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How Much of the Worsening Energy Crisis is Due to Depletion?

Coal and natural gas spot prices have recently soared to record levels internationally, while oil is trading at over $80 a barrel—the highest price in seven years. Newspaper columnists are asking whether people in Europe and Asia who can't afford high fuel and electricity prices might freeze this winter. High natural gas prices are causing fertilizer prices to spike, which will inevitably raise costs to farmers, with eventual catastrophic impact on people who already have trouble paying for food.

Political commentators are naturally searching for culprits (or scapegoats). For those on the business-friendly political right, the usual target is green energy policies that discourage fossil fuel investment. For those on the left, the culprit is insufficient investment in renewable energy.

But there's another explanation for the high prices: *depletion*. I'm not suggesting we're about to completely run out of coal, oil, or gas; there's no immediate danger of that. However, the energy industry has historically targeted the highest-quality and easiest-accessed of these resources, which means that what's left, in most cases, are fuels that will be costlier to extract and process—and also more polluting. The proximate causes of current price spikes may be transient market conditions (the see-sawing pandemic, Britain's decision to leave the European Internal Energy Market, Russia's reluctance to provide more gas to European buyers until a new pipeline is given final approval, and China's choice to reduce coal imports from Australia). But behind the energy headlines is persistent, accelerating depletion.

Fossil fuel supply shocks have long been forecast by the few analysts who track resource depletion and its consequences. In the early years of this century, a robust literature developed around the concept of "peak oil" (as well as "peak gas" and "peak coal"). Analysts predicted that world oil production might begin to decline as soon as 2005 or 2010, natural gas in the 2020s, and coal in the 2020s to 2040s.

Forecasts for a peak in world oil production proved premature, with new supplies of "unconventional" petroleum (i.e., tight oil, oil sands, and deepwater oil) coming on line to boost US and world production by millions of barrels per day. Roughly 90 percent of new oil output added during the last decade came from US tight oil wells that were horizontally drilled and

fracked. At the same time, using the same drilling and fracking technologies, so much natural gas was liberated that the US became a significant exporter. Meanwhile, Australia ramped up its coal mining in order to export the fuel to support fast-growing Asian economies. Supply problems were solved—sort of, and temporarily.

Now, circumstances are changing and reality seems to be catching up with peak-supply forecasts. Many economic analysts attribute shortages and price hikes to failure by the fossil fuel industry to invest enough in exploration and production. But, to some extent, that's just a misleading way of acknowledging that, from now on, extracting fossil fuels from Earth's crust will take more money, technology, and energy than it used to.

So, to directly address the question with which this essay is titled: exactly how much of the world's current energy crisis is due to fossil fuel depletion, and how much to other factors? It's impossible to assign percentages. There has always been some volatility in fossil fuel markets. But as depletion continues, price spikes and troughs are likely to grow in amplitude, and to become more frequent. And that's precisely what we are seeing. Since 2005, when world conventional oil production stopped growing, petroleum prices have indeed become more volatile, with spot prices rising to the all-time record high of $147 (in July, 2008) and sinking to the all-time record low of -$37 (in April, 2020). Without depletion, there would still have been price variation—just as there would still be extreme weather events without climate change. But, like climate change, depletion is a slowly accumulating background condition that widens the envelope of day-to-day or year-to-year extremes.

Let's dig a little deeper into the "lack of investment" explanation for high fuel prices. As we've seen, higher rates of investment are needed because new projects are expensive. But, at the same time, it is also true that concern over climate change is leading major investors to reconsider long-standing practices of funding fossil fuel producers. Recently the highly influential International Energy Agency recommended that *no* new fossil fuel projects be approved after 2021—a suggestion inconceivable from that organization just a few years ago. The list of pension funds and banks that are divesting from fossil fuels grows with each passing month.

But depletion and climate concern are not the only reasons for levels of investment in fossil fuels that may be insufficient to stave off hardship for the industry—and likely for society as a whole. The fossil fuel industry requires relatively stable and predictable prices for its own internal investment purposes. High prices are viewed as good, in that they generate more profits that can be reinvested in new projects. But very high prices have a downside: when energy becomes unaffordable, the stage is set for a price collapse. Market volatility makes fossil fuel companies wary to expand operations, as new projects are often many years in development, and the comparatively few remaining prospective drilling sites are unlikely to yield profits absent stable, high prices. In recent years, some companies have decided that their free cash flow is better used in buying back their own stock shares rather than in funding speculative new oil or gas drilling. That's also partly because divestment campaigns are tending to lower the value of shares in oil and coal companies.

So, if there are reasons for high energy prices other than depletion, why focus on this particular one? Two things. First: virtually nobody is mentioning depletion. I routinely scan energy-related news articles in the mainstream press, and in its coverage of the energy crisis I have yet to see depletion mentioned once—even though it is undeniably a contributing factor. Why is it being ignored? Maybe because of this second thing: it can only get worse. Other causes of energy price volatility may be solvable with investment or government policy, but not depletion. As long as society is extracting and burning fossil fuels, their resource quality (that is, their accessibility, affordability, and usability without expensive processing to remove pollutants like sulfur or to bring them up to standards that will suit existing refineries) will continue to decline and costs of production will increase.

If fossil fuel prices are becoming more volatile, and if that's partly due to depletion (which is irreversible), then this has a couple of implications—one fairly obvious, another less so. The obvious implication: we probably have a wild ride ahead of us. Energy is the master resource; literally everything we do requires it. If energy gets more expensive, cost increases will migrate throughout the economy, making everything we do harder and more expensive. Unaffordable energy usually translates to inflation, with wage hikes unable to keep pace with soaring prices of food and consumer goods. The main likely brake on the inflationary accelerator of high energy prices would be widespread deflationary debt defaults—which would likewise draw nasty consequences in their wake.

But there's a less obvious consequence of depletion and energy price volatility, and it has to do with climate policy. It takes energy to make solar panels, wind turbines, batteries, electric vehicles, heat pumps, and all the rest of the technology that policy makers propose to replace current fuel-burning infrastructure. Most of the energy that will be required for transition purposes, at least in the early stages, will have to come from fossil fuels—as is the case currently with Chinese solar panels being made in factories operating with coal-fueled electrical power. If society attempts to maintain current levels of energy services throughout the transition, the result will be a spike in both energy usage and carbon emissions (which policy makers hope to offset using unscalable and unaffordable carbon capture technologies). If fossil energy prices are going haywire during the transition, that makes an already arduous and perilous process even more so.

Many climate activists may be happy to see fossil fuel price spikes and supply problems. Yes, if oil gets expensive, that means more people will buy electric cars. But where are the electric airliners, semi-trucks, container ships, and cement factories that will be needed? No company can simply order one today; they're mostly still in the realm of fantasy. Meanwhile, solar and wind together are supplying just 3.3 percent of the world's current primary energy budget.

Policy makers envision an energy transition in which solar and wind seamlessly and quickly substitute for coal, oil, and gas, leaving consumers enjoying just the same comforts and conveniences as they do now, while emitting no carbon. That's an exceedingly unlikely scenario. The real energy transition will almost certainly be a shift from using a lot to using a lot less.

If that's true, then what should we do? Over a dozen years ago, I was among

several energy analysts and commentators who recommended the adoption of depletion protocols (which are essentially programs for conserving and rationing nonrenewable resources) as a policy tool for helping society adapt to the inevitable end of the fossil fuel era. Politicians were uninterested. Today, rationing is still the best policy response. Energy could be rationed in several different ways; in addition to depletion protocols, another rationing approach I've long liked is tradable energy quotas, which effectively provide monetary incentivizes to those who use less energy. With rationing, those who use the most sacrifice the most, while those who use the least maintain (or gain) access to necessities.

There were always two reasons to reduce society's reliance on fossil fuels: pollution and depletion. Pollution has taken center stage via climate change. But as long as we keep extracting and burning coal, oil, and natural gas, our depletion problem likewise keeps simmering away in the background. This winter, the pot may boil over. No honest policy maker can say they weren't warned, or that there are no good responses.