



Employ America Research Report

Expanding the Capacity Frontier: An Approach to Increasing Energy Commodity Production

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Introduction

Energy price volatility, which may be with us for quite some time as we pursue decarbonization, is one of our nation's greatest macroeconomic threats. In just the past year, sanctions intended to punish the Russian invasion of Ukraine caused energy prices to surge in anticipation of threats to the global energy supply. Russia has long been one of the world's major suppliers of oil, refined petroleum products, and natural gas. As a result of both sanctions and spiking energy prices, Europe was forced to recommission retired coal plants, raising carbon emissions. The global energy situation has only become more volatile as China's COVID-zero policies simultaneously depressed demand and choked off supply through refined product export limitations. This disorder boosted inflation in developed markets like the US and EU, but emerging markets including Ghana, Lebanon, and Laos have experienced full-blown currency crises as they try to meet their energy needs. The delicate balance of energy supply and demand does not happen naturally, and if left solely to markets as the energy transition proceeds, will spawn more disorderly outcomes.

There is an important lesson here: **without effective planning and policy stabilization measures, new tail risks will continue to threaten the pace and viability of the energy transition.** Sharp rises in the prices of vital commodities reduce standards of living and stoke political instability (even if those sharp rises are a consequence of the agreed-upon demand for electrification and decarbonization). To minimize the economic volatility associated with the energy transition, we need to expand the capacity frontier for the production of certain new or critical commodities. Unfortunately, commodity producers won't do this on their own. High upfront costs, price volatility, and uncertain investment timelines push most producers to err on the side of underinvesting. As a result, upstream commodity capacity stalls out and leaves our economy less resilient as a result.

To decarbonize a prosperous standard of living, we must use every policy lever to push the capacity frontier for critical commodities outward. Fortunately, the federal government is uniquely positioned to use its flexible balance sheet and broad toolkit to limit uncertainty in a way that de-risks investment and encourages producers to add production.

Commodity Abundance is an Economic and National Security Necessity

Ensuring that the commodities required for the energy transition are abundantly available is both an economic and national security issue. When high-demand commodities are scarce, it becomes easier for individual countries or companies to dominate production and exert leverage. South Africa dominates platinum, the Democratic Republic of Congo dominates cobalt, and China dominates rare earth minerals. Unless we actively encourage upstream commodity abundance, we will remain vulnerable to production bottlenecks in these sectors while simultaneously missing an opportunity to gain or enhance leading-edge technology and production that depends on these commodities.

Consider solar panels, an American invention. Most of the polysilicon necessary for producing the conductive top layer for solar panels is produced in China (in no small part due to relatively cheaper electricity). This reality gives China an edge in maintaining a dominant position in solar panel production and raises concerns for US manufacturers looking for diversified sources of critical inputs, and holds for other energy transition products. Batteries for grid-level storage and electric vehicles will require production increases in lithium, nickel, cobalt, or other rare-earth minerals, depending on the technology adopted for each application. In order to deliver on the generational investments of the Biden Administration in electrification and decarbonization, we must make sure producers face an abundant supply of these critical commodities.

Increased demand for key commodities will be driven by more than just decarbonization. Global aspirations towards economic development, particularly among emerging and frontier markets, will contribute to sustained future demand. Copper is both critical for the goal of 'electrifying everything' and simply increasing reliable electricity access in less-developed nations. Supporting more production is the best way to mitigate the volatility that may arise from supply and demand imbalances as demand continues to grow.

The COVID-19 economic recovery demonstrates how industrial bottlenecks in one sector can quickly spill over into others. What started as a global microchip shortage turned into dramatic declines in the domestic production of automobiles. As recent research has shown, mitigating such bottlenecks can drastically reduce price volatility across a much wider set of goods and services than expected. Yet it remains a daunting undertaking.

The problem only becomes more difficult when we place it in the context of rapid innovation and deployment of investments to electrify and decarbonize our economy. How do we plan for bottlenecks in technologies that do not yet exist? Even relatively minor shortages of upstream inputs can wreak havoc on the broader economic and policy outlook through near-term inflation. Unfortunately, producer behavior is more likely to lead to scarcity than abundance.

Producer Behavior Can Limit the Capacity Frontier

The set of incentives that commodity producers face make these kinds of shortages more likely. By erring on the side of underinvestment rather than overinvestment, these incentives limit our ability to mitigate volatility and expand capacity across the broader economy. While each producer may be individually “rational,” the sum of this “rational” behavior can lead to suboptimal outcomes over time. The government – as the only entity large enough to engage with the macroeconomy as a whole – has a role to play in problems where coordination can reduce critical tail risks and uncertainties.

No business wants to be left holding excess inventory in an already oversupplied market. For every marginal investment, the risk of oversupplying the market can quickly outweigh the benefits. Prices are set on the margin, and even with the expected, dramatic increase in overall demand for climate transition commodities, minor local variations in supply or demand projections can cause extreme shifts in spot prices. As we have [previously written](#), the margins for global oil demand are often less than a million barrels, despite the global market representing more than a hundred million barrels per day.

This volatility is difficult for producers: profit margins disappear when supply drifts to surplus while prices explode when supply drifts into deficit. As it stands, this uncertainty is irreducible, and can render expected revenues uneconomical as investment matures into production. If you (a hypothetical producer) invest too much relative to realized prices and revenue, society might temporarily benefit from low prices, but you could soon find yourself out of business. In retrospect, this is the easiest way to understand the shale oil boom of the mid-2010s. We do not want to set the stage for socially excessive capital discipline in commodity markets necessary to the energy transition today.

The government has both social and economic objectives to promote prosperity, and insufficient investment has been a major drag on those objectives. Underinvestment can quickly lead to critical resource scarcity and inflation as a result. The government should use the tools available – lending agreements, insurance mechanisms, and other ‘de-risking’ authorities. The government’s tools can shift producer incentives such that they will err more towards producing too much, rather than producing too little. Markets cannot do this alone because

private insurance costs are punitively high. Private sellers of such insurance are plagued by the same market uncertainty, coordination costs, and balance sheet constraints as private producers.

We know this strategy works well for ensuring the availability of other important kinds of commodities: just look at agriculture. Federally-guaranteed crop insurance secures a baseline rate of return for farmers even if crop prices crash, which incentivizes increased planting and production. Though this may seem wasteful under strict definitions of “efficiency,” efficiency costs must be weighed against the importance of food abundance and security.

We can build energy security and resilience in much the same way. Instead of paying for excess milk and corn, the government should be open to backstopping investment that expands the capacity frontier and steadies the energy transition.

Priorities Necessary to Expanding the Capacity Frontier

Our approach to expanding the capacity and capacity frontier in this sector is simple: The Federal Government can (and should) use its existing authorities to encourage additional investment on the margin. This was the animating objective of our approach to using the Strategic Petroleum Reserve to boost domestic oil production. Two priorities are necessary to realize this objective: (1) limit volatility; and (2) match government authority to specific market deficiencies.

Limiting volatility is paramount. As mentioned earlier, price volatility, coupled with the uncertain timelines from investment to production, plays a critical role in holding back investment, and thus capacity. In the case of the SPR, its physical storage capacity provided a basis for the government to manage volatility. Commodity prices clear at the margin, and we demonstrated how the SPR’s considerable physical storage capacity could provide a meaningful buffer to impact that margin. The Biden administration’s recent announcement that it would begin tactical purchases of oil if prices fell within a predetermined price range offers one such method of limiting volatility.

In commodity markets where we do not have storage or stockpiling capacity, the scope for volatility reduction is much narrower. Absent congressional action, intervention may mean executive action to intervene in existing markets to maintain or expand private storage capacity. Many markets that may prove key to decarbonization and electrification already have more than sufficient storage capacity, even if there is not corresponding governmental warehousing and stockpiles. Nickel, copper, and a number of other metals have existing derivatives markets and warehouse capacity, but the underlying price volatility makes insurance contracts punitively expensive. Intervening in these markets to lower the price could be relatively straightforward. However, establishing methods

for intervening in newer, less-liquid markets will also be necessary to reduce volatility.

Outlining the technical details of the storage requirements for a strategic reserve of lithium precursors or rare earths is beyond the ambit of this piece, but the production processes of lithium might suggest an approach to emulating a strategic reserve through a combination of existing authorities.

Refined lithium is highly unstable, but precursors like lithium brine and spodumene can be safely stored. Since no arm's-length financial market currently exists for lithium precursors in the way it does for nickel or petroleum, government contracts structured as insurance or hedge options could help jump-start the formalization of this market. At the same time, lending facilities and authorities should be utilized to support refining capacity. These two actions would help catalyze investment while reducing our vulnerability to lithium price volatility.

The situation for more exotic materials occasionally required for battery production is more difficult. Many, like indium, gallium, and vanadium, are byproducts of other, more common metal refining processes. In these situations, a standing facility would have a critical role to play in ensuring the availability and efficient use of these byproducts, potentially limiting the amount of new investment necessary. Federal authorities to encourage capture through technological advancement and deployment may be most useful here. Without a ready purchaser, these incidental resources can easily be squandered.

Ideally, Congress should build permanent facilities to achieve these objectives. These purpose-built facilities could take the form of expanding the SPR to a "Strategic Energy Reserve" that includes storage for commodities. Such facilities could focus on commodities with limited carrying costs and should include investments in refining capacity. Senator Coons' Industrial Finance Corporation, which has broad authority to boost commercial production and supply chain resilience, could also create facilities targeted to this purpose. Any such facility should include a range of capabilities involved in forecasting and responding to markets for these specific commodities, and may also prove a natural outgrowth of enhanced supply chain monitoring. In short, a long-term institution should provide a buffer stock of key commodities in order to smooth uncertainty on the investment side while minimizing price volatility in spot markets.

By supporting additional production and reserves of these key commodities (either privately or publicly) and creating storage capacity to maintain those stocks, the government can provide standing offers to buy and sell these materials. As such the government would aid in managing the markets while helping keep spot prices within a well-communicated corridor. Even better, by using forward contracts and options, strategic reserves can incentivize greater

investment in advance of the actual delivery of the finished material. This will allow the facility to effectively multiply the degree of uncertainty mitigation it is able to provide for a given volume of storage space.

The second priority is that the government must match its tools and authorities to failures in each commodity market which, if rectified, will increase investment at the margin. Beyond the storage capacity, the SPR's acquisition authorities offered flexibility to address the specific market failures particular to the oil industry. For other commodities, the authorities are not so expansive, nor are the market deficiencies exactly the same. But with creativity, and an understanding of particular bottlenecks in each industry, the federal government can use its authorities to expand the capacity frontier by bringing additional production online.

It is worth distinguishing between two kinds of interventions: those in well-established commodities markets and those in yet-to-be-established commodities markets. As mentioned above, we do not even know the full set of minerals that will prove critical for decarbonization. And aside from the particular challenges that a certain type of commodity production may face—there are macroeconomic headwinds that are limiting our capacity frontier.

Perhaps the most impactful is the return of non-zero interest rate policy. The Fed's interest rate hikes have directly contributed to a higher cost of financing fixed capital formation, risk intermediation, and inventory replenishment. While these effects are not the only ingredients relevant to the supply side, they do have meaningful effects at the margin. Regardless of the exact circumstances, government intervention should play the same role in each case—providing the support necessary to expand the capacity frontier—but the technical aspects of the intervention will be markedly different across commodities.

The Solution: Utilize Every Authority to Expand the Capacity Frontier

Tools as varied as grants, loans, loan guarantees, purchase guarantees, procurement or “other transactions,” can all be used to minimize the risk faced by investments in necessary commodities.

- Where lending is the primary authority, the use of secured but nonrecourse loans and special purpose vehicles may be warranted (agencies could look to the Federal Reserve, which has proven itself particularly adept at using such authorities and structures to functionally provision insurance through the form of lending authorities)
- Where acquisition is the authority, it may prove ideal to structure acquisition contracts in a market-contingent manner—like put option contracts—to reduce downside commodity price exposure for producers.

- Where procurement and contracting are the authorities, requiring contractors to have minimum stockpiles may be warranted. Underpinning all of this would be the need to build storage capacity, either through public ownership, or through private contracting.

The important point is that these authorities exist. As we've previously argued, there is a legal justification for the Exchange Stabilization Fund (ESF) to create an emergency facility that insures and accelerates production for critical commodities. The justification is strongest for fuel, a class of commodities which have severely depleted currency reserves for nations like Sri Lanka and Lebanon; it could also be justified for steel, or for food-related commodities like potash. The justification for using the ESF to support commodity production is not abstract.

A short-term facility could plausibly bridge us through a period of high economic anxiety and uncertainty. Many of these commodities, like copper or lithium, have considerably longer lead times from investment to production. If we hope to have sufficient supply of commodities for the energy transition, producers must be making affirmative investment decisions now. Unfortunately, tighter financial conditions coupled with an uncertain economic outlook are pushing the opposite. As a result, if supply undershoots as demand substantially increases, the climate transition presents a severe risk to foreign exchange and balance of payments stability. Second, encouraging price stability for alternative energy commodities will reduce demand for the most exchange-rate-linked commodity—oil. As such, using the Exchange Stabilization Fund to stand up Strategic Reserves of various commodities is a natural extension of the strategy of using it to help finance expanded domestic fossil fuel production.

Conclusion

As the past year has shown, **we are governing in an era of fragility**. It is up to the federal government to utilize its unique authorities and flexible balance sheet to mitigate the uncertainty currently restraining investment while providing producers with a substantial cushion to invest without such uncertainty. As the complexity and challenges of getting to a decarbonized economy become clearer, it is imperative that the government use these tools to their fullest extent to support a cleaner and more prosperous future for all.