

On the virtue of self-delusion (or maybe not)

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The chief virtue of self-delusion is that it enables one to ignore discomfoting aspects of reality. The downside is that habitual practice may prove catastrophic, even fatal.

Starting premise: The human brain is obsolete

- The human brain evolved in the context of small tribal groups living in spatially limited, relatively knowable predictable ecosystems. Tribal myths and shared illusions were relatively harmless.
- Result: We tend think in simplistic, linear, reductionist ways; we don't 'get' complexity; we don't connect the dots.

Modern techno-industrial (MTI) humans:

- Are not neuro-cognitively equipped to understand, let alone control, the mind-numbingly complex world-system of overlapping sub-systems we ourselves have created.
- Cannot truly grasp the workings of the global economy, geopolitics, or even the internet, let alone the climate system and the ecosphere.

One result: Climate change as reductionist fixation

- MTI society tends to fixate on a single problem at a time—the economy, climate change, the pandemic and now back to climate change.
- Climate change is important but not *the* existential threat facing humanity.
- The present focus on climate change as ‘the’ issue is a prime example of a *pan-cultural shared illusion*.
- **Climate change is a *distraction* from a greater meta-problem.**

The *real* existential threat is **overshoot**

- **The human enterprise is using bio-resources faster than ecosystems can regenerate and producing wastes in excess of the assimilative capacities of the ecosphere.**
 - We are literally consuming and polluting the biophysical basis of our own existence.
 - This is the archetypal definition of biophysical unsustainability.
 - Overshoot is a systemic (not sectoral) crisis.
 - Virtually all so-called ‘environmental problems,’ including climate change, are mere symptoms of overshoot.

Overshoot is the overriding disease.

Overshoot: An exemplary, *inexorable* wicked problem

- If we don't deal with it, we will be forced to deal with it.

Left unattended, overshoot is terminal.

Consider the current fixation, climate change

To avoid potentially catastrophic climate change the world community must:

- reduce CO₂ emissions by ~ 50% below 2010 levels by 2030 (i.e., >8% per year beginning in 2022).
- achieve complete decarbonization by 2050.
(More recent studies suggest we must decarbonize by 2030.)

What did COP26 achieve?

- Pledges that **do not go far enough in cutting emissions** and lack details or unanimity.
 - 40 countries to quit coal; 30 countries to phase out ICE cars/vans by 2040; 100 countries to slash methane emissions 30% by 2030; 130 countries to end deforestation.
- **Pledges are voluntarily and non-legally binding.**
- **No plan to limit warming to the Paris 1.5 C° , or even 2 C°.**
- **Before COP26, we were tracking 2.7 C° warming by century's end; new commitments could limit warming to (a catastrophic) 2.4 C° , *assuming countries follow through.***

Meanwhile, by popular demand



- Climate activist organizations (including Greta Thunberg and followers) demand that the world rapidly slash carbon emissions, abandon fossil fuels, stop subsidizing the fossil energy sector and transition to 100% renewable 'green' energy.

Egged on by such simplistically delusional nonsense* as

- “...if solar photovoltaics, wind, batteries and hydrogen electrolyzers continue to follow their current exponentially increasing deployment trends for another decade, we achieve a near-net-zero emissions energy system within twenty-five years.” [a contradictory arithmetic truism and material and economic impossibility; also, the system and all replacement end-use equipment would be built-out using mostly FF with associated carbon emissions]
- “...If non-energy sources of carbon emissions such as agriculture are brought under control, our analysis indicates that a rapid green energy transition would likely generate considerable economic savings while also meeting the 1.5 degrees Paris Agreement target.” [There is zero possibility that non-energy sources of emissions will be reduced; they will increase, likely dramatically, because of overshoot and positive feedbacks e.g., expanding agriculture, deforestation, increasing wildfires, melting permafrost; alleged economic savings do not account for ecological and social externalities; there is no possibility of achieving the 1.5 C° warming limit]

Official negotiations and climate activism: Two versions of the same MTI shipwreck



- Governments, economists, and corporate interests strive to maintain business-as-usual **by shoveling more coal and drilling more oil/gas** for the engines of growth while capturing the CO₂ from the stacks.
- Most climate activists and GND aficionados strive to maintain business-as-usual-**by-alternative-means**, replacing the ship's FF engines with electric motors powered by wind turbines and solar PV.
- **Both assume minimal disruption and continuous economic/population growth.**
- **Neither acknowledges overshoot.**

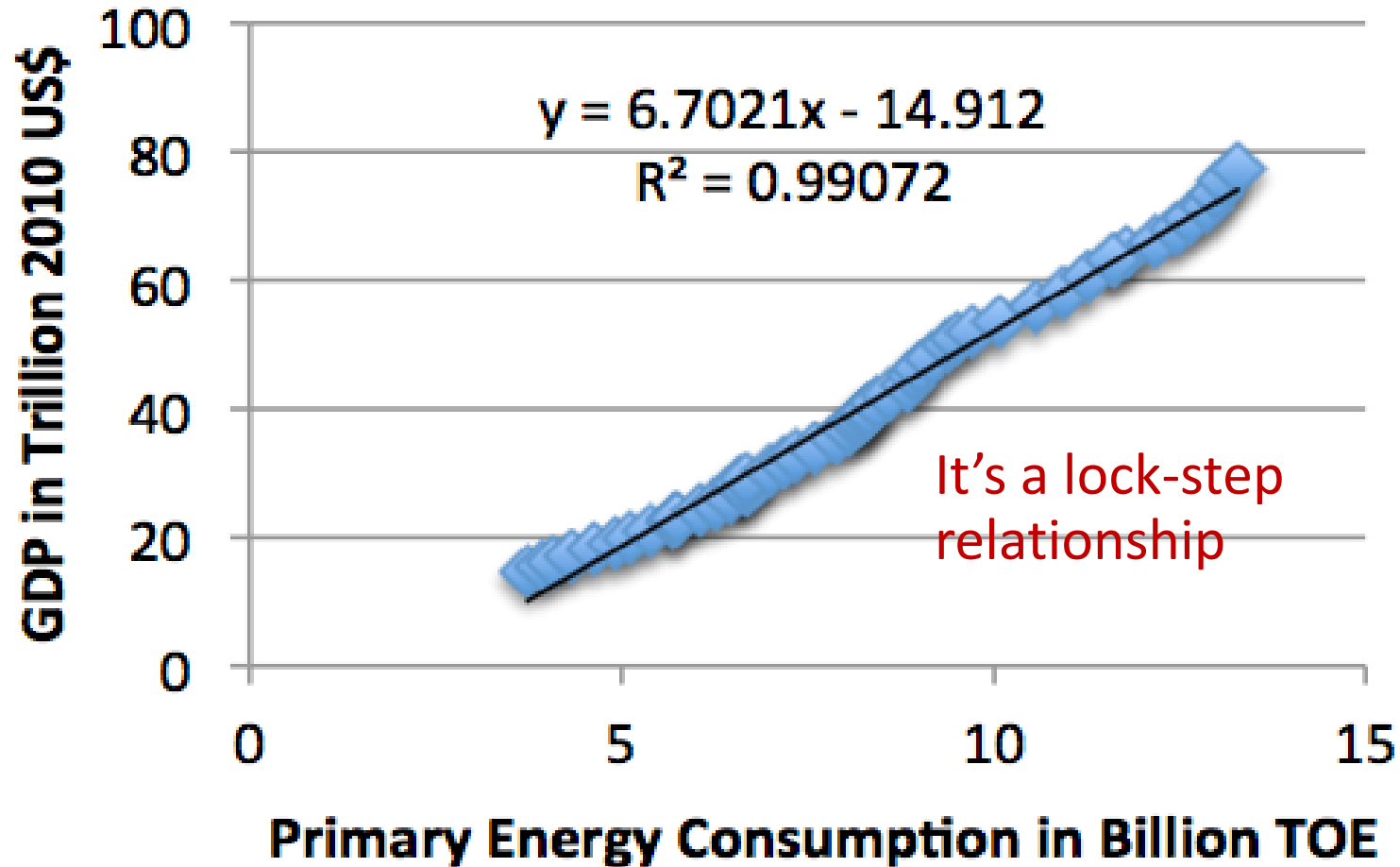
Proffered 'solutions' from both sides exemplify society's shared illusion

- Disaster policy is being designed to serve the capitalist growth-based [MTI] economy “...so the latter becomes the solution to (not the cause of) the [problem]” (Spash 2016, p.931).

Was COP26 even about climate change?

- “Climate scientists have practically been excluded from COP meetings, dominated as they are by economists, lawyers and politicians. To date no address has been made by leading climate scientists... leaving delegates and populations unaware of the ultimate consequences of global climate devastation.”
-the science-based projections of global heating have only received faint echoes among the assembly of warring tribes at COP-26, dominated by nationalism, vested interests and sheer ignorance of the current trend, which can only culminate in the end of civilization” (Glickson 2021).

What about this relationship? Energy consumption vs World GDP, 1965 – 2016 (2010 \$)



Energy powers economic growth

(abetted since the 1970's by globalization—cheap labour and resources – and a debt/credit boost)

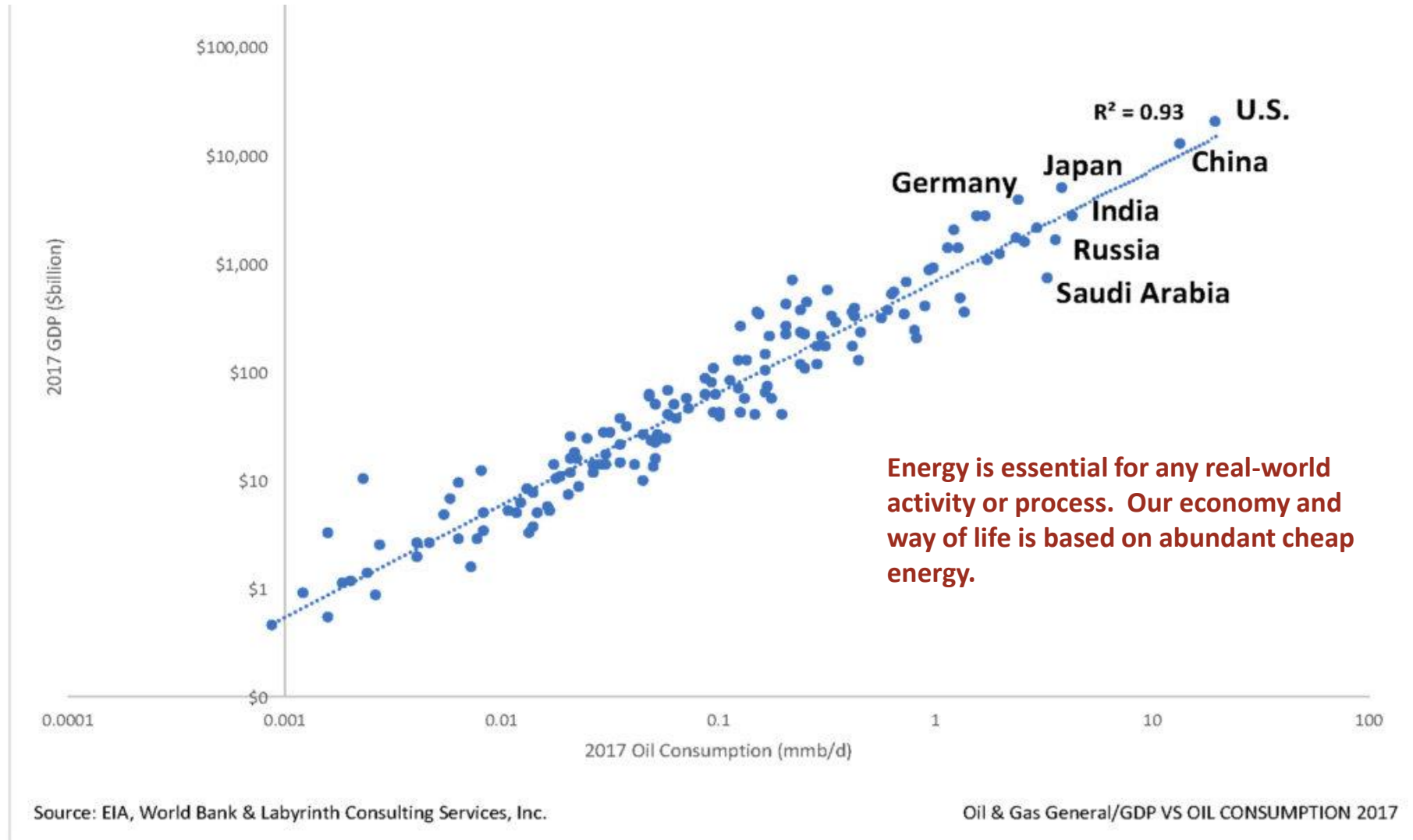
◆ 1965-2016

— Linear (1965-2016)

Source: Tverberg (2021)

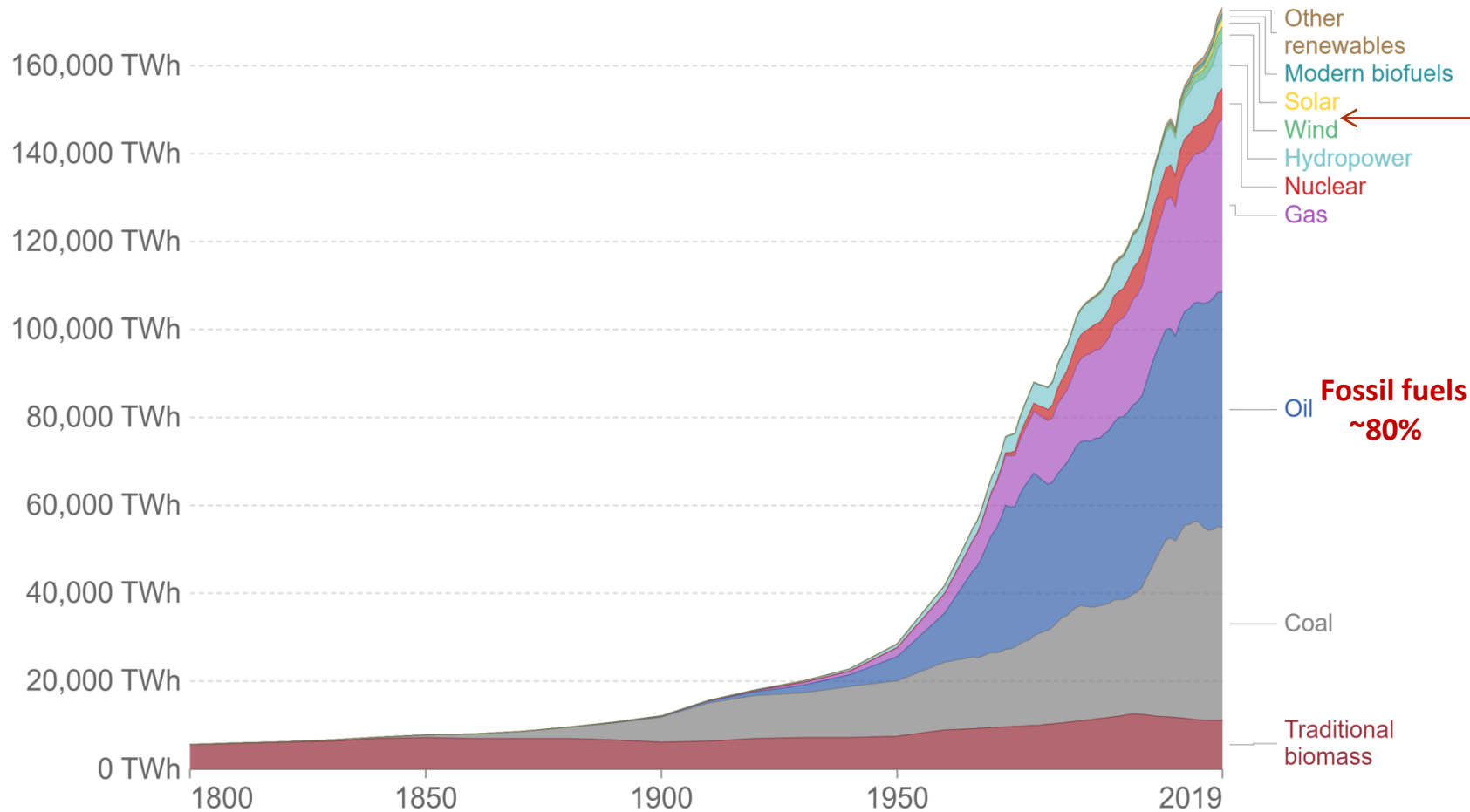
GDP is proportional to oil consumption

(Log scales)



Global Primary Energy Consumption by Source

Our World
in Data



Solar and wind
together = 3%

- Abundant energy (currently mostly fossil fuels) is essential even to *maintain* the human enterprise.
- If we were to end fossil energy use abruptly, **hundreds of millions, even billions, of people would likely die** from food and other resource shortages, civil strife, and geo-political chaos.

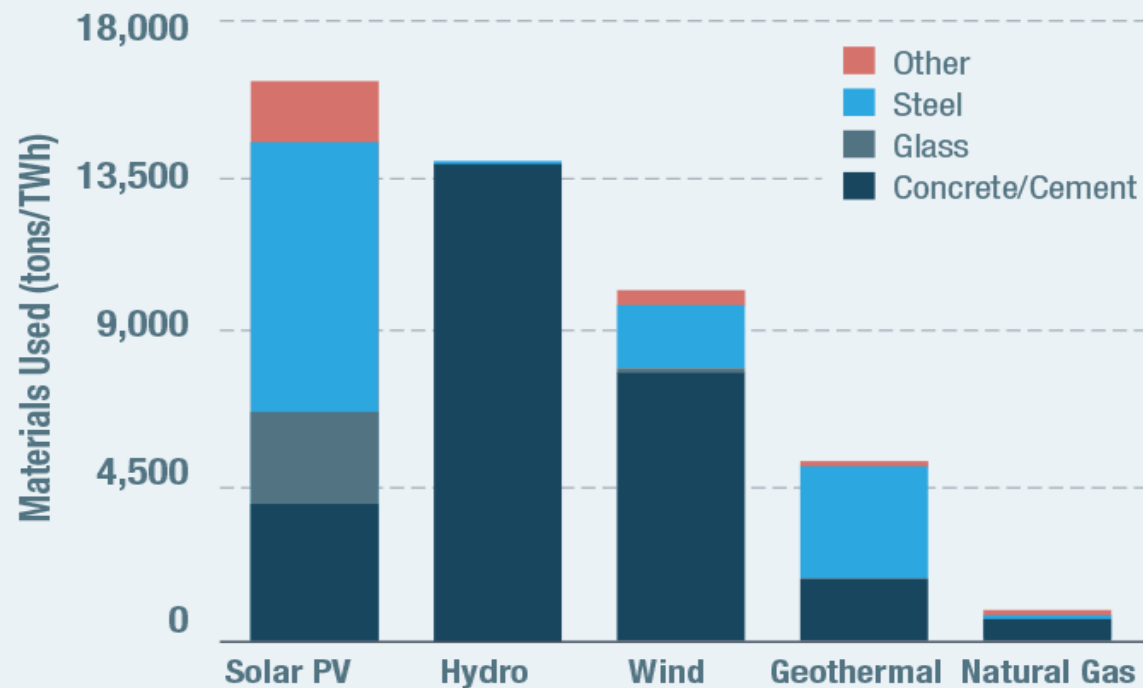
But wait, what about 'green' RE?

At scale, wind turbines, solar PV panels, hydrogen face numerous technical challenges

- likely materials (e.g., rare metals) shortages.
- massive increases in mining and refining involving fossil fuels, toxic wastes and slave/child labour.
- manufacturing and operation are ecologically damaging and socially unjust.
- major distribution bottlenecks.
- require more space than many countries have available.
- are impossible to scale up in a climate-relevant time-frame.
- are not actually renewable, merely replaceable (15–20 yr working life-span for wind turbines; 20–30 for solar panels).

RElec tech: material demands orders of magnitude greater than equivalent gas generation

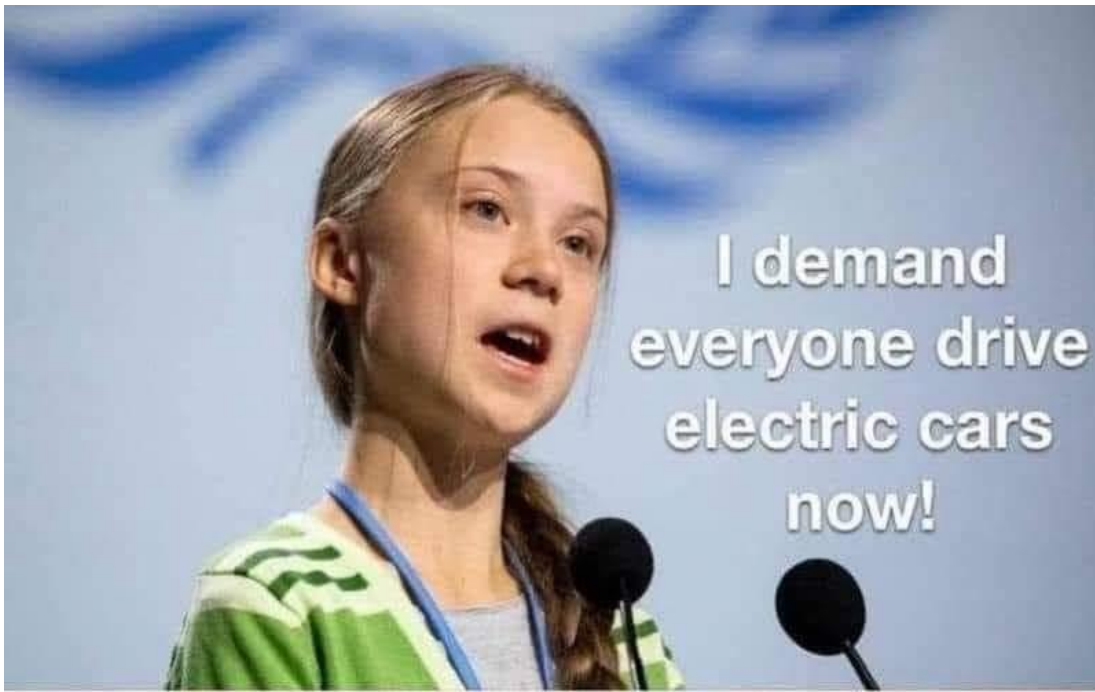
Materials Requirements to Build Different Energy Machines



Source: U.S. Department of Energy (DOE), "Quadrennial Technology Review: An Assessment of Energy Technologies and Research Opportunities," September 2015, p. 390

Chart: Manhattan Institute

- To replace the energy output from a single **100-MW natural gas-fired turbine**, (about the size of a house) which produces enough electricity for 75,000 homes), requires **~100 of the average wind turbines being installed in the US today** (2.75 MW running at 33% capacity) and would occupy **52 - 78 sq km (20-30 sq mi) of land**.
- A single electric car battery weighing 454 kg requires extracting and processing some 226,800 kg of materials.



Comforting illusions don't acknowledge social impacts

- "I would spend 24 hours down in the tunnels. I arrived in the morning and would leave the following morning"
(14-year-old orphan cobalt miner, one of ~40,000 child miners in DRC).

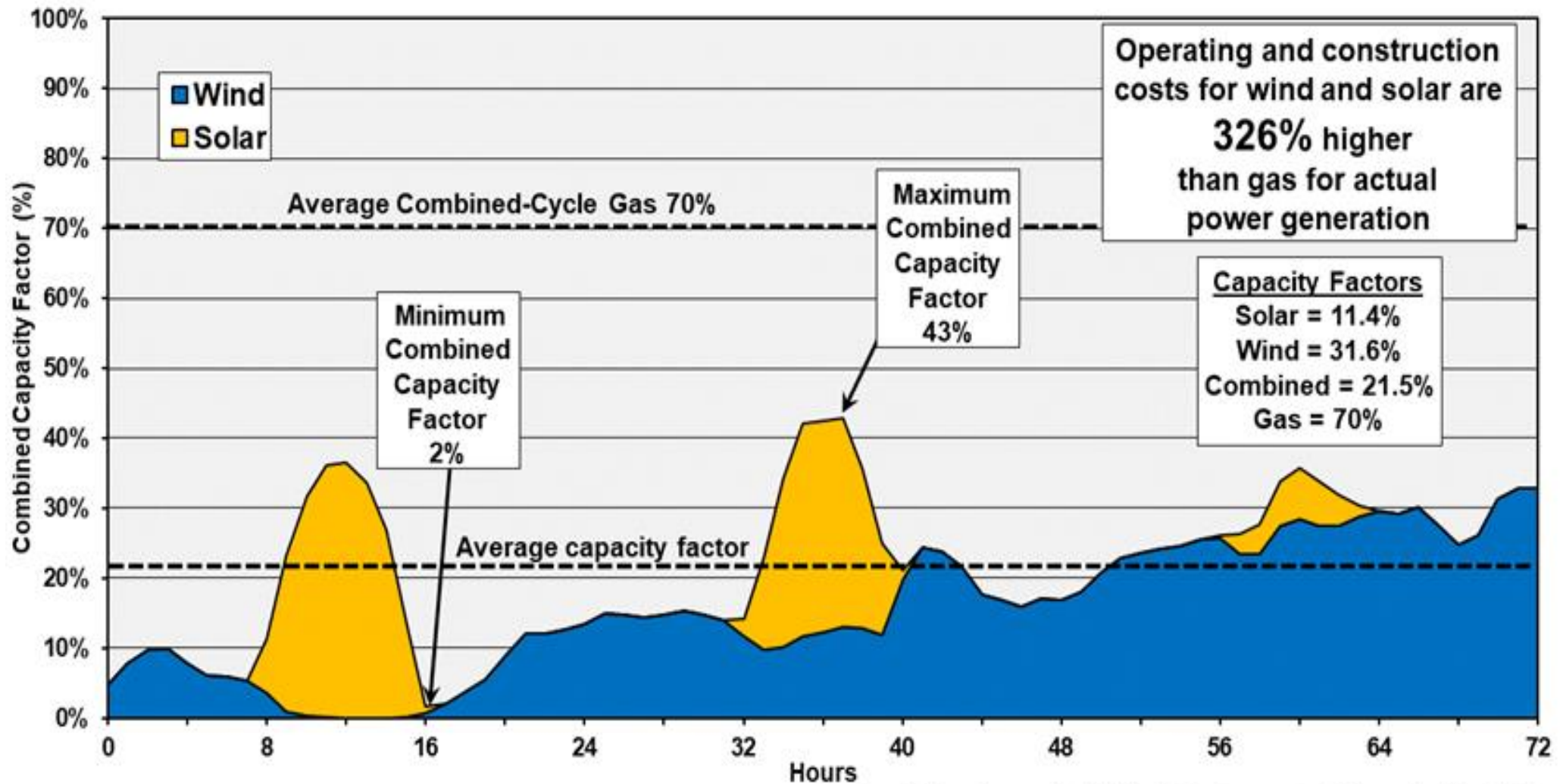


100% renewables? In northern latitudes?

Get ready for major energy shortages

- Grid-scale wind and solar PV are incapable of quantitatively replacing fossil fuels particularly in more northern latitudes like Canada, much of Europe and Russia.
- Capacity factors—energy actually delivered compared to name-plate capacity—are often <10% for solar panels (capacity factors for wind are better at >25%). Massive storage or 100% FF backup required.
- Several full life-cycle studies suggest that the extended energy return on energy invested (ERoEI) for wind and solar is <3:1, insufficient to power modern societies.
- Solar may be a **net energy sink** in northern latitudes.

Combined output of solar and wind capacity compared to gas in Midland, Ontario, at winter solstice (December 20 to 22) – implications for backup power



Operating and construction costs for wind and solar are **326%** higher than gas for actual power generation

Capacity Factors
 Solar = 11.4%
 Wind = 31.6%
 Combined = 21.5%
 Gas = 70%

(data from 2019 weather records for Midland, Ontario, assuming 1 Kwatt solar PV and 1 Kwatt

© Hughes GSR Inc, 2020 from an 80 metre Vestas wind mill, <https://www.renewables.ninja/#> Construction costs from https://www.cer-rec.gc.ca/nra/ntqrd/ft/2019/ssmptns/index-eng.html#_ftn6)

Courtesy of Dave Hughes

President Biden's delusion: Create a carbon pollution-free power sector by 2035

- In 2020, US consumed 18 times as much primary energy from hydrocarbons as it does from wind and solar combined.
- The US generated 2,600 TWhrs of electricity with fossil fuel.

This is:

- nearly equal to the output of all of the nuclear power plants on the planet.
- roughly equal to three times the output of all global solar.
- twice the output of all of the wind turbines in the world.
- **It is not credible that the United States could build that much new nuclear, or solar, or wind capacity, certainly not in 14 years.**

From testimony of Robert Bryce Before the *Committee on Energy and Natural Resources*, United States Senate, 16 Nov 2021

PS: This doesn't consider non-electrical energy consumption.
Globally, FF = 67% of final consumption, electricity is only 19%.

Scaling up globally: RElec proponents should do the math

- To replace just 50% of global FF use with electricity by 2030 would require that the world construct ~1.1 times the entire present cumulative global stock of wind farms and solar panels every year for the next nine years.*
- This assumes one unit of electricity is equivalent to 2.7 units of fossil energy, that hard-to-electrify applications (e.g. Highway [diesel truck], air and marine transportation; high-heat industrial processes) will become easy to electrify and that there will be no growth in demand or mineral supply problems.
- All this in a world expecting two billion more people and a 50% increase in demand for energy (by 2050).

* In 2020, FF provided 462.9 EJ primary energy. 50% = 231.5 EJ; Divided among nine years = 25.7 EJ/yr until 2030; Assume FF to RElec ratio of = 2.7:1; Then 25.7 EJ FF = 10.3 EJ RElec; But the total RElec generation in 2020 was less at 8.8 EJ; Required annual build-out (10.3EJ) is ~1.1 times total generation by wind and solar in 2020 (Data source: BP Statistical Review of World Energy 2021)

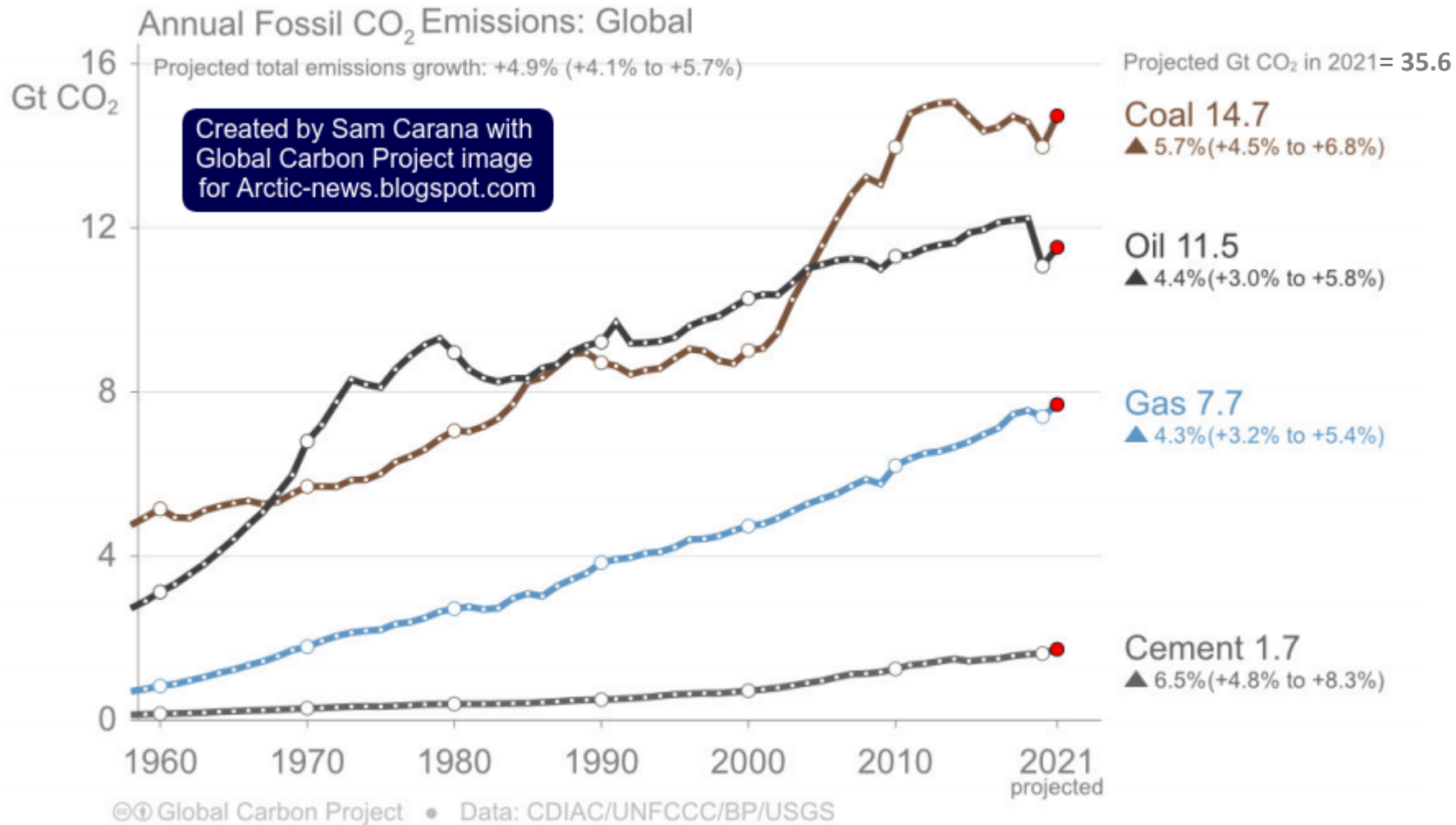
The transition to green wouldn't mean zero emissions: It would require large quantities of FF energy

- Wind turbines, solar panels and related infrastructure as well as EVs and all other machinery and equipment that would have to be electrified and replaced, are still manufactured using mainly fossil fuels. That is:
- Even if 100% RE were viable, we cannot make the transition to carbon-free energy without FF, and
- This alone would soak up much of any remaining carbon budget (and some climate scientists say there is none).
- Note: There are many other demands. Urban populations are expected to increase by 2.5 billion or >60% -- cities are made of steel, concrete and asphalt, big emitters of carbon dioxide.

100% quantitative replacement of FF?

- This cannot happen in a climate meaningful time-frame; it is an **impossibility theorem**.
- *Which is a good thing* because if MTI culture does acquire another abundant cheap source of energy, we will use it in ways that continue consuming/polluting/wrecking the planet (remember overshoot?)

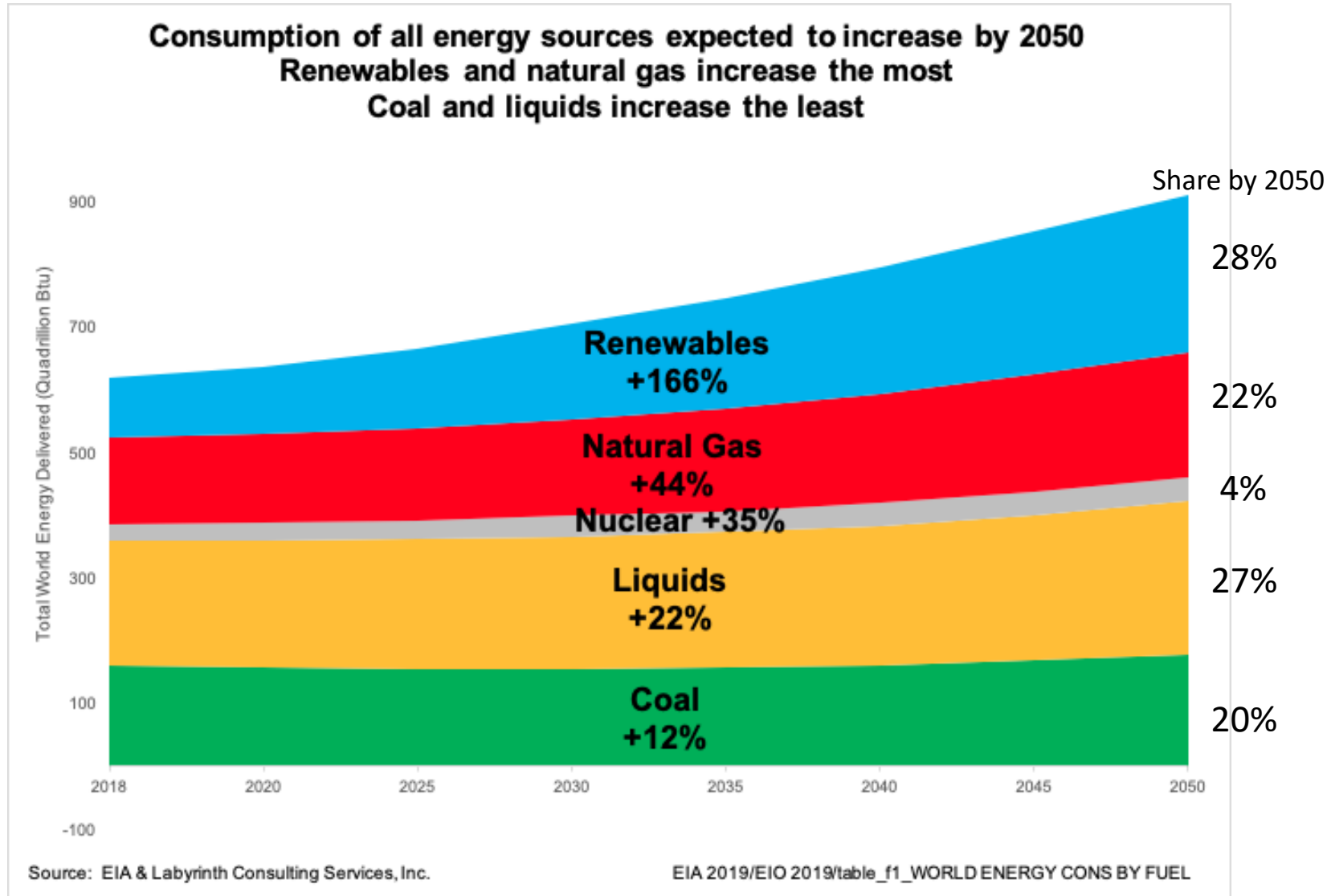
It is also why the FF beat goes on



- And if history is any guide, are these trajectories likely to change sufficiently to meet even the 2.0 C° Paris warming limit?

Coal and gas use grow more in 2021 than they fell in 2020. Oil use remains below 2019 levels.

According to the US Energy Information Administration



In 2050, fossil fuels are still ~70% of total energy consumption.



Global society's *default* position

A future struggling to maintain economic growth and a growing population using mainly fossil fuel

Which leads to

- a catastrophic 2.4 C degrees warming and increasingly erratic weather.
- accelerating desertification
- melting permafrost & methane releases.
- more and longer heat waves/droughts.
- More energetically violent storms and floods
- water shortages & failing agriculture.
- widespread famine.
- the flooding and loss of many coastal cities.
- an increase in other uninhabitable regions
- mass migrations.
- collapsed economies and geopolitical chaos.

A glimpse of the future--Unprecedented catastrophic flooding in British Columbia

November 2021



Sumas Prairie near
Abbotsford, BC – a once
(and future?) lake

Sumas Prairie: underwater farm



Relocating reluctant residents



Coquihalla Hwy Bridge Out

(One of several)



Highway 99 North -- bridge out
and several deaths in landslides



Un-fightable RV dealership fire

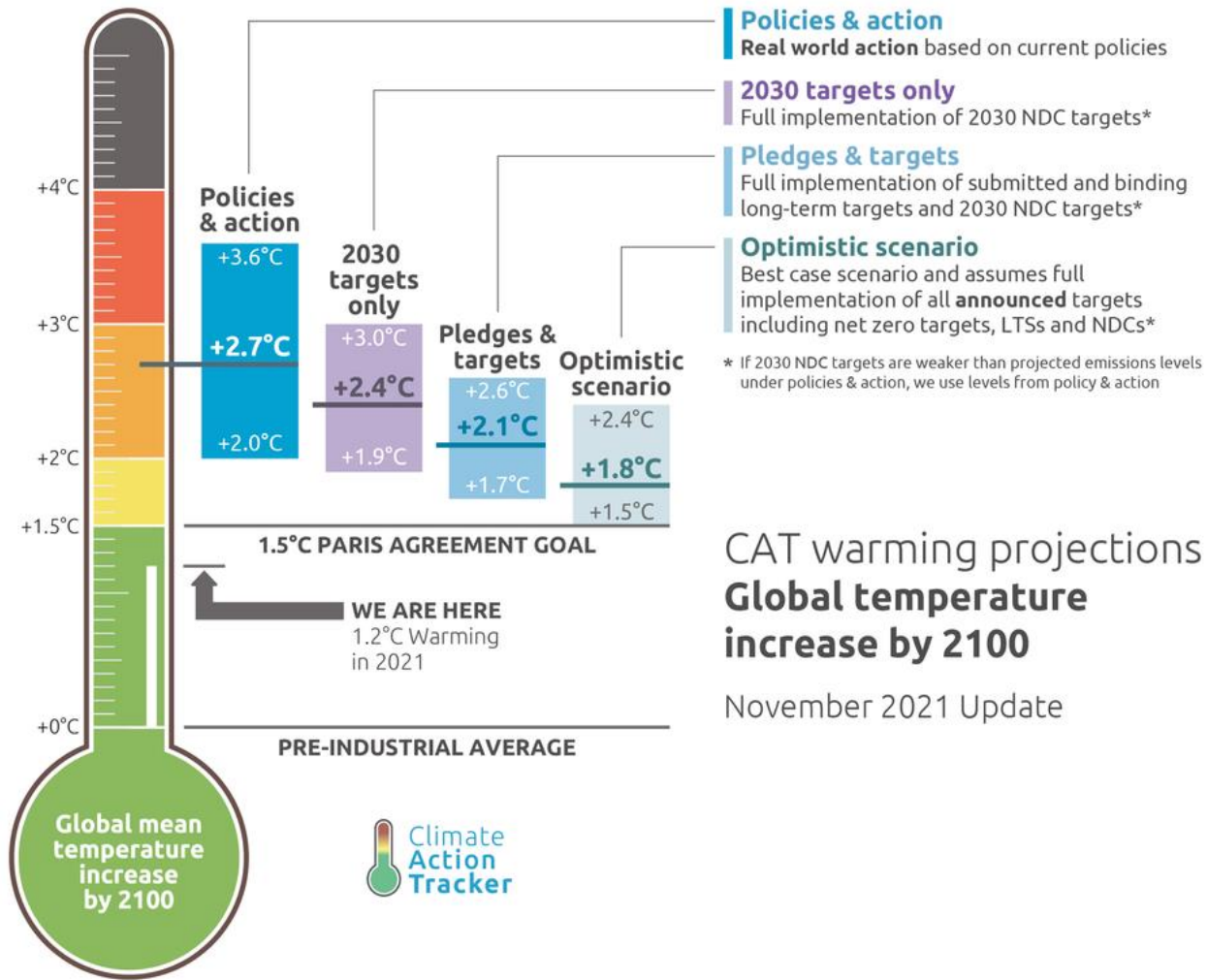


The end of the road(s)?



What real climate scientists say

(The climate game is over – everybody and the ecosphere lost)



CAT warming projections
Global temperature increase by 2100

November 2021 Update

- “1.5 degrees is not attainable. It never has been...” (Weaver 2021)
- “...more than 0.5°C additional global warming is in the pipeline” (Hansen 2018)
- “The Earth system's responses to climate change appear to be non-linear... If we venture far beyond the two degrees guardrail, towards the four degrees line, the risk of crossing tipping points rises sharply” (Schellnhuber 2012)
- “...unless civilization moves to a war-like footing... to reduce carbon emissions from all sectors and to sequester greenhouse gas levels, large parts of the Earth may become uninhabitable” (Glikson 2021).

Moving to a war-like footing

What if we actually got serious about climate?

- Trying to reverse climate change by focussing on climate change will not fix the real problem (and probably not climate change).
- Climate change is merely one symptom of overshoot and can best be addressed by ending overshoot.
- Overshoot can be fixed only through absolute reductions in energy and material consumption.
- Prepare for a cultural and life-style transformation.

Other inconvenient truths to keep in mind

- One barrel of oil is the energy equivalent of 10+ years of human labour (~5 years after conversion losses).
- Apart from hydro and nuclear electricity ~96% of 'labor' in human economies is done by oil, coal and natural gas.
- Each North American has 200 – 500 energy slaves employed full time producing goods and services we take for granted.
- Who will do what work when most of these energy slaves 'retire'?

Not a seamless transition

- In the real world, the coming societal transition is more likely to be a ragged shift from using too much energy to not having enough.
- This will mean a proportional decrease in GDP/capita, i.e., the end of material growth and *the beginning of steep contraction*.
- Without adequate planning, the resultant economic crisis will precipitate social chaos.

Rapid de-carbonization without a plan

Would lead to:

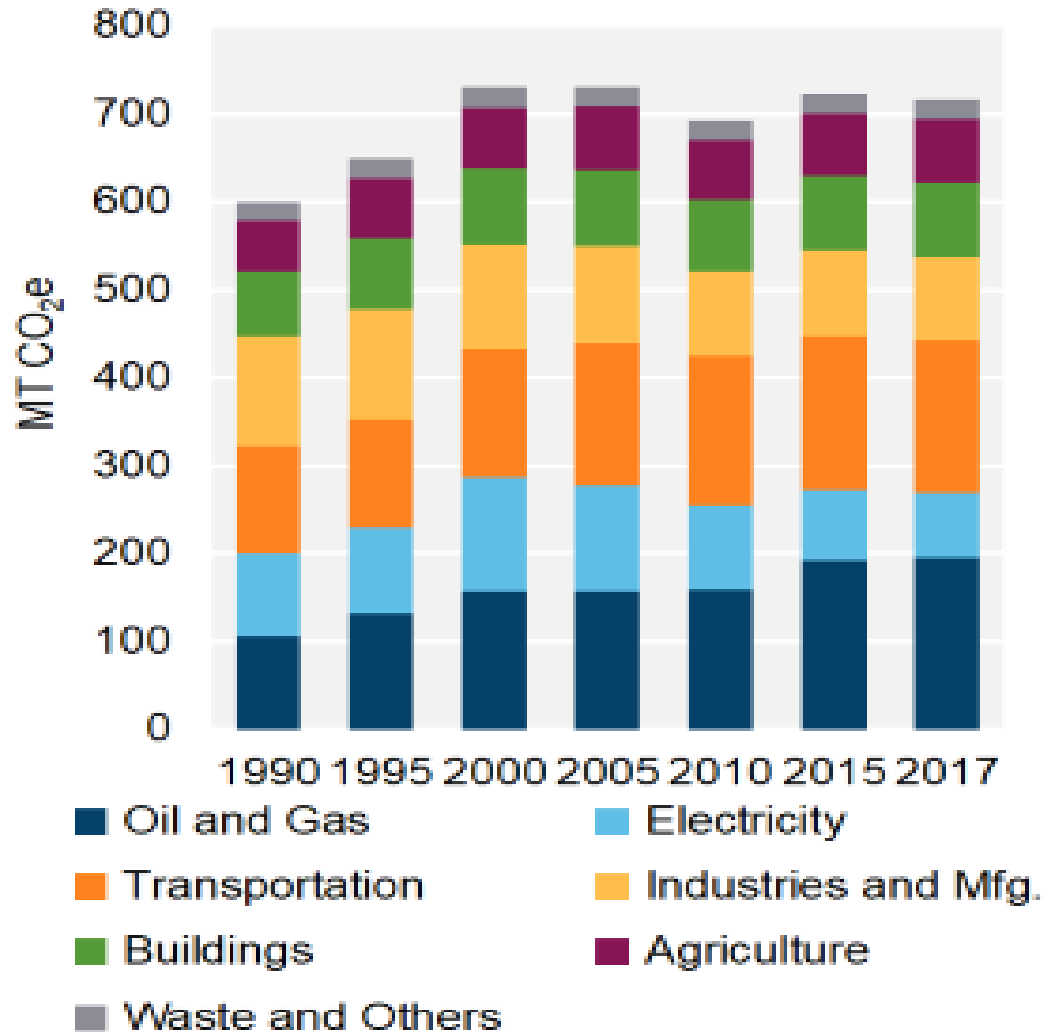
- global warming continues beyond 1.5 C degrees.
- Increasingly erratic weather.
- inadequate energy supplies.
- economic contraction (lower GDP) and falling incomes.
- rising inequality & widespread unemployment.
- broken supply lines.
- failing agriculture.
- food and other resource shortages.
- local famines.
- civil unrest & abandoned cities.
- mass migrations.
- collapsed economies & geopolitical chaos

By contrast, controlled contraction:

A sample of what we *should* be doing (assuming the goal is sustainability with justice.)

- Phase out non-essential and frivolous uses of FF.
(e.g., private vehicles including EVs, ATVs, jet-skis, leaf-blowers, non-essential air travel, etc.)
- Allocate remaining FF budget to essential uses.
(e.g., agriculture/food processing, inter-urban truck transportation, space and water heating)
- Implement carbon taxes, depletion taxes, etc.
(i.e, internalize social and eco-externalities through *full social-cost pricing*)
- Re-localize essential manufacturing and food production.
(i.e., reduce dependence on unreliable global supply chains)
- Reorganize settlements into more self-reliant, steady-state, urban-centred bioregions integrated into local ecosystems.
- Downsize housing (new house = 1000 sq ft, down from 2500 sq ft)
- All new construction to passive house standards (~80% more energy efficient).
- Implement a fair income-tax system and minimum income strategy.
- Restore essential ecosystems and life-support services.
- Implement a global non-coercive family planning/population program starting with better education and economic independence for women.

Canada - emissions by sector 2018



We need to *abandon fossil fuels where possible* and reserve any remaining carbon budget for essential uses.

- Agriculture and essential transportation get priority
- Focus on reducing other transportation and building emissions.
- Enhance efficiency in industry/manufacturing.
- It's the end of consumer lifestyles.

Even with just the *present* population

A Sustainable Lifestyle

= One-Room Home with Small Bed and Kitchen

Minimal Plumbing

Electricity for a Few Small Appliances

No Central Heat , A/C or Hot Water

Local Plant-Based Diet only

No Clothes Washer / Dryer or Dishwasher

Couple Sets of Clothes and Pairs of Shoes

Never Driving in a Car

Never Flying in a Plane



Then there's the intractable population problem



We fruitful and multiply...



Now divide.

On a finite planet already in overshoot

- It is not biophysically possible to raise all 8 billion people to high-income material standards.
- The only way to achieve a just sustainability without reducing population, is for the impoverished to remain poor and the wealthy to join them.

Population planning: no easy task

Assume a global one-child/family policy

- Population would keep growing for the first 25 years after implementation because the average global age is still quite low.
- Global population would be still be ~8 billion after 40 years.
- Earth might support one to two billion people living materially well indefinitely.
- But even at one child/family, it would take 135 years to get to 1 billion.
- We can't even discuss population strategies – it's a taboo subject.

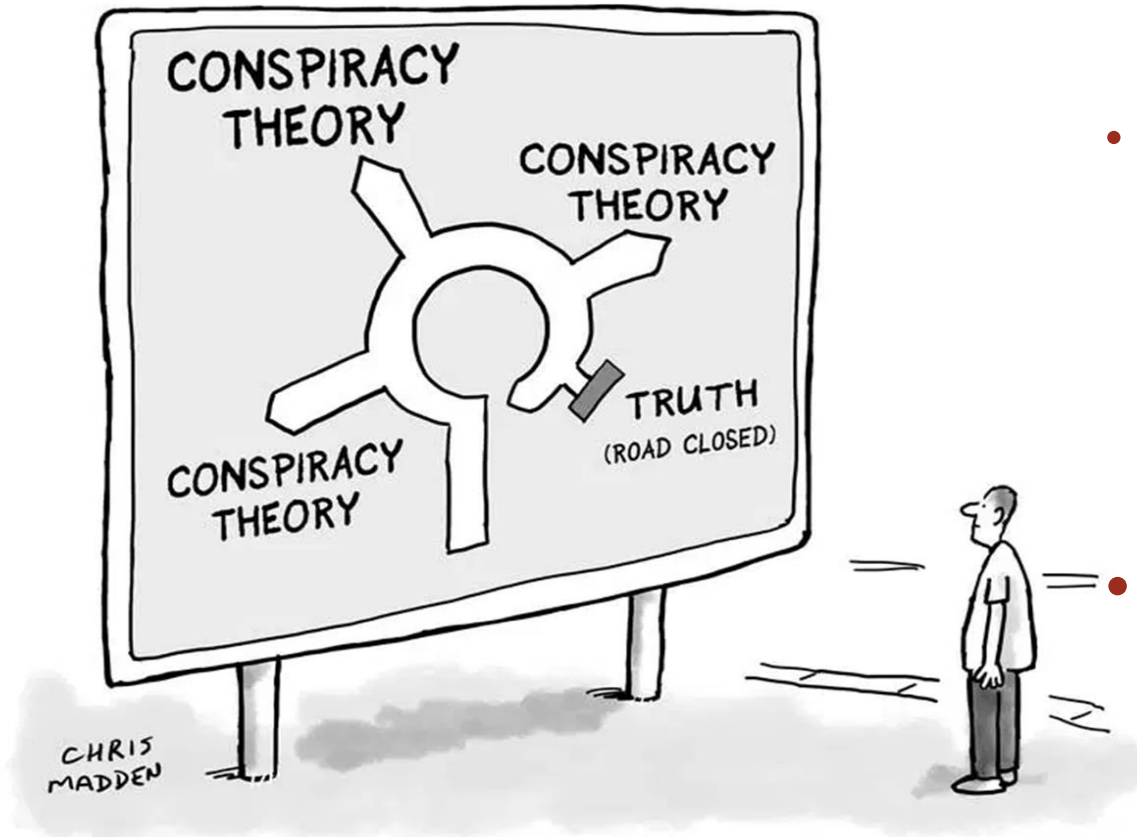
There is no political or popular taste for 'getting serious'. So far basic human nature calls the shots

- Humans have an innate tendency for temporal, spatial, and social discounting. I.e., **people naturally value the certain, comfortable present, their home communities and close relatives/friends over uncertain future threats, distant places, and complete strangers.**



It doesn't help that this is the 'Post-truth' era

Oxford dictionaries word of the year for 2016

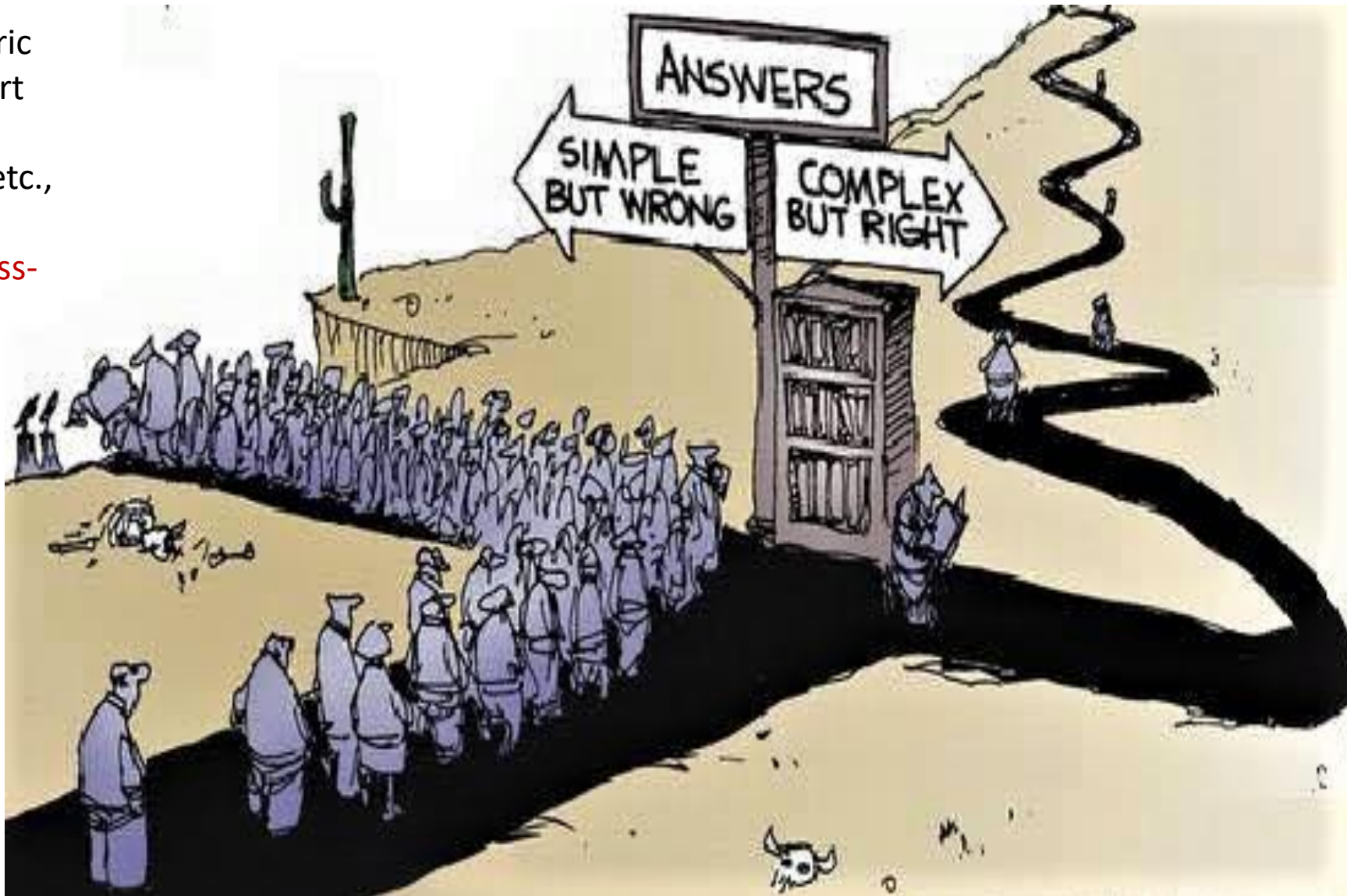


SIGN OF THE TIMES

- With the prevalence of false news, and social media, many people have become ill-informed self-delusionists and denialists.
- “...virtually everyone wants to hear good news, even when the news isn't very good.” Even the Mainstream Media mostly report “...from the perspective of what people *want to hear*, rather than from the perspective of *what the story really is*” (Tverberg 2021).
- So it is that the world has so far chosen 'business-as-usual' (by-alternative-means, where possible).

Delusional thinking: It's the human way

Wind turbines, solar photo-voltaics, electric vehicles, smart cities, geo-engineering, etc., *i.e.*, growth-bound business-as-usual *via* techno-fixes leading to collapse.



Smaller eco-footprints, lifestyle changes, greater equality, population planning, *i.e.*, degrowth leading to improved well-being including eco-stability and economic security.

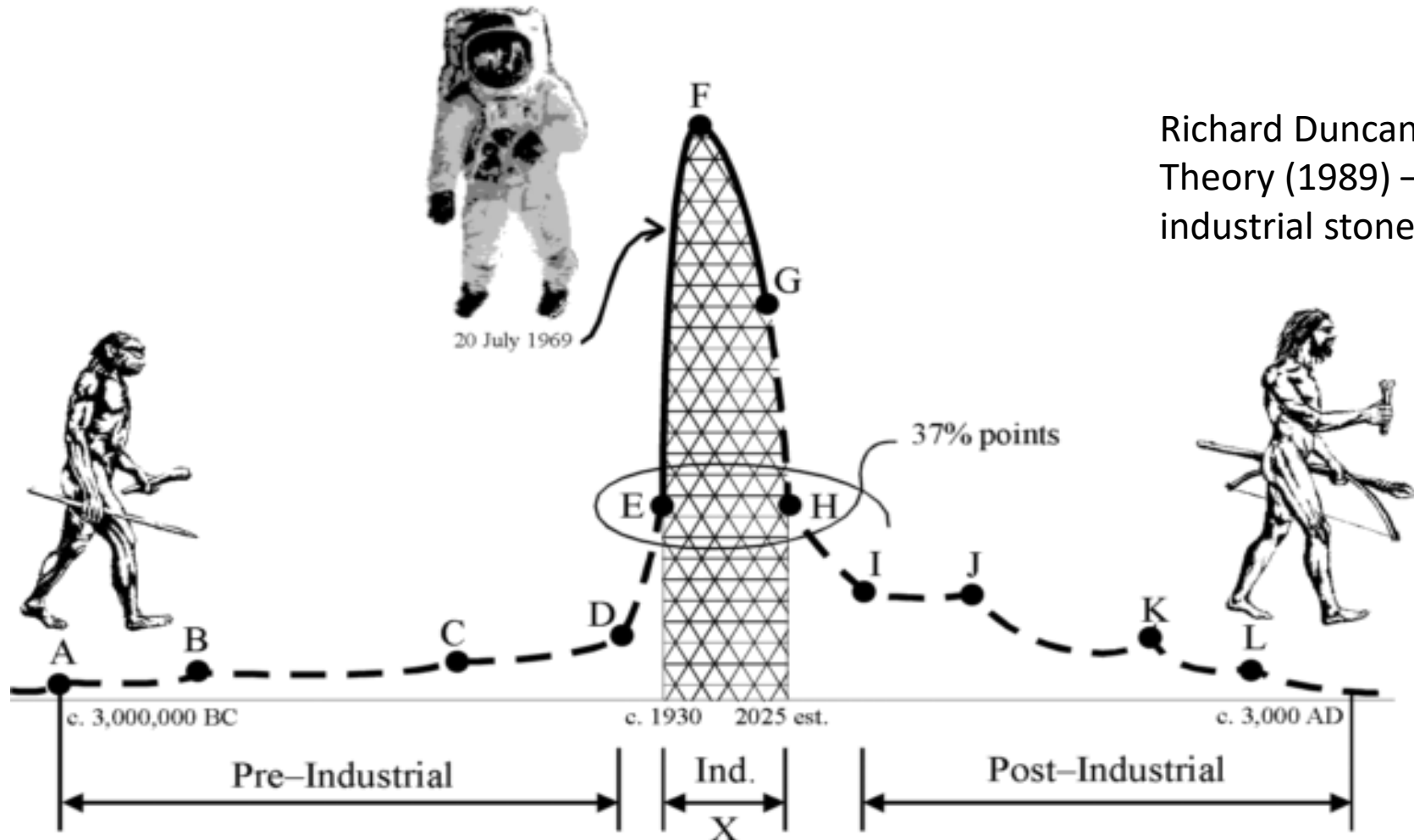
I want to like people, but they're
just so fucking stupid.



Our MTI paradigmatic trap

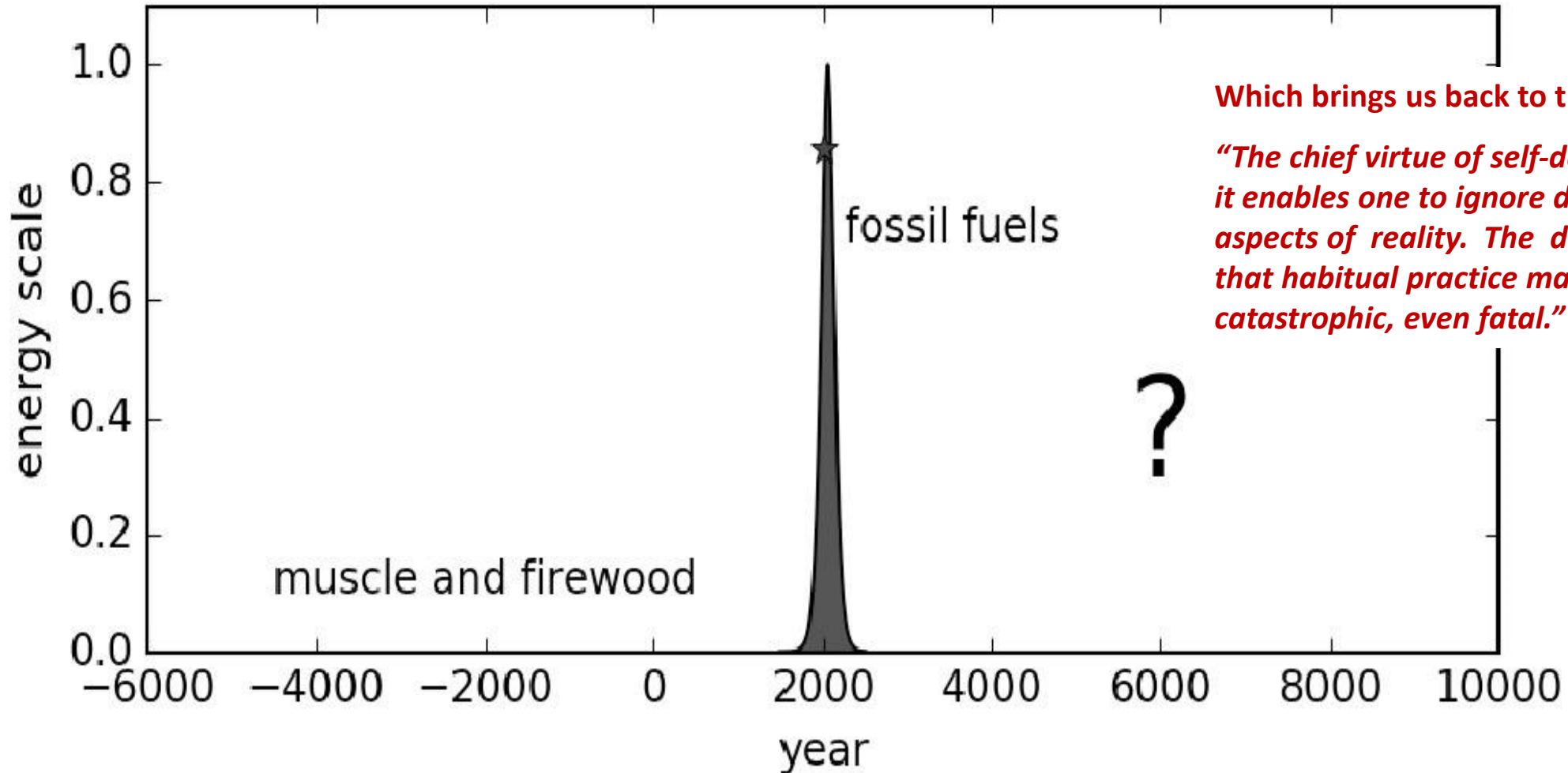
“What is ecologically and socially necessary for sustainability is not politically feasible, but the politically feasible is ecologically and socially ineffective, if not catastrophic.”

What it all means: Techno-industrial society is likely to be a short blip in the history of *H. sapiens*



Richard Duncan's Olduvai Theory (1989) – a post-industrial stone age.

Tom Murphy *et al.* (2021) think much the same way



Which brings us back to the beginning:
“The chief virtue of self-delusion is that it enables one to ignore discomfoting aspects of reality. The downside is that habitual practice may prove catastrophic, even fatal.”

A schematic long view of human energy production rate up to the present (star), the dramatic rise of which is almost wholly due to fossil fuels, supplanting firewood and animate power (human and animal muscle) as primary energy sources

(Murphy *et al.* 2021. Modernity is incompatible with planetary limits: Developing a PLAN for the future Energy Research & Social Science 81 [2021] 102239)