NUCLEAR MONITOR

April 26, 2025| Issue #926

A PUBLICATION OF WORLD INFORMATION SERVICE ON ENERGY (WISE) AND THE NUCLEAR INFORMATION & RESOURCE SERVICE (NIRS)

WISE/NIRS Nuclear Monitor

The World Information Service on Energy (WISE) was founded in 1978 and is based in the Netherlands.

The Nuclear Information & Resource Service (NIRS) was founded in the same year and is based in the U.S. WISE and NIRS joined forces in the year 2000 to produce Nuclear Monitor.

Nuclear Monitor is published in English, 10 times a year, in electronic (PDF) format only. Back issues are published on the WISE website two months after being sent to subscribers (www.wiseinternational.org/nuclear-monitor).

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Monitored this issue:

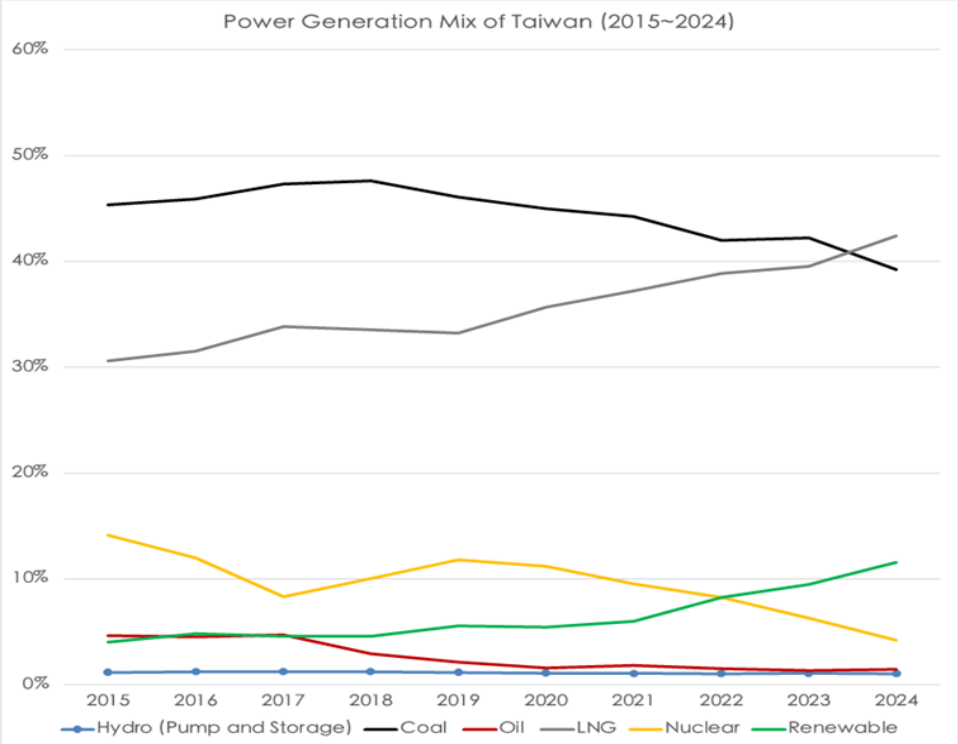
Taiwan's Final Step Toward a Nuclear-Free Homeland Faces New Political Hurdles

Chia-Wei Chao, Research Director of Taiwan Climate Action Network

On May 17th, Taiwan is set to shut down the last operating reactor at the Maanshan Nuclear Power Plant (NPP 3), effectively realizing its long-held goal of becoming a "nuclear-free homeland." This milestone marks the culmination of a policy first initiated after the Democratic Progressive Party (DPP)—an anti-nuclear political force—won the presidential election in 2016 and launched an ambitious energy transition plan. The policy aimed to phase out all nuclear power plants by 2025, replacing them with renewable energy sources, while gradually reducing coal-fired power in favor of natural gas.

From its inception, the energy transition has been politically contentious. Pro-nuclear parties and advocacy groups initiated two national referendums in 2018 and 2021. The 2018 vote succeeded in repealing a symbolic clause in the Electricity Act referencing a "nuclear-free homeland," but this had no substantive effect on policy. The 2021 referendum, which sought to revive the mothballed Lungmen Nuclear Power Plant (NPP 4), was narrowly defeated, with 53% voting against it, the result effectively closed the door on restarting NPP 4.

Amid the political controversy. the nuclear phase-out driven energy transition policy already reshapes the landscape of power system. The share of nuclear power reduces to 4% in 2024, the share of renewable energy increase to 12%. In the other aspect, coal fired power plant no longer dominates the power generation, it was overtaken by LNG generation in 2024. Taiwan rank No 17 in term of total solar capacity and No. 5 in offshore wind capacity, and more than 32 thousand green jobs are created, those achievements are the legacy of Taiwan's energy transition policy.



Yet, the final stretch toward a nuclear-free future is now encountering significant resistance. Opposition parties, which hold a majority in the legislature, have proposed a new referendum to extend the life of NPP 3. They are also attempting to amend the Nuclear Reactor Facilities Regulation Act, seeking to remove the current deadline for submitting life-extension applications. The phase-out, once seen as inevitable, now must endure renewed political and legislative challenges.

Five key drivers are behind this renewed push for nuclear energy.

1. Economic Pressures
Taiwan's state-owned utility, Taipower, has raised electricity prices by 35% between 2021 and 2024—an increase modest by global standards but amplified by pro-nuclear groups. They argue that the nuclear phase-out is to blame, framing it as the root cause of rising costs and an increased burden on households.

2. Power Shortage Concerns
Nationwide blackouts in 2018 and 2021 have eroded public confidence in Taiwan's power grid. Compounding this concern is the soaring energy demand driven by the island's semiconductor boom and its aspirations to host hyperscale data centers to power AI technologies. Electricity consumption is growing at an annual rate of 2.8%, fueling doubts over the adequacy of a post-nuclear energy mix.

3. Stalled Momentum and Lower Public
Confidence in Energy Transition Although renewable energy now accounts for 12% of Taiwan's electricity generation, its expansion faces headwinds. Public trust has been shaken by corruption scandals tied to solar and offshore wind projects. Local opposition—fueled by concerns about farmland being repurposed for solar panels and the impact of offshore wind on aquaculture—has delayed permitting processes. As a result, nuclear power is once again being seen by some as a more favorable, less disruptive option.

4. The "Nuclear Renaissance" Narrative
Media coverage of the "Declaration to Triple Nuclear Energy" at COP28—often mischaracterized as an official COP decision—has stoked excitement around small modular reactors (SMRs). Business magazines in Taiwan dedicated extensive features to SMR developments and MoUs signed by tech giants like Amazon, Google, and Microsoft. Omitted from these stories, however, was the recent cancellation of the NuScale SMR project—an omission that further tilts the public narrative toward nuclear optimism.

5. National Security Imperatives
Unique to Taiwan is the specter of geopolitical instability, particularly the threat of a naval blockade by China. Energy security has become a central concern—not just for pro-nuclear groups but also among top-level decision-makers. During a recent tabletop exercise, a former director of the American Institute in Taiwan (the de facto U.S. embassy) publicly questioned Taiwan's decision to phase out nuclear power. This was echoed by visiting U.S. lawmakers and, more recently, the sitting AIT director, who proposed bilateral cooperation on nuclear development to ensure a stable electricity supply for AI infrastructure.

Faced with these converging pressures, Taiwan's leaders have started to recalibrate their stance. For example, Premier Cho Jung-tai say the existing government is open to new nuclear energy technology during an interview with Bloomberg last October, but he also set-up three conditions by emphasized that *"As long as there is a consensus within Taiwan on nuclear safety and a good direction and*

guarantees for handling nuclear waste, with this strong consensus, we can have a public discussion," President Lai reinforced this position in a press release on Earth Day, underscoring a growing shift in tone—from ideological opposition to conditional openness.

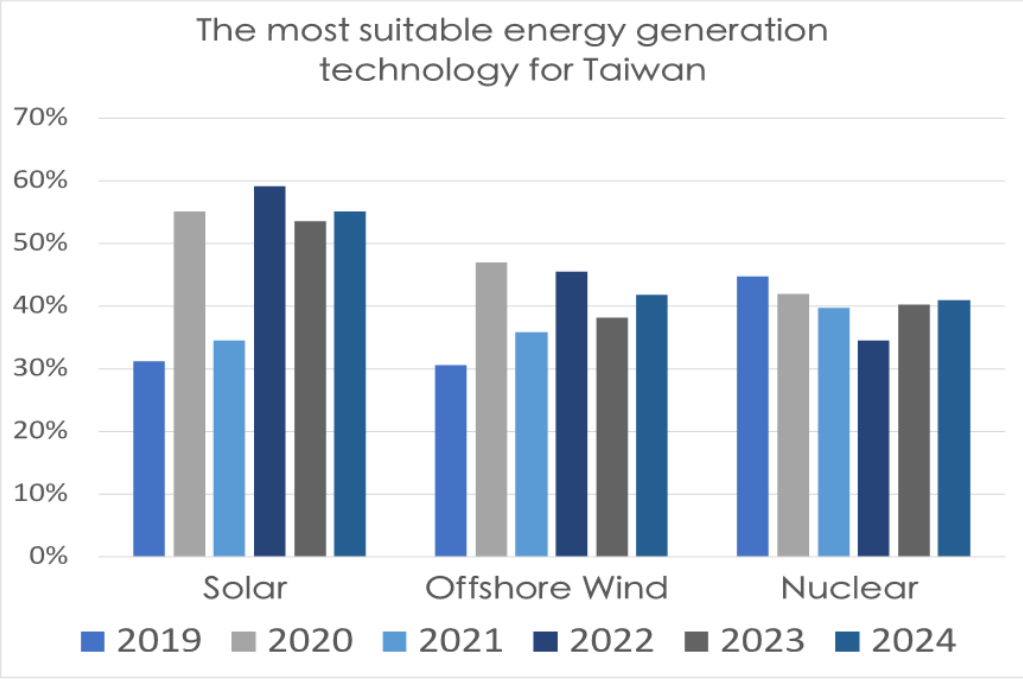
While the shutdown of Maanshan on May 17th will mark a historic moment, the political struggle over nuclear energy in Taiwan is far from over. Pro-nuclear forces will likely continue to push referendums and legislative amendments. In response, anti-nuclear advocates are organizing to consolidate the nuclear phase-out through three strategies:

1. Securing local politicians' support by encouraging the mayors of Kaohsiung and Pingtung—home to the Maanshan plant—to publicly endorse the phase-out.

2. Blocking legal revisions of Nuclear Reactor Facilities Regulation Act by backing recall movement that could alter the parliamentary balance of power. Existing majority of the parliament is hold by the pro-nuclear political parties, they also attempt to block the budget that use for energy efficiency measure and rooftop solar development in addition to push for the revival of nuclear power.

3. Countering national security arguments by enabling companies like TSMC to meet their RE100 commitments, thereby demonstrating that a nuclear-free, renewables-based grid can still support Taiwan's strategic industries.

In Taiwan, the path to a nuclear-free future has never been merely a technical decision—it is a political saga still being written.



Problems for new Flamanville reactor are piling up

Jan van Evert

The French electricity company EDF has decided to completely recompose the core of the new EPR reactor in Flamanville. There are problems with the water tightness of the nuclear fuel rods. This decision is based on feedback from the Taishan reactor in China, which experienced the same type of problem during the second cycle of the EPR production cycle.

After more than two months of shutdown, the Flamanville 3 reactor prepares to be reconnected to the electricity grid on Monday 21st April. EDF has also announced the future replacement of part of the fuel.

The energy company has to deal with neutron flux disturbances at the bottom of the reactor vessel. This problem could lead to the fuel rods losing their seals. These problems have already been observed at the Taishan EPR in China, during its second production cycle.

As a preventive measure, the core of the Flamanville EPR reactor will therefore be rebuilt with reinforced fuel rods after its first unit outage, at the end of 2026 or early 2027.

“This is a precautionary measure", stresses EDF, “To date, there have been no leakage problems. We are simply taking into account international experience feedback”.

This is not the first incident with this reactor: it has already been shut down three times since it was connected to the grid on December 21st last year. The problems are piling up: faulty temperature sensors, alternator problems and so on (see Nuclear monitor 925).

How the IEA is still grossly biased against renewables

David Toke

The International Energy Agency (the IEA) is hopelessly biased against renewable energy both in terms of the projections of future energy development it has made and also in the way it frames the statistics about energy supply. The statistical methods used by the IEA favour fossil fuels and nuclear power. The IEA does not give sufficient attention to energy efficiency. These things can be illustrated by reference to analysis of its past energy projections and also by analysing the way it counts energy statistics. The question that must be posed, is what is the point of the IEA if it gets things so badly wrong?

I begin this discussion by talking about the contrast between the IEA’s projections of nuclear power generation in the future with their projections of renewable energy, focussing on solar PV. Then I turn to discussing how the IEA’s method of presenting the energy statistics is biased towards fossil fuels and nuclear power and against renewable energy. I illustrate my points with a discussion of UK energy statistics. I discuss how the IEA’s statistical methods biases discussion against the energy efficiency advantages of electrification in general. Again I illustrate my argument with some projections in the case of UK energy.

How the IEA has been biased in their future energy projections

The IEA has had a consistent tendency to be over-optimistic about the prospects for nuclear power. For example, in its 2010 report it projected, in its 'new policies' scenario, a 46 per cent increase in world nuclear generation between 2009 and 2023 (see HERE on page 84). In fact nuclear production in 2023 was identical to that of 2009.

By contrast the IEA grossly underestimated increases in renewable energy generation. As can be seen in the Figure 1 below, reproduced from a recently published academic paper the IEA has had a consistent habit of projecting much smaller increases in world solar PV generation than has happened in practice. The vertical axis represents annual solar PV additions in GW. The IEA projections consistently have solar pv capacity more or less levelling off in the future, whereas in reality there has been exponential growth of the technology.

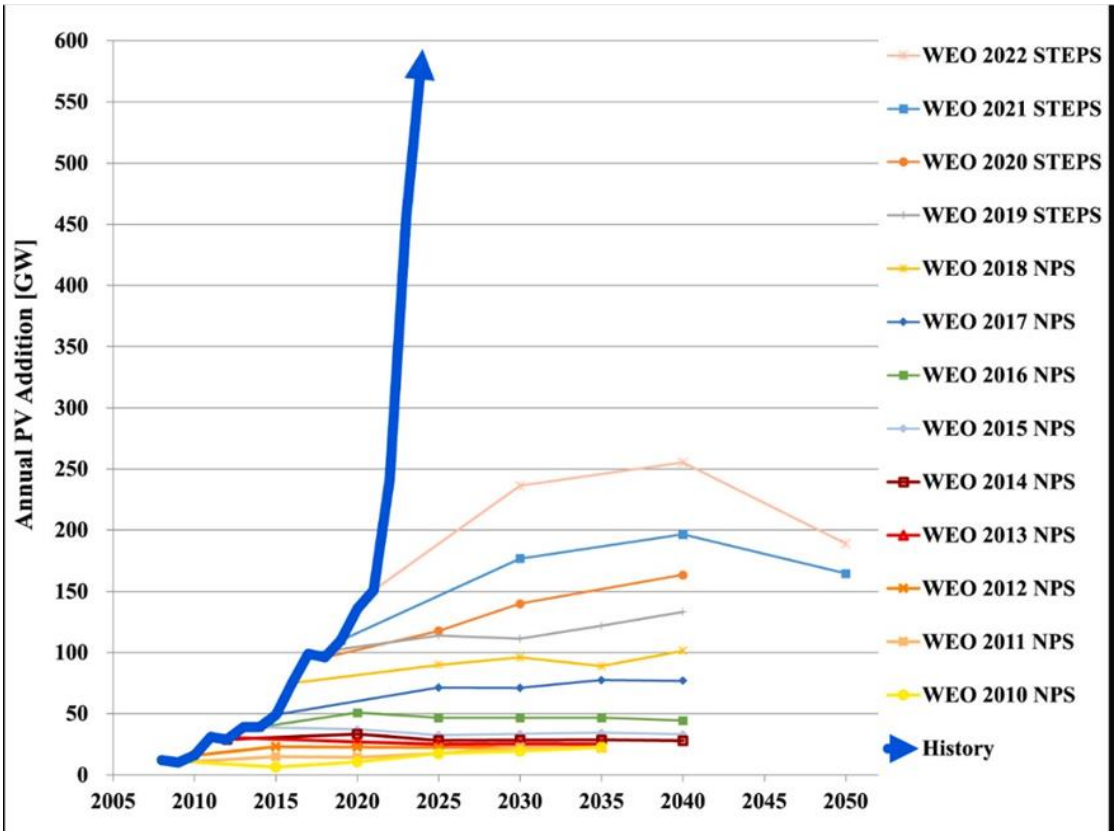


Figure 1 Annual solar PV additions by WEO outlook scenarios compared to historical developments

Source: G. Lopez, Y. Pourjamal, C. Breyer (2025) 'Paving the way towards a sustainable future or lagging behind? An ex-post analysis of the International Energy Agency'sWorld Energy Outlook', *Renewable and Sustainable Energy Reviews* Volume 212, April 2025, 115371, page 17 Figure 29. See paper HERE

Now it is certainly true that in the last couple of years the IEA has been producing some much more realistic energy projections for the future. However much of its language, and its method of counting the statistics remains in the same vein that downplays the role of renewables.

Analysis of IEA method of counting energy statistics

The UK as an example

Under the IEA's accounting of energy statistics, nuclear power accounted for 123 TWh of UK energy production in 2023. Note that I have converted the TJ units used by the IEA into TWh which is more usually used for generation of electricity. You can see the IEA's figures HERE. But what is odd about these figures is that the nuclear energy figures are rather larger than the figures for solar and wind, which amount to 97TWh of generation in 2023. Yet, according to the British Government's own electricity generation statistics (see HERE) there was only 40.6 TWh of nuclear generation, not the 123 TWh reported by the IEA. In fact, as reported by the UK Government, solar and wind between them really generated rather more than double the quantity of nuclear power generated in the UK on 2023.

The IEA rationale

There is something obviously strange about these IEA figures even from a first glance because wind and solar etc appear to be producing less energy than nuclear power in the UK. This even though the UK Government energy statistics show that wind, solar and hydro produced around twice as much electricity in 2023 compared to nuclear power. The same sort of bias occurs when dealing with fossil fuel production. Around half of energy used in generating electricity from gas fired power plant is wasted, yet all of the energy, including the wasted energy is included in the IEA's statistics for energy generation from gas.

In the case of nuclear power around two-thirds of the energy used to generate the nuclear electricity is wasted. Yet the wasted energy is included in the IEA data making it look like solar and wind actually produce less energy than nuclear power! The IEA's justification for this disparity is to point out that in fact nuclear power stations do produce around three times the energy that gets converted into electricity. It is just that this energy goes up cooling towers or into rivers or seas.

So, the methodological reason that the statistics are so biased is because the IEA uses a method for counting energy statistics which includes the energy wasted when fossil fuels and nuclear power are used to produce useful energy. On the other hand when it comes to renewable energy fuels, essentially wind, solar, and some hydro power sources only the final energy production, that is the amount of electricity that is generated, is used in the data. I would explain the reasons for the bias by reference to the IEA's fossil fuel focussed history and intergovernmental priority being given to nuclear energy. The IEA does not play any important role in international energy transactions themselves, but it does have an important information role that influences the policy environment.

The (in)efficiency bias against renewables

Another, very important aspect of IEA bias is that its main focus on energy supply implicitly downplays the energy efficiency. Take for instance the IEA press release of February 25th 2025 where there was talk of the 'world's surging electricity demand' (see HERE). Nuclear power is mentioned 8 times, solar 4 times, wind power twice. Note that the mentions of nuclear are out of all proportion to their recent growth where nuclear lags behind renewables. Meanwhile heat pumps and electric vehicles were given no specific mentions at all.

The emphasis on nuclear power growth compared to renewables is not supported by facts. As can be seen in Figure 2, whilst world nuclear power growth has been next to zero

this century, non hydro renewables (almost all wind and solar) has increased rapidly leaving nuclear power a long way behind.

The way that solar and wind production statistics are counted themselves represent a major element of the bias. Apparently, it is ok

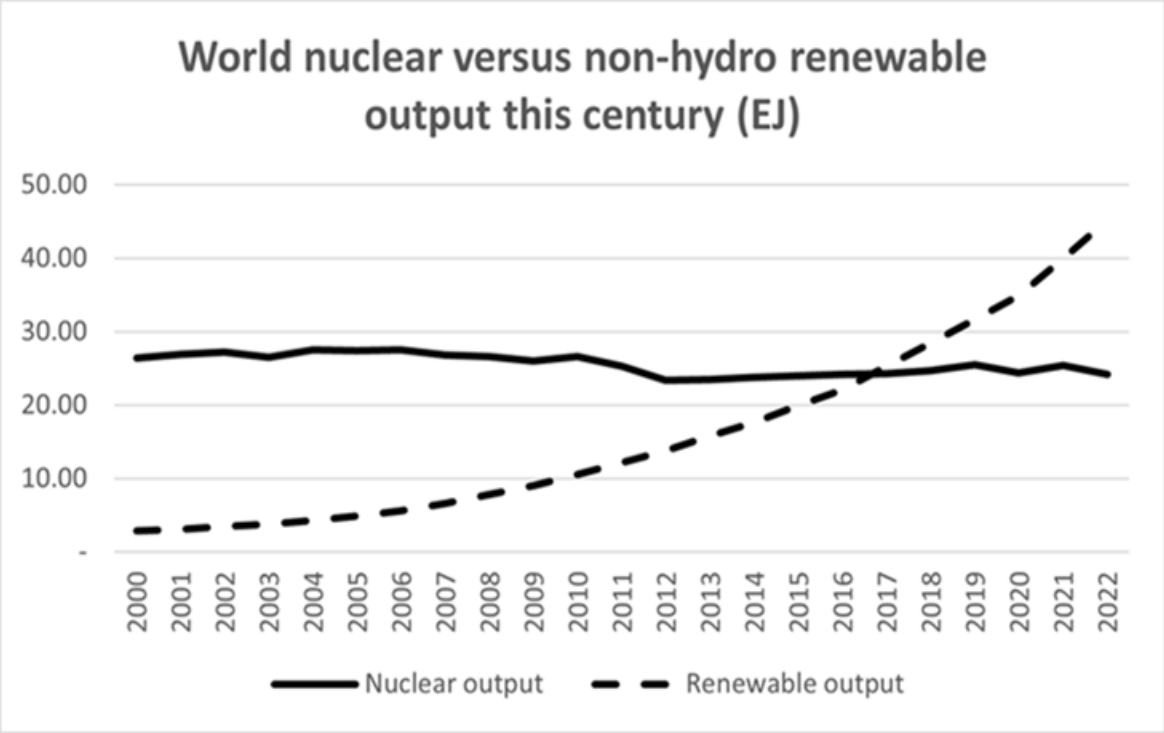


Figure 2 Source: David Toke (2024) Energy Revolutions - Profiteering versus Democracy, Pluto Press, page 17

In fact, solar and wind energy, being delivered through electricity, is associated with the most efficient means of supplying electricity. This can be demonstrated by comparison with the use of fossil fuels. Yet the way the IEA frames the debate, organises its statistics and makes its wildly erroneous projections does not help us understand this.

According to UK Government statistics for 2023, around 72 per cent of oil consumption in the UK is used in the transport sector. Around one third of the natural gas consumed in the UK is used to make electricity. However, much of this energy is wasted. In the transport sector the bulk of energy is wasted in inefficient internal combustion engines. In a green energy system this waste is eliminated, leaving us with a much reduced total for energy consumption compared to IEA accounting.

to include amounts of fossil fuels or nuclear power wasted in production or when generated through equipment such as boilers or motor vehicle engines. On the other hand the wind or solar energy that is not collected by wind or solar farms from the available wind and solar energy is ignored by the IEA statisticians.

For example, normally solar panels convert no more than around 20 per cent of the sunlight they receive into electricity. But the other 80 per cent is not counted as solar production. In the case of wind turbines, less than a half of the available wind energy is turned into electricity generation, but this ‘wasted’ wind energy is not counted as part of production.

As I have already commented, in the case of natural gas used for electricity generation, approximately 2 units of gas will be needed to produce one unit of electricity. Yet under the IEA’s method, a given kWh of electricity

produced from gas will count as double the value of the electricity generated from wind, solar, hydro, or tidal power.

Gas boilers account for most of the rest of natural gas consumption. They will on average be no more than around 80 per cent efficient in practice (note existing ones, not brand new boilers under ideal test conditions). By contrast heat pumps actually produce around three times the useful heat output compared to the amount of electricity needed by the heat pumps. They also reduce energy consumption by similar amounts when used to replace conventional air conditioning systems.

Energy Efficiency through electrification

In the case of nuclear power and oil consumption the pro-fossil fuel and pro-nuclear bias in the statistics gets even worse. In the IEA statistics a kWh of electricity generated by nuclear power counts as triple the amount of electricity generated by wind or solar power. This is despite the fact that a kWh of electricity from solar or wind will power your tv set just as much as a kWh of electricity from nuclear power.

The oil statistics obscure the contribution to reduction of energy consumption that will come from electrification. Motor vehicles will waste around 70-75% of their energy. But this is not counted in the figures which therefore grossly exaggerate the useful energy produced by fossil fuels used in transport. By comparison Electric Vehicles are around three times as energy efficient as fossil fuel vehicles. On the other hand solar/wind powered EVs will use about a third of the energy compared to the wasteful fossil fuel powered vehicles. Even in the case of aircraft, battery technology is evolving at such a rapid pace that laboratory based research implies in 20 years even medium-range air flights will be done using battery electric technology.

In looking at renewables, a distinction has to be drawn between sources like wind and solar and biomass. Biofuels are themselves usually an inefficient means of providing energy services. This is because no more than around a third of what is counted as biofuel production is turned into useful final energy such as electricity or fuel for motor vehicles.

The extent of the wastefulness of the current energy system comes when we compare an efficient electrified economy powered totally by renewable energy with our current one. By efficient electrification, I mean one where heating and air conditioning services are provided by heat pumps and transport is done through battery-electric technology. Indeed if this is achieved then total UK energy consumption will fall by nearly half. I calculate this using data drawn from UK Government estimates of energy consumed in the process of delivering different types of service (See for instance data HERE and HERE). In Figure 3 I present the distribution of energy consumption in an energy-efficient economy where transport and heating is delivered through battery electric technology and heat pumps respectively.

Because this system is one where all transport and heating is done by battery electric technology and heat pumps respectively it involves much less energy to produce exactly the same level of service as today. I assume that the same heating levels are achieved and in transport the number of miles travelled remains the same as was the case in 2023 in the UK. It is powered entirely by renewable energy, mostly wind and solar.

In a energy system that is completely powered by fluctuating renewables long-term storage is needed, at least to afford complete cover in those weeks where there is little or no solar PV or wind. Also there is fluctuation in wind and solar production between different years. This need to provide long term storage will

add around 4-7 per cent of annual generation needs, depending on how much 'overcapacity' is built into the system . Over 10-12 years this would build up to be equivalent to 40-70 per cent of a single year's total generation. I am assuming that green hydrogen produced by electrolysing water with renewable energy is used and stored, although there are various other possibilities. See papers analysing 100 per cent renewable energy systems (see HERE and HERE). This provision of long term storage should not be confused with short term storage within particular days done through conventional batteries.

Altogether the 100 per cent renewables scenario will reduce the total UK energy consumption in 2023 from 1904 TWh to 891 TWh according to my calculations. This is shown in Figure 4 . This a reduction of around 53 per cent to provide the same level of services as provided today. In making this calculation I am using the UK Government's assessment of total UK primary (that is, raw) energy and comparing it with the energy efficient scenario. The Government's statistics in mtoe have been converted to TWh. For discussion and data on total UK primary energy consumption as measured by the UK Government see HERE, page 14.

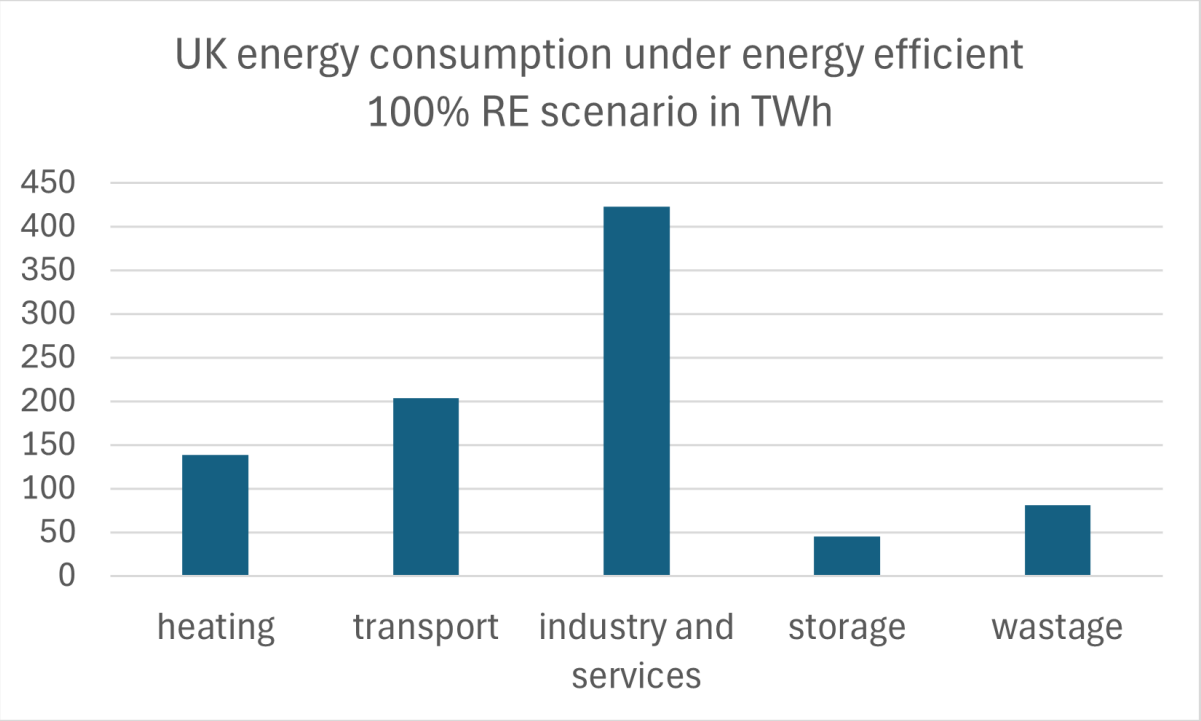


Figure 3 ***Shares of UK Energy Consumption based on 100 per cent renewable energy (RE) scenario***

Note: Analysis of impact of switch to use of heat pumps for all heating drawn from UK Government data on patterns of final energy consumption: ECUK 2024: Consumption data tables (Excel) (see HERE) and also Government data on oil products (see HERE). I have used 2020 levels of final energy consumption since these are the latest available. I have added on 10 per cent to the final energy consumption figures to account for wastage (eg transmission and distribution losses) when comparing with the amount of renewable energy needed to deliver this level of final energy.

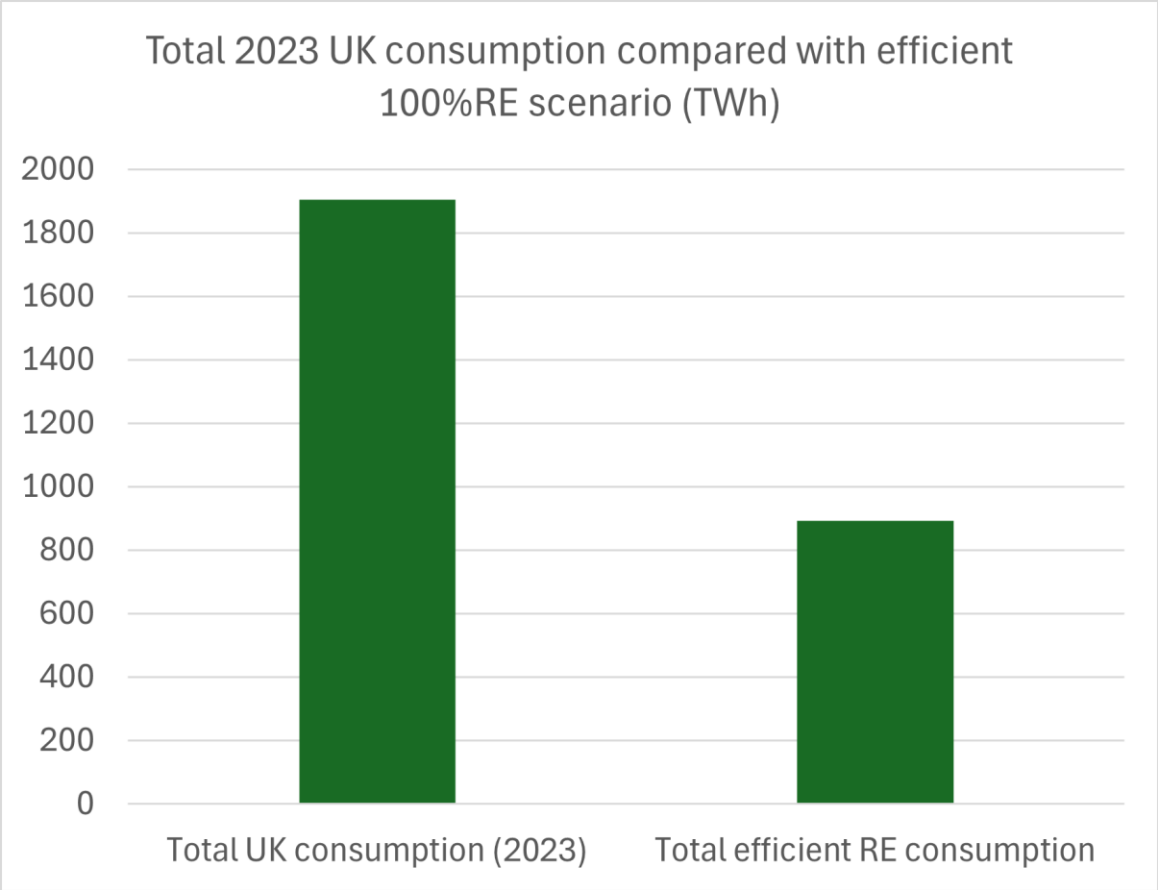


Figure 4 Total UK energy consumption in 2023 compared with energy efficient 100 per cent renewable energy scenario.

In some ways this assessment understates the level of likely energy reduction since this analysis (which is based on limited time resources) made no allowance for increases in the energy efficiency of buildings - something which is improving all the time as new buildings replace older ones.

Conclusion

The way that the IEA compiles its statistics is grossly biased against renewable energy and in favour of fossil fuels and nuclear power. Its future energy projections have been abysmal, and this failure illustrates its appalling bias. The IEA's approach also obscures the impact of energy transition which will involve increasing dominance by electric-battery and heat pump technologies. The IEA fails to give priority to energy efficiency. Rather it tends to talk more about absolute increases in energy consumption, such as in data centres (for example see HERE).

Yet such notions of accelerated absolute increases in energy consumption have already proved to be overblown. This is demonstrated by China's DeepSeek AI project which is being powered by a small fraction of the energy consumption of earlier AI projects (See HERE). The IEA is also keen on pushing nuclear power fantasies, including small modular reactors (see HERE).

In general the IEA tends to talk about energy security rather than energy transition, as can be seem in the executive summary of its 2024 World Energy Energy Outlook (see HERE). Yet energy transition will implicitly give us energy security. It will do through the replacement of of insecure and volatile fossil fuel supplies with renewable energy and electrically based energy efficient technologies.

The key to understand this is that the IEA is not independent in focus or finance. The IEA is financed by a collection of mostly western

governments. We should remember that the IEA was formed to, in effect, help western countries cope with the fact that the western based oil companies lost control of oil markets after 1973. The Secretariat is based in nuclear-dominated France. The information it gives is seriously flawed.

The conditions which led to the IEA's formation have fundamentally changed. Our biggest challenge now is energy transition and the climate struggle to reduce greenhouse gas emissions. The IEA's projections are wholly unreliable and its statistics give a false impression of what is happening.

The main energy trade groups already have their own trade associations - eg IRENA for renewables, the WNA for nuclear, and we know that the oil and gas companies look after themselves. If the IEA is to play a useful role it needs to shift its language, its statistical methods and away from it mostly supply centred focus. A new raft of work has to be created with a mission of promoting energy efficiency technologies.

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Belgians protest against new nuclear power plants

Jan van Evert

On Tuesday March 11th , exactly 14 years after the Fukushima nuclear disaster, representatives of twelve Belgian organisations stood at the entrance of the Federal Public Service FPS Energy. It was a diverse group, with climate, peace and antinuclear activists. They were protesting against the government's plans to extend the lifespan of the old nuclear power plants, and to build new ones.

During the action, Yuko Matsubaru reads a recently written letter from Ruiko Muto, a resident of Fukushima, Japan. In it, she describes the threatening living conditions of the area around the nuclear power plant: "Nearby, in a small urban area that the government has decontaminated to lift evacuation orders, 'reconstruction houses' have been built for families with children. According to a new resident, the level of radioactivity in his house is 0.3 microSievert per hour (μSv/h), five to ten times higher than before the accident. "It is not exactly a healthy environment to live in and raise children."

At the end of the action, the spokespersons of VAKS (a Belgian anti-nuclear group) and Yuko Matsubaru handed over two large envelopes, containing Ruiko Muto's letter and other documents. These include a brief analysis of VAKS, a list of seven demands, and a list of 46 supporting organisations

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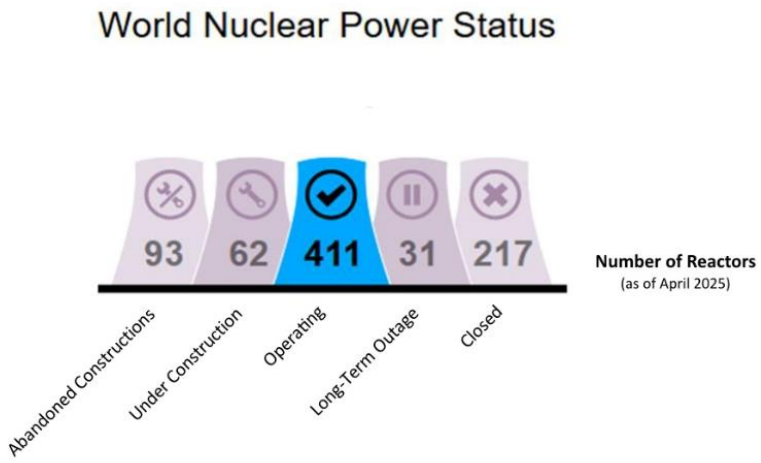

Compared to the last edition of the Nuclear Monitor (925) nothing changed.