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Transitioning Off of Fossil Fuels

Stop Pretending “business-as-usual” is Good

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By William Strauss, PhD

The depletion of extractive hydrocarbons, if we continue with “business-as-usual” (BAU) and do not begin a well-planned transition to a future that is not dependent on extracted hydrocarbons, will generate economic, social, and environmental chaos for future generations.

To be clear, if we continue with BAU, your children’s children will be living in a world of scarcity, uncertainty, and endless conflict.

We do not have to wait a few generations to see a preview of what the future could be like.

Economic chaos is happening now. A supply side shock induced by conflict has stopped about 30% of global crude oil from turning into the energy and other by-products that are essential to the functioning of everything we take for granted (see the Sankey chart on the next page¹). Scarcity and uncertainty and punishing prices are almost everywhere.

The fragility of the global crude oil supply chain and the extremal risks associated with dependence on oil is “in your face” because of the flow disruptions that are a result of the conflict between the US and Iran.

Global trade flows of crude have dropped from 36.0 to 25.5 million barrels per day.

Meanwhile, atmospheric concentrations of carbon dioxide (CO₂) hit another new record high on April 5, 2026, of 433.24 parts per million.

This disruption may be temporary, but it has, at least during the crisis, induced an increase in rational discussions about transitioning to a future in which energy is derived from highly distributed renewing sources that do not depend on shiploads of extracted black minerals produced by a few nations.

¹ Generated by a ChatGPT query.

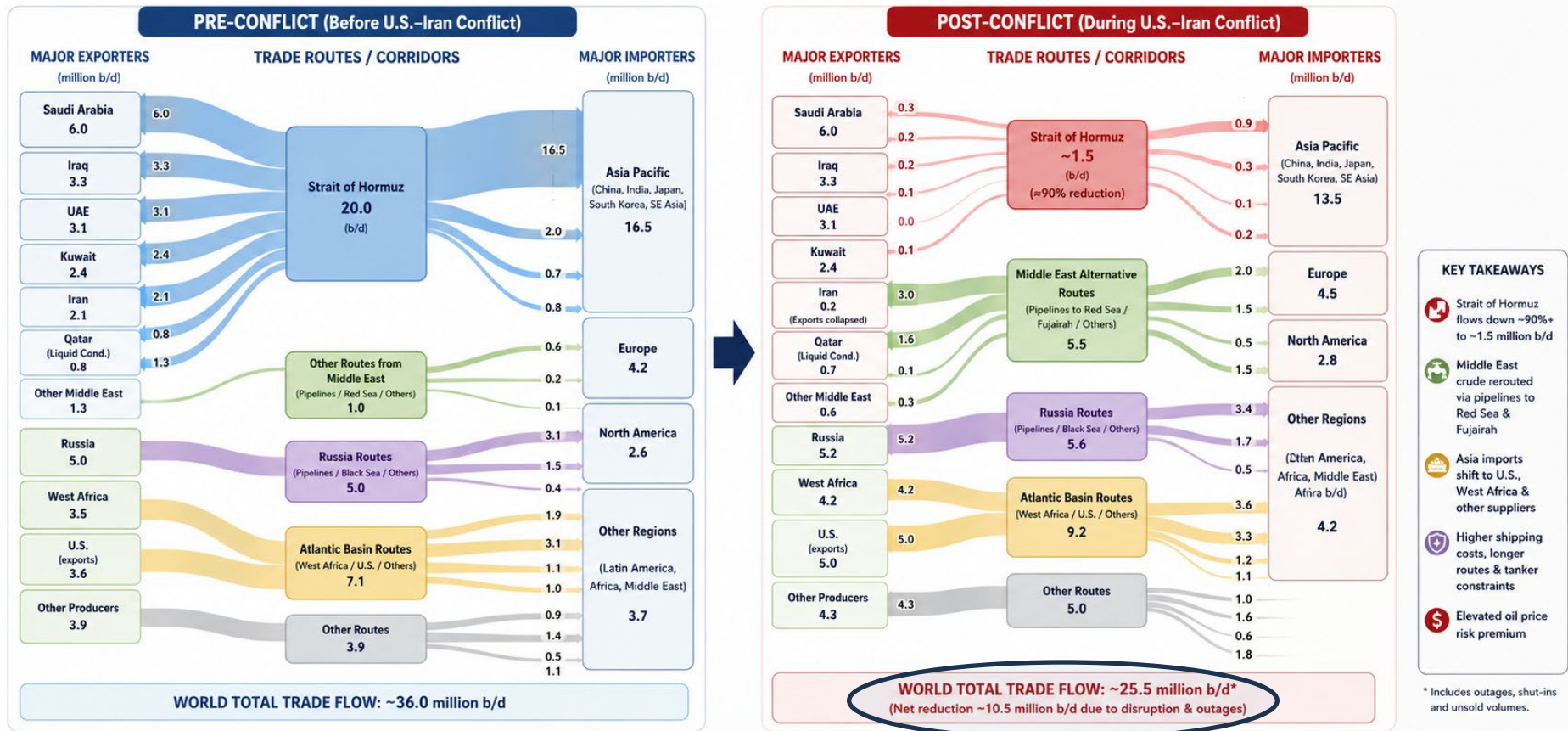


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GLOBAL CRUDE OIL TRADE FLOW: PRE-CONFLICT vs POST-CONFLICT (2026)

Average volumes in million barrels per day (b/d)



- KEY TAKEAWAYS**
- Strait of Hormuz flows down ~90%+ to ~1.5 million b/d
 - Middle East crude rerouted via pipelines to Red Sea & Fujairah
 - Asia imports shift to U.S., West Africa & other suppliers
 - Higher shipping costs, longer routes & tanker constraints
 - Elevated oil price risk premium

* Includes outages, shut-ins and unsold volumes.

Blue = Middle East flows (via Strait of Hormuz) Green = Middle East alternative routes Purple = Russia flows Yellow = Atlantic Basin flows Grey = Other flows
Sources: U.S. EIA, IEA, Kpler, Vortexa, Shipping data (2025 averages)



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The disruption illustrated in the Sankey diagram is a preview of the impacts of BAU.

Under BAU, there will be a growing gap between demand and supply. The world will segregate. In parallel with economic depression, social unrest will accelerate. The “have nots” will not sit quietly on the sidelines. Coordinated in part by near instantaneous mass communications, those pissed off cohorts will aggregate to a point where no army is big enough.

The outlook under BAU is dystopian!

But perhaps today’s increasing costs and impossible to ignore uncertainty about supply security in the future will turn the tide...

Or perhaps not. Until now, the aggregate global response to this looming crisis has been poor in many jurisdictions. Vested interests resist change:

“And it ought to be remembered that there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success than to take the lead in the introduction of a new order of things. Because the innovator has for enemies all those who have done well under the old conditions, and lukewarm defenders in those who may do well under the new. This coolness arises partly from fear of the opponents, who have the laws on their side, and partly from the incredulity of men, who not readily believe in new things until have had a long experience of them. Thus it happens that whenever those who are hostile have the opportunity to attack, they do it like a partisan, whilst the others defend lukewarmly” (Machiavelli, 1515, p. 27).

At least during this moment it would seem that even those with their heads deepest in the sand will notice that something has to be done. Short-termism may suggest military solutions. But resolution by conflict is just one more example of BAU. It does not address the inevitable scarcity that will face future generations.

BAU has to be rewritten...

Version 2.0 of BAU should be based on a strategic plan that builds a foundation for economic, social, and environmental stability. Dependency on depleting resources controlled by a few nations has to be reduced and eventually eliminated.

By definition, there is an end of life to all “depleting” resources. So they will disappear eventually either via a transition plan that supports V2.0 of BAU or via doing what we are doing now. Transitions are better if they are managed and gradual rather than being forced by crisis and chaos.



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What is the basis of a future not dependent on ships carrying extracted hydrocarbons?

The earth is bathed in solar energy. Every year about 5.7×10^{24} joules of solar energy irradiates the earth's surface². That is about 9,200 times greater than the annual global demand for energy.

If 0.0108% of that solar energy is converted into storable and transmittable energy, the electricity, transportation, and heating needs of the world would be satisfied without any fossil fuel input³.

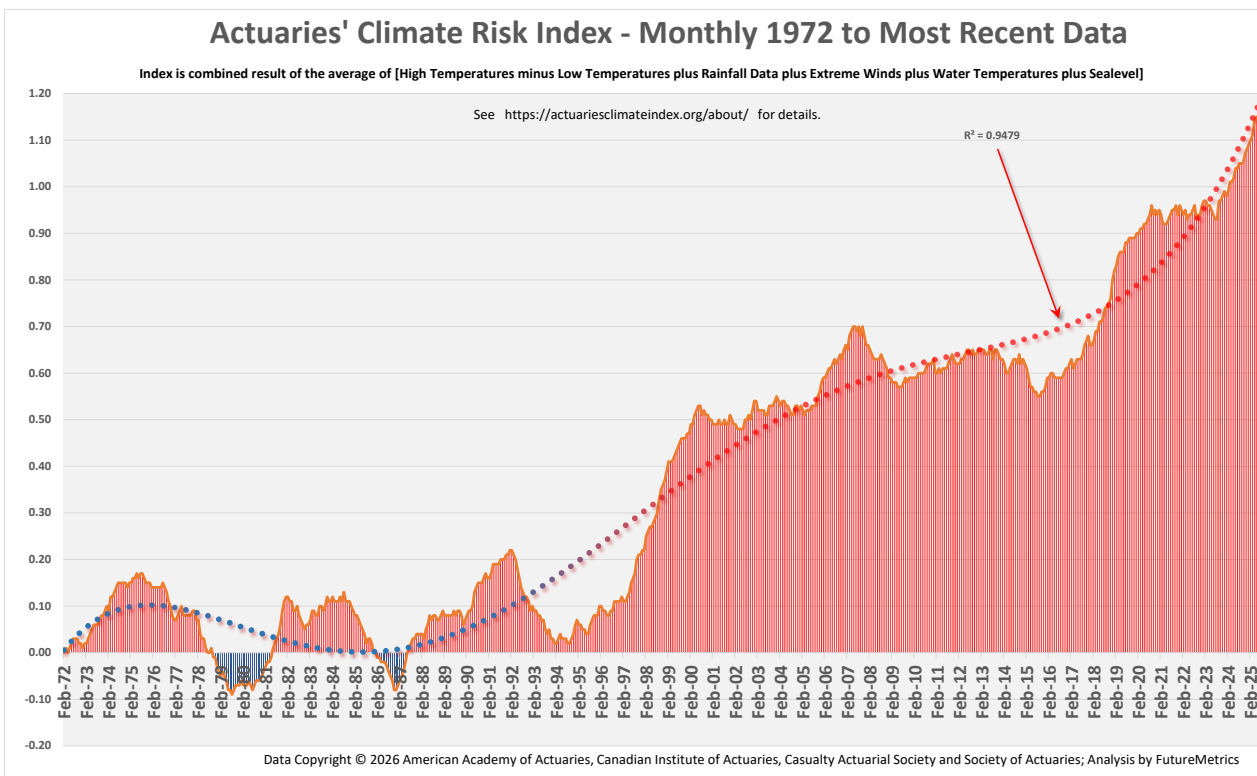
That has to be the overarching goal. Petroleum, coal, and natural gas will not last forever.

But there is more besides scarcity.

BAU is also driving risks other than those associated with maintaining the flow of crude oil.

The chart below is produced by the experts that quantify risk for insurance companies.

The risks in the chart are not geopolitical. They are due to the consequences of the by-products of fossil fuel combustion.



The rapidly increasing climate risk is a consequence of the fossil fuel age. The rapid release of carbon that has been naturally sequestered over many millions of years, within a span of about 150 years, has raised atmospheric

² <http://www.fao.org/docrep/w7241e/w7241e06.htm#TopOfPage>

³ Maybe two hundredths of a percent would be used (not $1/100^{\text{th}}$) if conversion and distribution losses are considered. Whatever, it is a very small fraction.

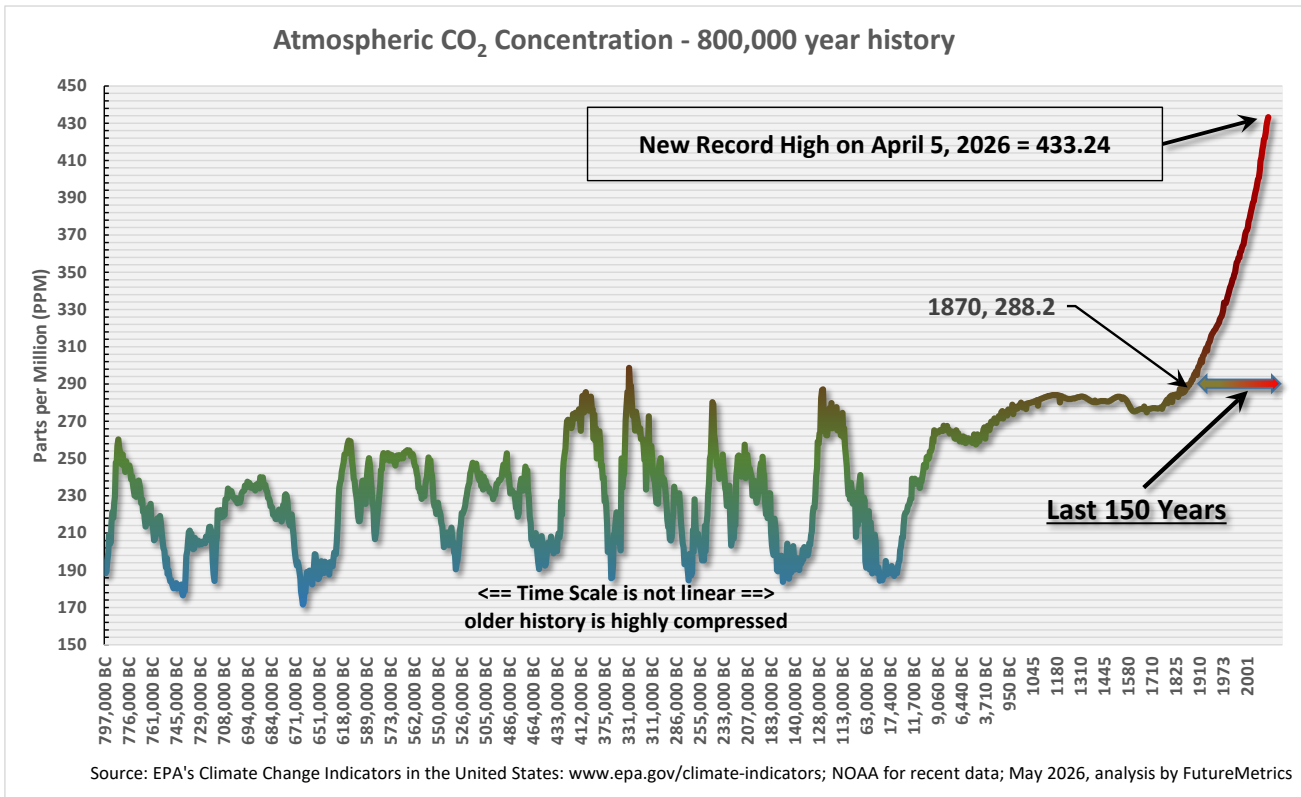


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concentrations of carbon dioxide at both speed and scale many times faster than observed in known geologic history (see chart below). The rapid increase has thrown the fundamental balance of the earth's systems on a path towards environmental chaos⁴.

This march toward chaos is reflected in the actuaries climate risk index's recent exponential increases. The greater the index and the steeper the curve, the more uncertain the predictions. For insurers and those that need insurance, that directly maps into higher prices. Even for those that deny climate change and what the consequence will be, they have no choice but to experience the direct link between climate change and the increasing cost of doing business.



BAU's first order consequences for the future are the scarcity of primary energy. Those impacts are further multiplied by BAU's implicit support for sea level rise, persistent/permanent changes in precipitation patterns, increasing summer heat levels, and more frequent and severe storms. Another world changing consequence of excess CO₂ emissions is ocean acidification⁵.

One way to look into the future of climate change is to show where we could be in terms of atmospheric CO₂ levels at the end of this century (your children's children could be middle aged by then).

⁴ Chaos as in both how social routines become unglued, and also in mathematical terms. The author of this paper completed the equivalent of two semesters of study of chaos theory at MIT prior to receiving his PhD. There is a chapter in his book that uses chaos theory. A hardcopy of "The Myth of Endless Growth" is on Amazon. But for readers of this white paper, a free to download full manuscript of the book is [HERE](#).

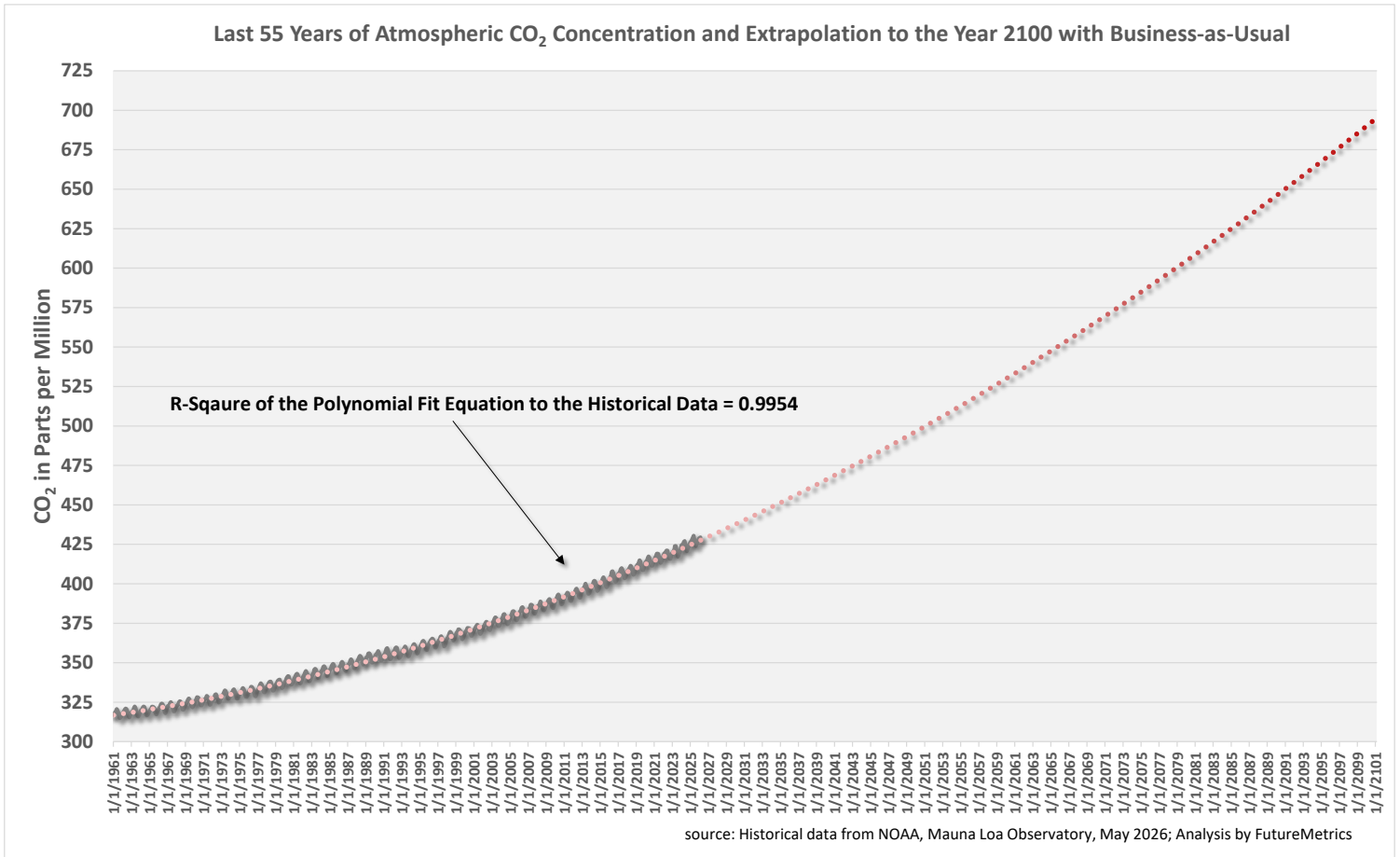
⁵ See [HERE](#) for more on ocean acidification.



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The chart below is a simple time series best fit equation that is allowed to generate values to about the year 2100. The complexity of the earth systems and the fact that fossil fuels are a depleting resource that probably will not be mined in sufficient quantities to match the quantity needed to get us to to near 700 ppm means that the future shown in the chart seems unlikely. However, the trajectory we are currently on would get us there if there were no limits to the growth of fossil fuel use and policy totally fails. Both of those conditions are possible!



If we stay on the path we are on now, imagine the chaos and conflict that sits between now and that dismal environmental future.

The trajectory between now and the end of the century may be self-correcting in a very bad way as conflicts over the control of depleting fossil fuels and scarcity induced social turmoil increase.



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Solutions?

It starts with the need for sufficient sustainable non-depleting energy that can be used for power generation, transportation, and heat.

Easy to say. But replacing the existing energy infrastructure that has been the underpinning of the last 150 years of economic growth with a full substitution cannot happen AND maintain standards of living during the transition without a plan and a commitment to the plan.

The way to get there is easily imagined: The major primary sources are from capturing solar energy directly from sunlight (solar generation) and indirectly from the energy the sun puts into the atmosphere that creates wind (wind power). But making the electricity is only a starting point.

For example, unless unimaginable energy dense batteries are invented, aircraft need the energy density of aviation fuel to travel long distances. Thus the emerging sector for sustainable aviation fuel (SAF). Ships can operate efficiently and reliably with sustainable liquid fuels that can replace the heavy oil and diesel fuel that many use now. Thus the emerging markets for e-methanol⁶.

In aggregate there is plenty of solar energy bathing the earth, but in practice, the intensity and duration vary significantly. To buffer that variability and intermittency, storage and distribution are the real challenges.

But those are challenges that even today do not present themselves as insurmountable. Planning for the infrastructure of the future requires government support and policy guidance. Otherwise, BAU continues.

There is one more component in the portfolio of solutions that will take us, hopefully, to a future independent of fossil fuel for energy. As long-time readers of FutureMetrics white paper should anticipate, it is based on what one might call “nature’s natural solar battery”.

Rather than write more pages on that topic, please refer to the PowerPoint used for a presentation at the Argus Biomass conference in London on April 22, 2026. [HERE](#). The presentation discusses the potential for leveraging the already existing sustainably managed forest products industry⁷ to produce hydrocarbon replacements from carbohydrates. It is not rocket science!

Sustainability is also discussed in the presentation. With sustainability baked in as an absolutely necessary precursor to the use of biomass as a feedstock, we have a perpetually renewing resource that starts with sunlight.

The solution for the future is the gift of sunlight. After all, it was that same solar energy converted to carbohydrates pathway that produced the millions of years old biomass that mineralized into so-called fossil fuels.

The transition from now to a global energy system that depends on solar energy in its direct and indirect forms will happen. The nice way or the not nice way...

⁶ For more see [HERE](#).

⁷ Where do you think lumber, flooring, packaging, toilet paper, office paper, etc. come from? Look at the PPT.