Time to Stop Pretending Renewables Are Cheap

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DEC 05, 2025

In the cacophony of voices clamouring for a hasty ‘energy transition’ away from fossil fuels, there are several tropes that are regularly employed by devotees of the Church of Climate. Over the past few decades, these tropes have been weaponised to convince lay people to cede all power to climate bureaucrats to ‘save the planet’. One trope that permeates the mass media and writings by ‘climate experts’ like Michael Mann and Bill McKibben is ‘cheap’ solar and wind energy. This is despite the debunking of the magical thinking of the ‘new’ energy economy by those who understand and respect the laws of physics and economics.

Another trope that has gained traction among green ideologues is the ‘primary energy fallacy’. Social media commentary is peppered with references to this fallacy, frequently invoked to show that fossil fuels need not be replaced ‘one-to-one’ by ‘efficient’ renewable energy. This notion, peddled by advocates of wind and solar power such as Dr Jan Rosenow, Senior Research Associate at Oxford and Cambridge Universities, argues that traditional metrics of primary energy consumption — measuring the raw energy extracted from nature before conversion — systematically underestimate the contributions of renewables.

Why? Because fossil fuels like coal and gas lose much of their energy as waste heat during electricity generation, while wind turbines and solar panels deliver electricity with near-perfect efficiency. Thus, the argument goes, comparing energy sources on a primary energy basis penalises 'efficient' low-carbon technologies and inflates the role of 'inefficient' fossil fuels. It's a clever rhetorical device that paints unreliable, intermittent renewables as the unsung heroes of decarbonisation.

A fallacy which isn't

But scratch beneath the surface, and this 'fallacy' reveals itself as little more than a sleight of hand, a convenient narrative to prop up costly and unreliable energy sources at the expense of economic rationality. Drawing on the incisive analyses of advocates of energy literacy such as Lars Schernikau and Ronald Stein, it's clear that the real distortion lies in ignoring the full system-level costs and inefficiencies of wind and solar as well as the multiple uses of oil and gas as feedstock for myriad products.

Far from being a progressive insight, the primary energy fallacy critique serves to obscure the harsh realities of intermittency, resource intensity and escalating costs that plague the push for renewables. In an era where energy security and affordability are paramount — especially for developing economies in Asia, Africa and Latin America — this misdirection threatens to impose vast financial costs on societies already straining under fiscal and trade deficits.

Primary energy, as defined by institutions like the International Energy Agency (IEA) and BP in their annual statistical reviews, tallies the unprocessed energy from sources such as coal, oil, gas, uranium, wind and sunlight. It relates to the total energy content of natural resources before any conversion processes take place. When converted to electricity, thermal sources like coal-fired plants operate at efficiencies of around 35-40%, with combined-cycle gas turbines reaching up to 60%. The rest dissipates as heat.

In contrast, wind and solar convert their 'primary' inputs — kinetic wind energy or solar irradiance — directly into electricity with minimal thermal losses, approaching 100% in accounting terms. A simple example illustrates the point: 100 units of gas primary energy might yield only 40 to 60 units of electricity, while 100 units from wind deliver the same 100 units as usable power. On primary energy charts, gas appears to contribute more, making renewables seem marginal.

Yet this comparison is myopic, confined as it is to the electricity sector, which accounts for just about 20% of global final energy consumption. The bulk of energy use — some 80% — occurs in non-electric forms: industrial heat for steelmaking and cement production, gas for cooking and home heating, petroleum for transportation, and petrochemicals for everything from fertilisers to plastics. Here, fossil fuels often deliver energy services with far higher efficiencies than the pro-renewable narrative admits. Direct combustion of gas for heating, for instance, achieves 80-90% efficiency, dwarfing the losses in electricity generation.

Renewables, by their nature, produce only electricity – intermittently at that — leaving vast swathes of the energy economy untouched without massive, inefficient 'electrify everything' efforts. As Dr Schernikau aptly notes in his writings, primary energy remains 'king' because it captures the raw inputs needed across the entire energy system, not just the narrow slice of grid power.

The indispensable role of fossil fuels extends far beyond energy provision requisite to modern civilisation. As Ronald Stein emphasises in his work, including the book *Clean Energy Exploitations*, oil and gas are the foundational feedstocks of over 6,000 products that underpin human progress, from plastics and cosmetics to pharmaceuticals and ammonia for fertilisers.

These materials cannot be replicated by so-called renewables like wind and solar, which generate only electrons and offer no viable pathways to synthesise the complex hydrocarbons essential for everything from medical devices and electronics to agricultural inputs that feed billions. Stein's energy literacy advocacy highlights how decarbonisation zeal overlooks this reality: without fossil-derived ammonia, global food production would plummet, exacerbating hunger in developing countries already facing population pressures.

Petrochemicals derived from crude oil enable the sterile packaging for vaccines, the durable materials for wind turbine blades (ironically) and the synthetic fibres in clothing. Attempting to 'electrify everything' ignores that these products require molecular building blocks from fossils, not just electricity, rendering the transition not just costly but fundamentally impossible without alternatives that don't exist at scale. This dependency underscores why primary energy metrics are vital — they reflect the total resource base sustaining not only power but the myriad goods that define quality of life.

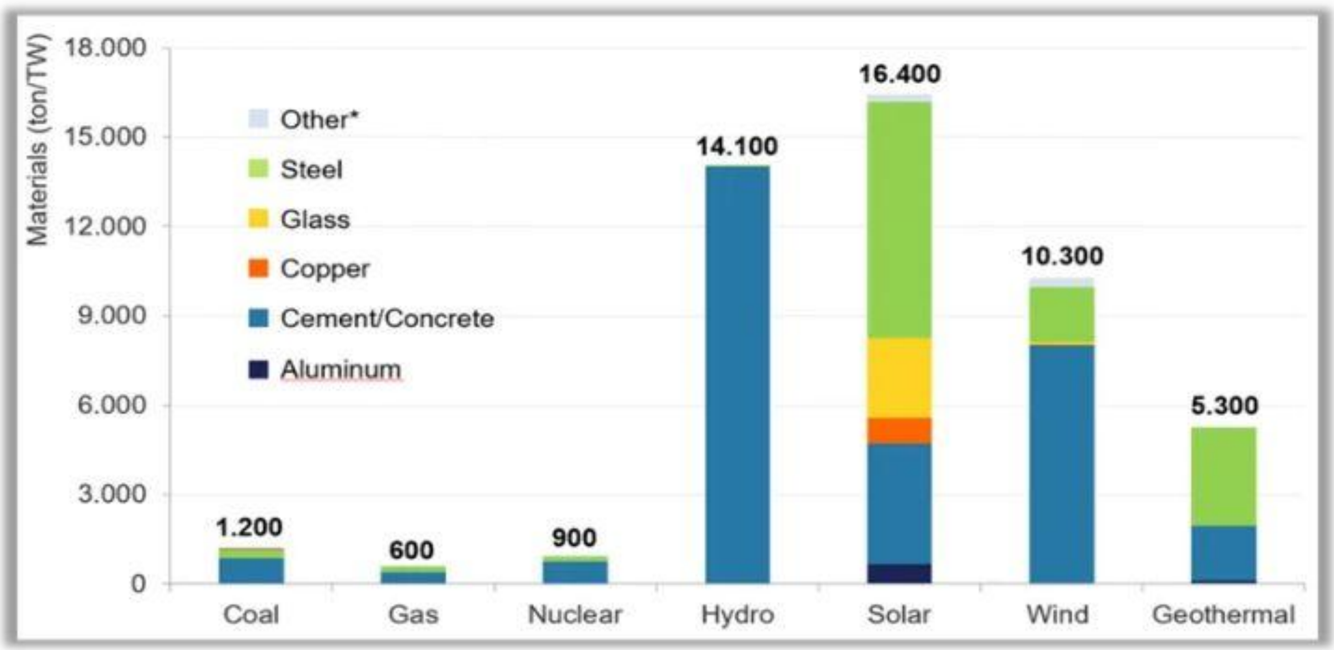
Moreover, the efficiency boast of renewable energy enthusiasts crumbles when we consider the intermittency of wind and solar energy — sources that generate electricity only when nature cooperates, typically at capacity factors of 15-40% for wind and 10-25% for solar, compared to 80-90% for baseload coal or nuclear. This variability demands a 'redundancy' infrastructure of dispatchable power backup plants, largely fossil-fuelled, to fill the gaps. It is tantamount to paying twice for the same thing.

The real costs of 'cheap' renewables

In Germany, the poster child for the *Energiewende* (energy transition), wind and solar, now comprise over 50% of installed capacity, yet the country has had to maintain and even expand coal and gas-fired plants as backups. These backups operate at low utilisation rates, burning fuel inefficiently and inflating primary energy use. Grid-scale battery storage, often touted as the solution to intermittency, remains prohibitively expensive and resource-intensive. Even Tesla's Megapacks can provide mere minutes or hours of backup for utility-scale needs, and scaling to days or weeks during periods of *Dunkelflaute* would require astronomical investments in rare earths and minerals, much of it controlled by China. Germany and fellow energy-suicide countries such as the UK now boast among the world's highest electricity prices.

Schernikau's system-level analysis exposes the core deception: while individual wind turbines or solar panels may appear efficient, their integration into a reliable grid erodes that advantage. To achieve dispatchable power — electricity available 24/7/365 with stable voltage, frequency and phase — renewables necessitate overbuilding by factors of three to five times or more, plus ancillary systems like short-duration batteries and upgraded transmission lines.

These additions consume vast amounts of primary energy in mining and manufacturing, often unaccounted for in standard metrics. For example, producing one TWh of lifetime electricity from solar requires 340-560 kilotons of steel plus copper and rare earths, compared to just one to two kilotons of steel for coal or gas. Wind fares little better, demanding 30-50 kilotons of steel and three to six kilotons of copper per TWh. Mining these materials is energy-intensive, predominantly powered by trucks and mining equipment powered by fossil fuels, embedding hidden primary energy costs that the IEA's 'partial substitution method' conveniently ignores by assuming near-100% efficiency for renewables.



Selected materials required by electricity generation technology. Source: Schernikau

Selected materials required by electricity generation technology. Source: Schernikau based on Department of Energy, USA. See also [here](#).

This brings us to the energy return on investment (eROI), a metric that measures how much usable energy a source delivers relative to the energy invested in its extraction, processing and deployment. At the system level, wind and solar's eROI plummets to 5-10 to 1 for solar and 10-20 to 1 for wind (even lower with battery storage), versus 25-30 to 1 for coal and gas and over 75 to 1 for nuclear. Schernikau highlights that renewables' short operational lifetimes — 10-20 years for wind, 12-15 for solar — mean that they must be replaced two to four times over a 40-60 year fossil plant lifecycle, generating mountains of waste and further primary energy demands. Global primary energy statistics underplay this; in 2024 IEA data, wind and solar's 4,655 TWh of primary energy yielded 4,623 TWh of electricity, but this excludes the energy for overbuilding and backups.

The analysis provided by renewables cheerleader the International Energy Agency leaves out the fact that as renewables penetration as a percentage of total grid generation increases, the marginal value of each additional renewable kWh diminishes. This leads to higher system costs and, counterintuitively, potentially even greater primary energy use overall.

Critics of primary energy metrics acknowledge efficiency gains in end-use technologies like electric vehicles (EVs), which are three to four times more efficient than internal combustion engines. But they too warn of over-optimism, noting that electrification amplifies resource demands: EVs require six times more critical minerals than conventional cars, and scaling renewables for an all-electric world would demand 12-16 times more minerals overall, plus over 100 times more land.

Land use is no trivial matter: solar farms at 5-7 MW per km^2 and wind at 1-2 MW per km^2 sprawl across vast areas, sparking opposition across rural communities in the US, Europe and the UK. In the US, the work of Robert Bryce on a renewables rejection database has tracked this phenomenon in detail. The damage to ecosystems and flora and fauna caused by wind and solar farms has sparked opposition by rural communities and conservationists around the world. It should be noted, however, that often rentier solar and wind energy companies with business models which harvest subsidies and reap guaranteed profits can buy farmers out in the agricultural sector.

Habitat destruction in areas set aside for solar and wind farms – which disrupts traditional livelihoods, hurts property values, wrecks vital croplands, ruins scenic vistas and kills birds, bats and other wildlife – has been amply documented over the years across rural communities around the world. We have yet to consider supply chain vulnerabilities of renewable energy systems and geopolitical risks — China dominates 80% of rare earth processing as well as dominating the global production of wind and solar energy components.

The full cost of electricity (FCOE), which includes intermittency and grid integration, reveals renewables as far costlier than the misleading ‘levelised cost of electricity’ (LCOE) metric suggests. In Europe, household electricity prices have doubled since the early 2000s, largely due to renewable subsidies and grid upgrades. Germany’s *Energiewende* has cost over €500 billion, yet emissions reductions stall as coal lingers for reliability. Developing nations, where energy demand is booming, cannot afford such experiments; Asia’s coal fleet, the world’s largest, continues to expand rapidly because it delivers affordable, dispatchable power.

What primary energy fallacy?

In truth, the ‘primary energy fallacy’ is a fallacy in itself, a distraction from the unpopular truths of energy physics and economics. By fixating on narrow efficiency gains, ideologues overlook how wind and solar, at scale, regress humanity toward low net-energy systems reminiscent of pre-industrial eras. Primary energy metrics, far from obsolete, illuminate the total inputs required for industrial societies that promise prosperity for the vast majority of people in the Global South. Until breakthroughs in storage render intermittent energy sources viable without mandates and massive subsidies, fossil fuels — and yes, even “beautiful, clean coal” with pollution-limiting filters and equipment — remain indispensable.

Decades of delusion and fanaticism over man-made climate crises predicted by junk science models collided with reality at the conclusion of the UN’s chaotic climate jamboree this year at Belem, Brazil. The concluding global outcome document of COP30 – which was not attended by the leaders of the world’s most prolific emitters of greenhouse gases, China, the US and India – had stripped out any mention of eliminating fossil fuels. This though did not stop UN bureaucrats from telling its members that they should triple their spending on the ‘climate crisis’ over the next decade.

Policymakers would do well to heed energy experts like Schernikau and Stein. Chasing luxury beliefs do not cost well-heeled climate bureaucrats and renewables ideologues much, but the burdens of irrational energy policies will be borne by the world's poorest. The real path forward lies in pragmatic, technology-neutral approaches that prioritise energy abundance over austerity.

This article was first published in the Daily Sceptic [https://dailysceptic.org/2025/12/05/time-to-stop-pretending-renewables-are-cheap/]

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