of shale gas has reduced American dependence on West Asian oil, allowing the US administration more strategic and diplomatic flexibility. More recently, the Trump and Biden administration have signalled a shift in strategic priorities, moving away from West Asia and towards China.[15]

China, increasingly becoming a major West Asian oil importer, has deepened its ties with West Asian countries, even proposing a "Petro-Yuan" arrangement[16] to challenge the Petrodollar supremacy. West Asian oil rentiers like Saudi Arabia are looking to diversify their strategic alliances away from the American umbrella, with China presenting an attractive alternative. The closer the ties between China and the West Asian states, the higher the possibility of US-China rivalry playing out in the West Asian region, thus adversely affecting the already fragile state of regional stability. The emergence of states exercising strategic autonomy and possessing economic and political clout with a vision for energy transition, such as India, could also influence the stability in the region.

The pivotal role of oil in defining the regional balance of power in West Asia, shaping inter and intra-regional relations, dependencies, and vulnerabilities, is undeniable. However, while oil is unlikely to lose its significance in global politics in the near future, the energy transition could diminish its influence. This shift in focus towards factors that drive cleaner and greener energy could potentially increase the influence of states that control such factors. In West Asia, this transition could introduce new patterns of vulnerabilities, dependencies, and alliances, thereby reshaping the geopolitical landscape.

## Geopolitics of New Energy Transition

Energy transition is an old phenomenon. Historically, dominant energy resources have shifted from wood to coal and, more recently, to oil and natural gas. Key drivers of these transitions have included growing populations, industrialisation, and the rise of emerging markets. Oil, in particular, became the most sought-after energy source due to its efficiency, ease of transport, and storage capabilities, while its limited supply granted geopolitical power to the few state actors controlling its production and distribution.

The current energy transition, however, is markedly different from previous ones. This new transition aims to move from oil to cleaner and greener energy sources such as solar, wind, geothermal, hydropower, ocean, bioenergy, and, to some extent, nuclear energy. There is an abundant supply for most of these, and states have different combinations of clean and green energy potential, which could reduce the energy dependence if not completely eliminate it. The primary challenge lies in developing the capacity to efficiently capture and utilise energy from these sources on a large scale. Thus, control over these capacities will shape the geopolitics of the new energy transition.

Energy transition is a process, and the end goal is several decades away. However, the process in itself has the potential to cause a strategic reshuffle of existing state relations. It could deepen state relations, increase competition, or forge new partnerships, and invariably, it could influence regional stability. Since energy plays a predominant role in inter- and intra-state relations within the West Asian region, any fundamental change will disrupt the status quo.

## Decentralisation and Limited Stability

Renewable energy sources present unique challenges in control and distribution, as they rely on harnessing continuous energy flows rather than

extracting finite stocks. These resources are more evenly distributed across geographies, promoting energy security for consumer nations by reducing dependence on external supplies.[17] The 'prosumer country' would build an energy model where energy production and consumption are broadly within the same territorial control.[18] This shift towards decentralised energy production and consumption within a country's territory significantly departs from traditional energy models.

The energy transition poses a complex dynamic for oil-producing nations in West Asia. Historically, conflicts in the region have been driven by the desire to control oil resources. However, with the move towards renewable energy, such motivations may diminish. Yet, the critical role of oil in defining state economies and their relationships with citizens means that a transition could trigger domestic instability. The diminishing attractiveness of the oil industry will compel West Asian states to seek new strategic tools beyond oil price control to maintain their influence, posing a significant challenge.

The shift towards renewable energy in West Asia underscores the importance of political and economic diversification. As the region transitions away from an external rent-based economy, new sources of revenue and industries will emerge. Technology, offering strategic supremacy, will become a focal point, incentivising West Asian states to invest in research and innovation and attract international talent. Ensuring stability, security, and social goods will be crucial for retaining talent and foreign investment. Political diversification could facilitate smoother economic transitions and societal transformations, serving as a strategic tool to balance regional power dynamics.

The UAE's gradual transformation and diversification have already presented a global model of success, with countries like Saudi Arabia, Qatar, and Kuwait following a similar path. For a region fraught with fragility, a balanced approach towards diversification and transformation triggered by the energy transition could mitigate further instability, even if it cannot usher in an era of regional peace.

## Instability Curse of Green Oil

To leverage cleaner and greener energy, nations need affordable and reliable access to technology, raw materials, and finance.[19] Recent trends indicate that states are increasingly seeking control over these factors to gain geopolitical leverage. West Asian oil-rentier states, with their substantial sovereign wealth funds, are less dependent on external climate finance, limiting its geopolitical impact. However, for other developing states, climate finance sources can exert considerable geopolitical influence. In the context of West Asia's energy transition, two critical factors—climate technology and critical mineral supply chains—will significantly impact regional geopolitics.

***Climate Technology -*** Harnessing clean and green energy necessitates a wide range of innovative technological products, including solar photovoltaic plants, wind turbines, batteries, and electric vehicles. Significant investments are also being made in the research and development of hydrogen-based economies to reduce greenhouse gas emissions and promote cleaner energy for

domestic and industrial uses. The ownership of patents often determines control over these innovations. A 2021 International Energy Agency report highlighted a substantial increase in patents for low-carbon energy technologies between 2000 and 2019, nearly doubling those for fossil fuel technologies.[20] Leading players in patent portfolios for net-zero energy technologies include the US, China, Japan, South Korea, Germany, France, and the UK.[21] Amongst these, China holds the most extensive patent portfolio, with three times more patents than the US, in second place.[22] Its portfolio includes patents on core solar technologies, electronic vehicle batteries, and new and upcoming technology to harness hydrogen energy.[23] The centrality of the patents to the design and production of the technological product determines the power to monopolise the availability and affordability of the product. While China's patent portfolio may have a mix of low- and high-quality inventions, it may still have a more significant say in monopolising the production of low-carbon and net zero-energy technologies.

- ***Critical Mineral Supply Chain -*** While cleaner and greener energy sources are abundant, the raw materials required for harnessing this energy are not evenly distributed. Production of low-carbon and net zero energy technologies requires varied combinations of critical minerals. These form the core raw materials for renewable power generation, power grids and other applications, including electric vehicles.[24] Essential minerals include lithium, nickel, cobalt, manganese, and graphite for batteries, rare earth elements for wind turbines and electric vehicle motors, and copper and aluminium for electrical networks and technologies.[25] The mining of critical minerals is spread across countries such as Indonesia, the Democratic Republic of Congo, the Philippines, Mozambique, Madagascar, Peru, Australia, China, Russia, and the US. However, China dominates the processing of these minerals. For instance, China processes more than half the global supply of rare earth elements, graphite, lithium, cobalt, and copper.[26] An interesting case is nickel, where although significant mining and processing occur in Indonesia, Chinese companies control 80% of the supply and 40% of raw mining, with Indonesian firms holding only 10% of the nickel mining in the country.[27] For any state envisioning a transition to cleaner energy, a reliable and affordable supply of critical minerals is essential to ensure energy security free from dependence and external interference. China's monopoly on the supply chain—from raw mining to processing and refining—of critical minerals poses a significant geopolitical challenge. Control over these materials is fundamental for the production of most clean and green energy technologies, highlighting the geopolitical importance of securing access to critical mineral supply chains.

China's increasing dominance in the current energy transition, with a monopoly over the most crucial factors responsible for the new energy landscape, has significant geopolitical implications. As China aims for

energy security, its role in the West Asian context is becoming more pronounced. To harness the domestic cleaner and greener energy potential, the states in the region will inevitably deepen their relationship with China. However, for many smaller states, this has resulted in increased economic dependence and Chinese political interference. The West Asian oil rentiers, with their substantial sovereign wealth funds, are in a more secure position, reducing the possibility of being strong-armed by China. This dynamic underscores the complex geopolitical landscape of the energy transition in West Asia.

For a region that is looking beyond the American umbrella to exert its strategic autonomy, Chinese opportunities, including in the energy transition domain, are lucrative. However, given the American history in the region, strengthening relations with China makes the region vulnerable to the fallouts of US-China rivalry. This could lead to the deepening of existing political fissures in the region, making it more unstable.

Another potential source of instability could arise from the rivalry between oil and gas-producing states. Natural gas is considered to be a cleaner source of energy compared with oil. This would imply that in the initial phases of the energy transition, states could aim to increase the share of natural gas in their domestic energy mix while reducing the share of oil until greener energy sources can be used on an industrial scale. Within the West Asian region, Iran, Qatar, and Saudi Arabia could benefit more than other oil-producing states. This shift could alter the economic and political leverage within the region, exacerbating tensions. The fragile Saudi-Qatar relations and the long-standing Saudi-Iran hostility, despite recent normalisation efforts, could be further strained. The Sunni-Shia divide also adds to the complexity. With Iran potentially gaining more leverage due to its natural gas reserves, regional tensions could rise.

The use of nuclear energy as an alternative to hydrocarbon-based energy is also an area of concern within the region. With the regional hostilities, Iran's nuclear program has already raised serious concerns for the regional and extra-regional actors. The insistence on increasing the share of nuclear energy to meet green energy targets, even if it is only for civilian use, particularly by Iran and Israel, could be seen with a sense of suspicion and concern by other actors.

## Regionalisation

In 2018, the Indian Prime Minister had first proposed "One Sun One World One Grid (OSOWOG)" initiative, aiming to connect regional grids through a common grid for transferring renewable energy.[28] In 2021, Green Grids Initiative (GGI) was launched at COP26 in partnership with OSOWOG. GGI aims to construct infrastructure to connect energy-rich locations with continental grids, ensuring seamless transfer of renewable energy.[29] Australia is already working on providing solar energy through high-voltage undersea cables to Singapore, which is situated nearly 5000 kms away.[30]

Over the years, the Gulf Cooperation Council (GCC) has become one of the most economically influential organisations. All the six member-states - Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE, are oil-rentier economies and account

for significantly high cleaner and greener energy potential. While the process for harnessing renewable energy is at an initial stage, developing regional electricity grids powered with greener energy, and supplying energy to other states in the region is an area of high potential for the West Asian states.

Through OSOWOG and GGI, and by leveraging the technology used by Australia, together the West Asian states could develop infrastructure to provide cleaner and greener energy to other states in the region and even beyond in the African and European continent. As they already have a collaborative arrangement through the GCC, leveraging it to become the pioneers of supplying renewable energy through regional electricity grids and undersea cables could elevate their regional geopolitical position.

## Conclusion

No state is immune to the impacts of the climate crisis, which include rising sea levels, increasing temperatures, droughts, food insecurity, and forced displacement. The need to reduce fossil fuel consumption is paramount, making energy transition inevitable. With growing populations and increasing energy demands, a gradual energy transition is essential. However, its impact on global power distribution and the geopolitical status quo cannot be overlooked.

For oil producing West Asian states, energy transition from oil to cleaner and greener energy sources has the potential to destabilise the regional balance of power. While it reduces the likelihood of physical conflicts over energy resources, it introduces political and economic complexities that could heighten regional tensions. China's dominance in climate technology and critical mineral supply chains will undoubtedly influence these states' relationships with China. Amidst the US-China rivalry, this dynamic could lead the US to reassess its approach to the region, contributing to increased tensions. Intra-regional factors, such as the rivalry between oil and gas producers, the use of nuclear energy, and the potential use of regional grids, will also impact regional stability.

The foremost strategy for the West Asian states to navigate this complexity is to develop a farsighted and comprehensive economic and political diversification strategy. While China's monopoly over crucial factors is significant, initiatives like the India-Middle East-Europe Economic Corridor and I2U2 can help balance multiple powers' interests and concerns, providing domestic benefits and opportunities for the oil rentiers of West Asia.

## *References:*


1 *Calculated based on the petroleum and other liquids production information publicly made available by the US Energy Information Administration, as accessed on June 04, 2024, https://www.eia.gov/international/data/world.*

2 *Ekrem Biceroglu, Muhammed Emin Canik, Ahmet Dursun, "Middle East plays vital role in global oil production,"* Anadolu Agency*, August 11, 2023, https://www.aa.com.tr/en/economy/middle-east-plays-vital-role-in-global-oil-production/2965593.*

3 *"Net Zero Scorecard,"* Energy &Climate Intelligence Unit*, as accessed on June 04, 2024, https://eciu.net/netzerotracker.*

4 *"UAE Energy Diversification,"* Embassy of The United Arab Emirates Washington DC*, as accessed on June 05, 2024, https://www.uae-embassy.org/discover-uae/climate-and-energy/uae-energy-diversification#:~:text=Renewable%20Energy,-The%20UAE%20has&text=per%20kilowatt%20hour.-,The%20UAE%20has%20three%20of%20the%20world's%20largest%20solar%20plants,200%2C000%20cars%20off%20the%20road.*

5 *Kate Dourian, "Kuwait's New Energy Strategy Takes Off but Oil's Still Dominant,"* The Arab Gulf States Institute in Washington*, May 14, 2024, https://agsiw.org/kuwaits-new-energy-strategy-takes-off-but-oils-still-dominant/.*

6 *Hazem Beblawi, "The Rentier State in the Arab World,"* Arab Studies Quarterly *9(4), (1987), pp. 383–98. http://www.jstor.org/stable/41857943.*

7 *John V. Basarin, "Oil: The Underlying Reason for Gallipoli,"* Australian Institute for International Affairs*, April 24, 2015, https://www.internationalaffairs.org.au/australianoutlook/oil-the-underlying-reason-for-gallipoli/.*

8 *Martin William Gibson. (2012).* British Strategy and Oil, 1914–1923 (PhD)*. Glasgow Theses Service. https://theses.gla.ac.uk/3160/.*

9 *Rasoul Sorkhabi, "Oil from Babylon to Iraq,"* GEOExPro - The Global Energy Sector From A Subsurface Perspective*, April 02, 2009, https://geoexpro.com/oil-from-babylon-to-iraq/.*

10 *David Ottaway, "The U.S. Saudi Arabia Since the 1930s,"* Foreign Policy Research Institute*, August 28, 2009, https://www.fpri.org/article/2009/08/the-u-s-and-saudi-arabia-since-the-1930s/.*

11 *"Suez Crisis, 1956," US Department of State Archive, as accessed on May 25, 2024, https://2001-2009.state.gov/r/pa/ho/time/lw/97179.htm.*

12 *Supra note 4.*

13 *JR MacLeod, "Saudi Arabia's Quandary: The End of the Petrodollar,"* Mises Institute – Austrian Economics, Freedom, and Peace*, March 02, 2023, https://mises.org/mises-wire/saudi-arabias-quandary-end-petrodollar.*

14 *Derika Weddington, "Rivalry in the Middle East: The History of Saudi-Iranian Relations and its Implications on American Foreign Policy" (2017).* MSU Graduate Theses*, https://bearworks.missouristate.edu/theses/3129*

15 *Steven A. Cook, "The US Needs a New Purpose in the Middle East,"* Foreign Policy*, June 03, 2024, https://foreignpolicy.com/2024/06/03/us-middle-east-policy-pivot-iraq-war-withdrawal-oil-israel-terrorism-climate/.*

16 *Summer Said & Stephen Kalin, "Saudi Arabia Considers Accepting Yuan Instead of Dollars for Chinese Oil Sales,"* The Wall Street Journal*, March 15, 2022, https://www.wsj.com/articles/saudi-arabia-considers-accepting-yuan-instead-of-dollars-for-chinese-oil-sales-11647351541.*

17 *Andre Mansson, "A resource curse for renewables? Conflict and cooperation in the renewable energy sector,"* Energy Research & Social Science*, Vol. 10, November 2015, pp. 1-9, https://www.sciencedirect.com/science/article/abs/pii/S2214629615000791*

18 *Daniel Scholten & Rick Bosman, "The geopolitics of renewables; exploring the political implications of renewable energy systems,"* Technological Forecasting and Social Change, Elsevier*, Vol. 103(C), 2016, pp, 273-283, doi: 10.1016/j.techfore.2015.10.014.*

19 *Meghan O'Sullivan, Indra Overland, David Sandalow, "The Geopolitics of Renewable Energy,"* Harvard University, Columbia University, and the Norwegian Institute of International Affairs, *https://*

*www.researchgate.net/publication/317954274.*

20 *"Patents and the energy transition Global trends in clean energy technology innovation April 2021", a report by International Energy Agency and European Patent Office, as accessed on 30 May 2024, https://www.iea.org/reports/patents-and-the-energy-transition.*

21 *"Elsevier report highlights exponential growth of Chinese patents in carbon-free energy technologies,"* ScienceBusiness*, November 02, 2021, https://sciencebusiness.net/news-byte/patents/elsevier-report-highlights-exponential-growth-chinese-patents-carbon-free-energy.*

22 *"China extends green tech lead to carbon capture and sequestration,"* Nikkei Asia*, May 19, 2024, https://asia.nikkei.com/Spotlight/Environment/Climate-Change/China-extends-green-tech-lead-to-carbon-capture-and-sequestration.*

23 *Jane Nakano, "US-China Relations and the Global Energy Transition," in Forum: Taking Stock of China and the Geopolitics of Energy,* The Oxford Institute for Energy Studies*, August 2023, Issue 137, pp. 44.*

24 *Dolf Gielen, "Critical Minerals for the Energy Transition,"* International Renewable Energy Agency*, Technical Paper 5/2021, https://www.irena.org/-/media/Irena/Files/Technical-papers/IRENA_Critical_Materials_2021.pdf.*

25 *"The Role of Critical Minerals in Clean Energy Transitions," World Energy Outlook Special Report,* International Energy Agency*, March 2022, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/executive-summary.*

26 *"Energy Transition and Geopolitics: Are Critical Minerals the New Oil?,"* World Economic Forum*, White Paper, April 2024, https://www.weforum.org/publications/energy-transition-and-geopolitics-are-critical-minerals-the-new-oil/.*

27 *Amena H. Sayid, "Nickel illustrates China conundrum on critical minerals,"* Cipher News*, May 29, 2024, https://www.ciphernews.com/articles/nickel-illustrates-china-conundrum-on-critical-minerals/.*

28 *"About,"* International Solar Alliance*, as accessed on June 07, 2024, https://isolaralliance.org/work/osowog.*

29 *"Why Grids?,"* Green Grids Initiative*, as accessed on June 07, 2024, https://www.greengridsinitiative.net/.*

30 *Loz Blain, "World's biggest clean energy project to power Singapore from Australia," September 28, 2021, https://newatlas.com/energy/sun-cable-australia-singapore-solar-undersea-powerlink/.*

◆◆◆