

The New Energy Security Paradigm

By **Michael C. Lynch**

Series Introduction

The Covid-19 pandemic capped a series of events that made 2020 one of the most disruptive years in the annals of the energy industry, affecting markets, prices and livelihoods. The “Middle East, Asia and Energy Security in the Age of Covid-19” series of *Insights* looks at some of these developments and their impacts, including the astonishingly rapid emergence of the United States as the world’s leading oil and gas producer, the increasingly dire outlook for the member countries of the Gulf Cooperation Council, the role of Asia in resuscitating global oil and gas demand and the increasingly important role of China, among the world’s largest importers of oil and gas, in Middle East affairs.

Abstract

Although the growth of renewable energy has led to decreasing imports of energy from politically vulnerable areas, countries that increasingly rely on solar and wind energy are becoming vulnerable to the variability and unpredictability of these forms of energy. In essence, many countries are trading political risk for operational risk.

Efficiency gains and increased use of renewables remain among the most cost-effective ways to enhance security of energy supply.

International Energy Agency¹

The above quote has been repeated by many in recent years amid efforts to push for increased use of renewables to address climate change. Small-scale power such as rooftop solar is widely promoted in part because it is thought less vulnerable to major disruptions like hurricanes, but also because the energy supply would typically be created within the consuming country, making it less vulnerable to external pressure. There is some truth to this, but, as is so often the case, reality is far more complex. Increased reliance on wind or solar power will reduce diversification, which increases vulnerability; also, these forms of renewable energy, while less vulnerable to geopolitical threats, suffer from operational instability.

The False Theories of Resource Scarcity

Alarms about world petroleum supplies becoming scarce have frequently been raised in the past century. These are a subset of concerns about the adequacy of resources more generally. In some cases, such concerns have influenced foreign policy, especially by prompting governments to be on good terms with resource exporters, but others have warned of military conflict in pursuit of oil.² The fact that none of

¹ International Energy Agency, *World Energy Outlook 2019*, p. 301

² See for example, Kent E Calder, *Pacific Defense: Arms, Energy and America's Future in Asia* (William Morrow & Co., 1996), and Michael Klare, *Resource Wars: The New Landscape of Global Conflict* (Metropolitan Books, 2001).

these fears has materialised rarely assuages such concerns except temporarily, to be revived with the next cycle of supply tightness.

The reality is that the perceptions of scarcity typically arise from researchers who are unfamiliar with geology and resource economics and their terminology. “Reserves” is defined as discovered producible resources and typically constitutes a very small portion of the total resource base. The reporting of resource estimates is almost always confined to the portion of the resource base that can be recovered with current technology, which constitutes a small fraction of the total resource base. As I have shown elsewhere, this has led to gross errors among those warning of scarcity.³

The History of Energy Security

Economic security was much less of a problem in the past, when transport was expensive and most bulk goods did not travel far, meaning exporters could not use them to gain political advantage. The use of economic embargoes, employed so often in recent years, dates to the ancient Egyptians, who suggested to the Mycenaeans that they cease trade with the Hittites. In more modern times, Napoleon’s Continental System was designed to punish England by refusing to trade with her, while the Union blockade of Southern ports during the American Civil War sought not only to deprive the rebel states of income from their cotton exports but also to block their imports of essential war goods. (The 1863 attack on an oil field in what would become West Virginia — the first military strike against the petroleum industry — was never expected to have any significant impact.)

Although “food security” is increasingly being discussed today, and “supply chain security” has gained attention amid the ongoing pandemic, “energy security” has long been a concern for energy-importing countries. (Exporters worry about demand security, but that is an entirely different issue.) Most of these concerns reflect not resource scarcity, but resource availability.⁴

The problem is that the most attractive resource, cheap petroleum, is not always readily available and the substitutes are more expensive and less useful. Fossil fuels are attractive because of their energy density: they are the result of biological and geochemical processes that concentrate solar energy. Petroleum, being liquid and readily transportable, is especially valuable for use in transportation, which includes many military applications.

Historically, energy security has focused on two goals: national control of supply and surge capacity to cope with disruptions. The former was historically dominant, but after the Iranian oil crisis of 1979, the latter came to the fore as many oil-importing countries built strategic petroleum inventories. More recently, the rise of renewables has suggested a return to a desire for national control, more as a side-effect of such a transition.

The vital importance of oil to a nation’s military and economy means that governments tend to seek control over their supplies or, as a secondary choice, access to them. The famous historical case of how such motivations are translated into policy was the British government’s pursuit of an ownership share in what is now British Petroleum following the latter’s discovery of oil in Iran. This quest arose after the British navy had switched from coal to oil to power its ships. The concentration of petroleum resources occurred along two axes: geographical and corporate. Before the Second World War, the United States dominated the world’s oil supply, causing concern among other nations such as England. By the 1920s, British and American companies (the so-called “Seven Sisters”) had near total control of the international trade in oil, which became decisive when those two countries declared an oil embargo on Japan in 1941; the Japanese, seeing no alternative, invaded a number of oil-producing areas, notably (the current) Indonesia. This event highlighted the importance of national control over producing companies and encouraged many countries to develop their own national oil companies.

³ Michael C Lynch “The Origins of Resource Pessimism and its Consequences”, Energy Policy Research Foundation Working Paper, June 2019, <https://eprinc.org/2019/06/a-report-on-resource-pessimism-by-eprinc-distinguished-fellow-michael-lynch/#sthash.wif8Yk8x.dpbs>

⁴ An excellent overview of the impact of perceptions of scarcity on foreign policy can be found in Robert Vitalis, *Oilcraft: The Myths of Scarcity and Security that Haunt U.S. Energy Policy* (Stanford University Press, 2020).

Since the Second World War, the great concentration of cheap oil resources in the Middle East region has heightened the perception of vulnerability for importers. From the 1951 Iranian nationalisation of British Petroleum's concession to the recent US unilateral sanctions on Iranian oil exports, political interference in the flow of oil from that area has been frequent and has occasionally caused serious economic damage. The first Arab oil embargo in 1967 proved ineffectual, but the second in 1973, coming as some exporters sought tax increases on foreign operating companies, was wildly successful. This encouraged many oil-importing countries to employ diplomacy to ensure friendly relations with oil exporters and thus access to supply.

But the 1979 Iranian revolution demonstrated that diplomacy could not prevent collateral damage from disruptions owing to domestic politics in oil-exporting countries. Good relations with the Shah of Iran proved counter-productive when his government was replaced by his enemies. And striking Iranian oil workers were unconcerned about the diplomacy of oil importers. Unfortunately, too many — like the US Central Intelligence Agency — thought the cause of the crisis was resource scarcity, rather than temporary supply disruptions.⁵ This led to, among other policies, the creation of the US Synthetic Fuels Corporation, which was intended to promote domestic sources of energy, such as coal gasification, to improve supply security.

More generally, these two oil price shocks originating in the Middle East created a great incentive for nations to diversify their energy supplies, promoting coal, nuclear power and natural gas as replacements. The first resource, being abundant, was seen as much less vulnerable to political pressure; the second, requiring minimal amounts of fuel, could be made secure through the use of stockpiles. In the case of natural gas, importing it was not always a clear-cut gain for energy security, with imports usually sourced from a small number of countries (Algeria, Indonesia, Norway and Russia) for many years. Sadly, importers typically signed contracts linking the price of natural gas to the price of oil, so that an oil supply disruption would raise gas prices too, negating the economic benefits of diversification.

The effects of the Iranian oil crisis helped promote long-standing proposals in importing countries to build strategic inventories that could provide surge capacity to cope with short-term supply disruptions. Some, such as the United States and Japan, built government-owned stockpiles, while others set mandatory minimum stockpile levels for the private sector, and a few others adopted temporary demand restrictions instead of seeking additional supply. In part, such measures were intended as deterrents against future hostile action by any oil-exporting nation, which has not occurred in nearly half a century. But neither has the surge capacity ever seen any significant employment.

It is worth noting that as the OECD countries step up production of shale oil and if they switch to electric vehicles in a big way, then Asia, especially China and India, will be where oil imports will be concentrated, and those imports will primarily come from the Middle East. Countries like China and India now rely heavily on domestic energy in the form of coal, but that should decline owing to climate change policies. The combination suggests much greater political involvement by China and India in the Middle East and a reduced presence for the United States, although it is not clear whether this will enhance or reduce stability of supply.

Barrels not Dollars

This highlights probably the biggest enduring mistake that importing governments have made: ignoring economics and especially *the economic damage caused by higher prices* during temporary, politically inspired, price shocks. The International Energy Agency and many individual governments have maintained that their oil crisis policies are not intended to prevent price spikes but rather to offset physical shortages. During the first Gulf war, the Bush administration specifically said that releases from its strategic petroleum reserve would occur only if refiners reported an inability to acquire oil, and it stood aside as prices rose owing to the cutoff of Iraqi and Kuwaiti oil supply.

⁵ US Central Intelligence Agency, "The Oil Market in the Years Ahead", 1979.

But while it is laudable that governments have not attempted to manipulate oil markets with strategic reserves, despite some political pressure to do so, the point of strategic reserves is to provide surge supplies to deal with *non-economic disruptions of supply*, such as the Iranian revolution or the Gulf wars. The only serious oil crises we have had thus far have arisen not from an absence of physical supplies but from curbs on production or exports, resulting in soaring prices and, consequently, recessions. Still, many governments insist that their job is to prevent factories shutting down and citizens being cold because of a lack of oil, not a lack of money.

Back to the Emphasis on Volumes, not Surge Capacity

This thinking has affected the debate over new sources of energy supply, such as biofuels, wind and solar power, most of which are produced and consumed domestically. To some, this implies an increase in energy security, as imported energy is reduced and there is no foreign governmental influence over domestic renewables. Far better for consumers to pay for renewable power feeding into an electrified transportation system than to rely on imported petroleum, because there is no political vulnerability of supply. Additionally, disruptions in power supplies such as have occurred during hurricanes are said to make distributed power like rooftop solar more desirable.

And again, this focus means ignoring the economics in favor of physical availability of supply. It has often translated into paying higher prices for energy on an ongoing basis, and if the purpose of energy security is to avoid paying for occasional price spikes, then the cost–benefit ratio might not be attractive. (Advocates of expensive fuels such as corn-based ethanol additionally argue that consumers prefer high but stable prices; given that ethanol blending is done as a result of government mandate, this notion of stability is clearly untrue.) Unfortunately, the cost–benefit analysis is admittedly complex, inasmuch as it involves predicting the frequency and size of energy price spikes compared with the economic losses from high prices when markets are not in disequilibrium.

Does the Energy Transformation Enhance Energy Security?

To date, however, there seems to be little empirical support for the idea that renewable energy is less vulnerable to physical disruptions from storms because the growth of renewable power is relatively recent. Additionally, it is possible that small-scale (rooftop) solar installations would require much more labour to repair in a storm than larger, centralised power systems or that the large areal nature of renewables means more damage could occur from, say, hurricane-force winds.

This is not to say that renewable energy might not enhance energy security. True, energy-importing countries would be trading reliance on imported fossil fuels for reliance on the imported equipment and/or minerals needed for renewables. At present, China produces over 60 per cent of the world's solar panels, according to the International Energy Agency.⁶ In early 2019, China had 73 per cent of the world's lithium-ion battery manufacturing capacity, although expansion in other nations is changing that dominance.⁷

Yet, it must be admitted that the related vulnerability of capital equipment involved in renewables is much less than for fuel: existing solar and wind generators will not stop operating because of a lack of new equipment, and their output will degrade only slowly if replacement parts are not available. Equipment relying on fossil fuels, on the other hand, must have a steady flow of supplies, allowing for inventory availability, and is thus more susceptible to disruptions.

And, the reliance on China for rare minerals has not proved particularly problematic, especially after China's brief embargo on exports to Japan in 2010 spurred numerous countries (especially Japan) to promote their own rare earths industries, reducing the political leverage China gained from its dominance

⁶ Chris Baraniuk, "How China's giant solar farms are transforming world energy," BBC, 4 September 2018, <https://www.bbc.com/future/article/20180822-why-china-is-transforming-the-worlds-solar-energy>

⁷ Robert Rapier, "Why China Is Dominating Lithium-Ion Battery Production," *Forbes*, 4 August 2019, <https://www.forbes.com/sites/rrapier/2019/08/04/why-china-is-dominating-lithium-ion-battery-production/#15d0d8b37867>

of the industry.⁸ But the growth of demand for rare earth minerals could mean renewed concentration of supplies in the future, and this point needs to be considered when promoting such technologies.

An Era of Operational Instability

In effect, by switching from imported energy, and especially fossil fuels, to domestically produced renewable energy, many countries may be trading geopolitical instability of supply for operational instability of supply. The energy industry has always suffered from an element of instability owing to natural phenomena — from droughts that reduce hydro power to squirrels that short out power transformers — and it may be argued that operational instability of power is no different.

However, the suggestion that the bulk of generating capacity should involve wind and solar power implies a greatly reduced degree of diversification. Aside from the fact that both suffer from intermittency, renewable energy is often geographically correlated. If there is no wind in an area, all wind turbines will cease production; if natural gas supplies to an area are disrupted, other types of power plants that may exist are unaffected.

If an area relies exclusively or heavily on one type of power, then it is more vulnerable to disruptions. In the case of natural gas, pipeline breaks are one such example. For nuclear power, the Fukushima incident in Japan meant that all of that nation's nuclear power plants were shut down for an extended period, demonstrating that even supposedly secure nuclear power could be massively disrupted (and by politics more than anything else). Which is why most companies and countries will attempt to achieve a broad diversification of supply along with integration between systems across wide areas.

However, suggestions by scholars like Jacobson et al. that 100 per cent of energy should be produced by solar, wind or hydro power would greatly reduce diversification and require either massive amounts of highly expensive energy storage, or huge levels of surge capacity and at great cost.⁹ One of the most basic lessons of the history of energy security is that unpredictable events, whether natural or political, occur all too frequently, and diversification and surge capacity are the best ways to cope with the challenges.

About the Author

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⁸ Center for Strategic and International Studies (CSIS), “Does China Pose a Threat to Rare Earth Supply Chains?” CSIS China Power Project, nd, <https://chinapower.csis.org/china-rare-earths/>.

⁹ Mark Z. Jacobson, et al., “100% Clean and Renewable Wind, Water and Solar and Sunlight All Sector Energy Roadmaps for 139 Countries of the World”, *Joule*, 8 September 2017, <https://web.stanford.edu/group/efmh/jacobson/Articles/I/CountriesWWS.pdf>.