

Watts Up With That?

November 1, 2021

Texas State Geologist Scott Tinker: The Bad Assumptions Underpinning COP26 and the Impending Energy Train Wreck

[David Middleton](#)

Guest “Reality can be a harsh teacher” by David Middleton

The world is already in an “energy crisis” of sorts due to the tremendous misallocation of capital from functioning energy infrastructure to mythical energy infrastructure. This has largely been driven by the false perception that a massive reduction in greenhouse gas emissions is the only way to save our planet (cue George Carlin). As if this wasn’t bad enough, the COP 26 path “to net-zero emissions” is “paved with” nothing other than “bad assumptions”.

The road to Glasgow is paved with bad assumptions

BY SCOTT W. TINKER, OPINION CONTRIBUTOR

While global leaders prepare to trek to Glasgow for COP26 – the United Nations Climate Change conference – Asia, Europe and Britain are experiencing [energy crises](#), largely politically self-inflicted. The public is paying the price.

[...]

As the guide for getting to net-zero emissions, the International Energy Agency (IEA) – an intergovernmental organization often called the “world’s energy watchdog” – published its “[Net Zero by 2050: A Roadmap for the Global Energy Sector](#)” in May of this year, where it describes a “narrow but achievable” path to net-zero emissions.

[...]

As global leaders at COP26 prepare to commit trillions of dollars, guided by this roadmap, it is important to understand how confusing, and even implausible, are some of the roadmap’s key 2050 assumptions.

Assumption No. 1: No new oil and gas fields, and no new coal mines or mine extensions.

In the roadmap, unabated coal demand declines by 98 percent, when in fact coal in Asia continues to [expand](#) significantly. Oil consumption declines by 75 percent, and natural gas by 55 percent.

These fuels are replaced within the roadmap in part by expanding wood, biomass and biofuels, even though bioenergy has been shown by many [studies](#) not to be particularly “green.”

[...]

Assumption No. 2: While population and the global economy continue to grow, global energy use actually declines.

[...]

Assumption No. 3: Two-thirds of total energy supply in 2050 will come from wind, solar, bioenergy, geothermal and hydro.

[...]

Assumption No. 4: In the roadmap, per capita CO₂ emissions in developed economies, currently around 10 tons, and in emerging and developing economies – for the more than 6 billion people other on Earth – currently around 4 tons, decline to zero.

[...]

Assumption No. 5: Investments in end-use energy, energy infrastructure, electricity generation and low emissions fuels rise from just over \$1 trillion annually to \$4 trillion; cumulatively around \$120 trillion in the next 28 years. Staggering.

Achieving any single assumption will be very difficult – but taken in the aggregate, it’s highly unlikely.

[...]

Yet, many academics, think tanks, advocacy organizations and government officials continue to propound IEA roadmap-type thinking and produce reports with 80 percent or more solar and wind. Reality can be a harsh teacher as we witness the many self-inflicted global energy crises today, in systems with considerably less than 80 percent. Weather-dependent wind and solar can’t deliver reliable energy at scale without extensive and expensive backup.

[...]

The road to green should not be paved with bad assumptions.

Scott W. Tinker is director of the Bureau of Economic Geology, a professor holding the Allday Endowed Chair at The University of Texas at Austin and produces global energy documentary films.

[The Hill](#)

Assumptions, Meet Reality...

The US Energy Information Administration's [2021 International Energy Outlook](#) paints a somewhat more realistic path to 2050...

Source: U.S. Energy Information Administration, [International Energy Outlook 2021](#) (IEO2021)

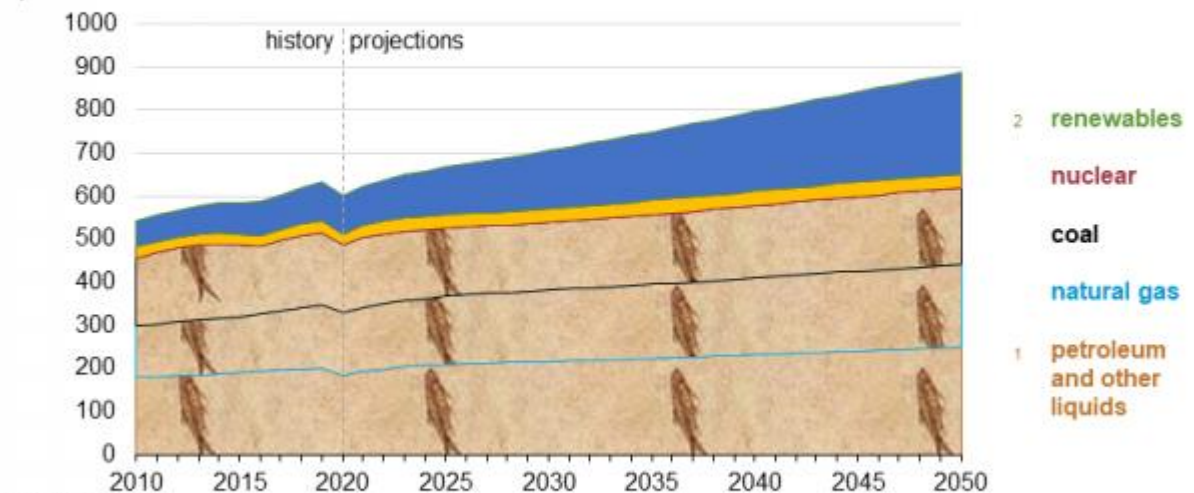
Note: *Petroleum and other liquids* includes biofuels

They forecast that fossil fuels will continue to be the world's dominant source of primary energy for many decades to come...

Liquid fuels remain the largest source of primary energy in the Reference case, but renewables use grows to nearly the same level

Primary energy consumption by energy source, world

quadrillion British thermal units



¹ Includes biofuels

² Electricity generation from renewable sources is converted to Btu at a rate of 8,124 Btu/kWh



IEO2021 Release, CSIS
October 6, 2021

Turning an “energy crisis” into a train wreck...

The same EIA base case outlook that has fossil fuel demand increasing past 2050, also features the [global internal combustion engine \(ICE\) light duty vehicle \(LDV\) fleet peaking in 2038](#), with the electric vehicle stock approaching 700 million units in 2050...

Source: U.S. Energy Information Administration, [International Energy Outlook 2021](#) Reference case

You can't get there from here...

In order to reach it's forecast of 673 million EV's on the road by 2050, the EV production rate from 2041-2050 would have to average nearly 29 million vehicles per year. To put this number in perspective:

All the mines Tesla needs to build 20 million cars a year

Frik Els | January 27, 2021

Elon Musk and his merry band of executive vice presidents had [plenty of advice for the mining and metals industry](#) at the company's Battery Day event in September, where the road map to a \$25,000 Tesla was laid out.

How easy it is to mine lithium (just add salt), just how much of it there is in Nevada (enough for 300 million EVs), how to be environmentally friendly ("put the chunk of dirt back where it was") and, given these facts, why miners haven't been trying harder.

Since lithium is "just like widely available", according to Musk and Tesla's scientists, they have eliminated other hard to come by metals like graphite (replace it with sand, obvs) and cobalt from batteries (at [least](#) in [theory](#)), Musk's prime raw material worry is nickel.

Nickel and dined

Devil's copper is in the details

MINING.COM used data from [Adamas Intelligence](#), which tracks demand for EV batteries by chemistry, cell supplier and capacity in over 90 countries, to calculate the deployment of raw materials in Tesla cars on a sales weighted basis in 2020.

By extrapolating those numbers, the company's use of raw materials, if it was producing 20 million cars a year instead of the 500,000 vehicles it made last year, was determined.

[MINING.COM](#)

METALS TESLA NEEDS TO BUILD 20M CARS A YEAR

Tesla Production @ 20m	Material Required (t)	Production 2019 (t)	% of Production
Graphite	1,028,775	1,100,000	94%
Nickel	750,410	2,460,000	31%
Lithium	127,302	77,000	165%
Copper (vehicle)	1,820,000	21,000,000	9%
Manganese	20,811	19,000,000	+0%
Cobalt	68,315	122,000	56%
Aluminum (battery)	16,544	64,000,000	+0%
Aluminum (vehicle)	3,380,000	64,000,000	5%
MagREO (NdPr, Dy, Tb)	18,000	46,000	39%

Battery graphite, nickel, cobalt, lithium, manganese, MagREO (NdPr, Dy, Tb): Adamas Intelligence
 Production: USGS, BMO, Morgan Stanley, BP, Fitch, Excl. synthetic graphite
 Copper, aluminum (vehicle): UBS estimates of Chevy Volt

MINING.COM
EV METAL
INDEX

Graphite is technically not a metal; however it does conduct electricity and is often considered a metal for industrial purposes. [MINING.COM](https://www.mining.com)

20 million Tesla EV's per year would require massive expansion of graphite, nickel, lithium, cobalt and MagREO (magnet/heavy rare earths) production. Bear in mind that this massive expansion in metal mining would occur while global petroleum consumption was increasing by 25%. On top of this, graphite production would have to increase by more than 100% to support the production of 28 million EV/yr.

Ever wonder where most graphite comes from?

	Mine production (t)		Reserves (t)
	2018	2019	
China	693,000	700,000	73,000,000
Mozambique	104,000	100,000	25,000,000
Brazil	95,000	96,000	72,000,000
Madagascar	46,900	47,000	1,600,000
Canada	40,000	40,000	
India	35,000	35,000	8,000,000
Russia	25,200	25,000	
Ukraine	20,000	20,000	
Norway	16,000	16,000	600,000
Pakistan	14,000	14,000	
Mexico	9,000	9,000	3,100,000
Korea, North	6,000	6,000	2,000,000

Vietnam	5,000	5,000	7,600,000
Sri Lanka	4,000	4,000	
Namibia	3,460	3,500	
Turkey	2,000	2,000	90,000,000
Zimbabwe	2,000	2,000	
Austria	1,000	1,000	
Germany	800	800	
Other	200	200	
Tanzania	150	150	18,000,000
United States	–	–	
World total (rounded)	1,120,000	1,100,000	300,000,000

Graphite Data Sheet – Mineral Commodity Summaries 2020 ([USGS](#))

That’s just MINING.COM... What do real scientists say?

This paper proposes a CoMIT (Cost, Macro, Infrastructure, Technology) model that can be used to analyse the impact of mass EV adoption on critical raw materials demand and forecasts that, by 2030, demand for vehicles will increase by 27.4%, of which 13.3% will be EVs. The model also predicts large increases in demand for certain base metals, including a 37 and 18-fold increase in demand for cobalt and lithium (relative to 2015 levels), respectively.

[Jones et al., 2020](#)

Metal demand for vehicles (kt).	AL	CO	CR	CU	FE	LI	MN	NI
World Total 2015 (est)	12,345	5	317	2,049	116,765	8	52	171
World Total 2030 (proj)	17,385	185	423	3289	106,731	147	271	808
% Change 2015-2030	41%	3600%	33%	61%	-9%	1738%	421%	373%

[Jones et al., 2020, Table 1, summarized.](#)

The impending energy train wreck has already left the station...

How Climate Activists Caused The Global Energy Crisis – OpEd

October 27, 2021 Michael Shellenberger

Over the last decade, climate activists have successfully pressured governments, banks, and corporations to divest from oil and natural gas companies. At first such efforts appeared to be strictly symbolic. But in recent years climate activists succeeded in driving public and private investment away from oil and gas exploration and toward renewables. The result is the worst energy crisis in 50 years.

Under-investment in oil and gas exploration is not the only cause of today’s energy crisis. The economic comeback from the covid pandemic has pushed up demand. Lack of wind in Europe meant higher demand for both [natural gas and coal](#). And a [drought in](#) Brazil meant it had to import natural gas.

But the main cause of energy shortages is the half-decade-long under-investment in oil and gas driven by climate concerns.

Normally, the anticipation of higher oil and gas demand causes firms to increase investment in exploration. That hasn't happened. The main reason, [according to Goldman Sachs](#), is climate activist pressure on governments, firms, and banks to divest from oil and gas exploration.

It's not like oil and gas executives didn't know that underinvestment would lead to today's price shocks. It's that they were ignored. When the former CEO of Exxon, Lee Raymond, was asked what kept him up at night he [said](#), simply, "Reserve replacement." Shareholders had demanded he stop investing. In 2020, under pressure from climate activists, JPMorgan Chase, America's largest investment bank, [removed](#) Raymond from his role as the board's lead independent director.

Part of the problem is that neither corporations nor governments are taking the right actions. Some are going in the wrong direction. The U.S. Congress appears close to approving a deal to pour \$500 billion into renewables and its enabling infrastructure over the next decade. Those taxpayer subsidies could further reduce the incentive for private firms to invest in oil and gas. Even if they don't, the Biden administration has moved to restrict oil and gas drilling on public lands.

As a result, foreign nations will benefit from rising oil and gas prices at America's expense. Saudi Aramco recently [increased](#) its investment in exploration and production by \$8 billion. "Of course we are trying to benefit from the lack of investments by major players in the market," its CEO said.

Increasing America's dependence on foreign oil producers makes even *The New York Times*, which has long championed oil and gas divestment, nervous. A reporter there recently [warned](#) that "the United States and Europe could become more vulnerable to the political turmoil in those countries and to the whims of their rulers."

Pundits are increasingly comparing President Biden to former President Jimmy Carter, and the 2020s to the 1970s. And, indeed, today's energy crisis is eerily similar to what happened back then. Carter throttled oil and gas production, promoted renewables, and provoked a backlash that helped elect Ronald Reagan.

Michael Shellenberger is a Time Magazine "Hero of the Environment," and president of Environmental Progress. Follow him on Twitter @ShellenbergerMD.

[Eurasia Review](#)

Taking 2021 as a starting point, we are looking at three decades of growing demand for fossil fuels and other reliable sources of energy, while continuing to misallocate capital from fossil fuels to unreliable energy sources and electric vehicles. This will drastically increase the demand for energy and mineral resources, while making energy and mineral resources much more expensive and less reliably obtainable.

While the tracks of this energy train wreck were laid in 2014, the past 10 months have made this energy industry observer feel like he's been watching the greatest hits of Gomez Addams' train wrecks...