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Monitored this issue:

Stop fueling the war,

stop reinforcing Russia's influence on European energy policies

Pauline Boyer, energy campaigner, nuclear expert for Greenpeace France

Foreword

This article contains several excerpts from reports published by Greenpeace, result of the work of Greenpeace's French office and Greenpeace Ukraine nuclear experts Shaun Burnie and Jan Vande Putte.

Article

The red and black hull of the Michaïl Dudin cuts through the dark waters of the port after passing through the entrance lock in the morning mist of Dunkirk in northern France. In its hold is a rather unusual cargo: cylindrical containers of uranium enriched in Russia and colorful rectangular containers of natural uranium straight from the mine. It's the usual shipment. Russia's full-scale invasion of Ukraine has not stopped the incessant ballet of cargo ships with their uranium swollen bellies between Saint Petersburg and Dunkirk. From Russia to France.

Russian uranium fueling French and European power plants

In 2022, France almost tripled its imports of Russian enriched uranium in the midst of the invasion of Ukraine, with Russia supplying a third of the enriched uranium needed to power French nuclear reactors. That same year, nearly half of the natural uranium imported into France came from Kazakhstan and Uzbekistan, while almost all of the natural uranium from Kazakhstan, and a considerable portion of that from Uzbekistan, passed through the hands of Rosatom, which controls the transport of all nuclear materials transiting Russian territory [1]. Also in 2022, all French exports of reprocessed uranium (RepU) were sent to Russia, and all imports of re-enriched uranium (ERU) into France came from Russia.

France is 100% dependent on Russia for the reuse of its reprocessed uranium, thereby justifying its spent fuel reprocessing facility in La Hague in order to perpetuate the myth of recyclable nuclear fuel at an enormous environmental cost, given the radioactive pollution that the plant releases into the air and the English Channel. This long-term collaboration with Russia also serves as a dumping ground for 90% of the French reprocessed uranium waste sent to the secret nuclear town called Severks in Siberia.

After more than three and a half years of occupation of the Zaporizhzhia nuclear power plant in Ukraine by Russian armed forces and the Russian company Rosatom, the balance sheet for uranium imports in 2024 shows that France continues to import enriched uranium from Russia [2]. A quarter of the enriched uranium imported by France in 2024 came from Russia. In 2024, nearly half of the natural uranium imported into France still came from Kazakhstan and Uzbekistan, most of it via Russia, controlled by Rosatom.
Through this trade, France is fueling the war in Ukraine, in total contradiction with the French government's official positions on its support for the Ukrainian people. French nuclear

[1] Greenpeace, La Russie, plaque tournante de l'uranium, 2023
https://www.greenpeace.fr/rapport-la-russie-plaque-tournante-de-luranium/

[2] Greenpeace presse release, Trois ans d'occupation de la centrale nucléaire de Zaporijia : la France contribue toujours au chantage nucléaire russe, mars 2025
https://www.greenpeace.fr/espace-presse/trois-ans-doccupation-de-la-centrale-nucleaire-de-zaporijia-la-france-contribue-toujours-au-chantage-nucleaire-russe/

industry players have so far deemed that no change in their relations with Rosatom is necessary. Worse still, these ties are set to grow stronger. Indeed, the uranium trade is only the tip of the iceberg.

French and Russian nuclear cooperation: a long-standing partnership

The French nuclear industry works closely with Rosatom, the Russian nuclear giant, at all levels of the production chain, from uranium mining to waste treatment, and from the construction of power plants to their operation [3].

Rosatom is a long-standing privileged partner of the French nuclear industry. Nuclear cooperation between France and the Russian Federation is governed by an intergovernmental agreement dating from 1996. Since then, numerous agreements and partnerships have been signed between manufacturers in both countries. France brought Rosatom into the European market in 1971. At the time, Tenex, a Rosatom subsidiary, had obtained its first contract to supply enriched uranium with the French Atomic Energy Commission (CEA). This contract was followed by new contracts to provide enrichment services with other Western European countries.

While Rosatom should be sanctioned, it is in the process of start of construction of two new nuclear reactors in Europe, with the help of the European nuclear consortium composed of the French company Framatome and its German technology partner Siemens Energy [4].

These two companies are the contractors selected by Rosatom for the Instrumentation & control I&C system at the Paks II nuclear plant in Hungary. The highly controversial Paks project is a partnership between Rosatom and the Hungarian government for the construction of two VVER 1200 reactors at the existing nuclear plant site, where four Soviet-supplied reactors continue to operate. In October 2019, the Framatome-Siemens consortium signed an agreement with Rosatom-subsidiary RASU JSC “to manufacture, deliver and commission automated process control systems” for the Paks reactor units [5] [6].

Framatome and Siemens Energy play a key role in Rosatom's nuclear reactor program in Russia and abroad. Through the export of cutting-edge technologies, software, knowledge, and expertise—particularly in instrumentation and control (I&C) systems, which are the brain and central nervous system of a nuclear power plant—they have helped establish Rosatom's position in the global nuclear trade. Rosatom is now the world's largest supplier of nuclear power plants under construction. Through their strategic partnerships with Rosatom, Framatome and Siemens Energy directly support the economic and geopolitical interests of the Russian state (in addition to the economic interests of the French nuclear industries).

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[3] [Décryptage] L’industrie nucléaire française, une alliée du régime de V. Poutine, mars 2022
https://www.greenpeace.fr/espace-presse/decryptage-lindustrie-nucleaire-francaise-une-alliee-du-regime-de-v-poutine/

[4] RUSSIA’S ATOMIC PARTNERS: FRAMATOME, SIEMENS ENERGY AND ROSATOM
How European companies are supporting a criminal Russian state nuclear company – and why EU sanctions are needed to stop it, july 2023
https://www.greenpeace.de/publikationen/Rosatom_Report_G.pdf

[5] Greenpeace European unit, ‘Russian doll’ gas and nuclear lobbying threatens EU energy independence – new research, may 2022
https://www.greenpeace.org/eu-unit/issues/climate-energy/46227/russian-doll-gas-nuclear-lobbying-taxonomy-eu/

[6] Anastasiya Shapochkina, “Plus de trois décennies après Tchernobyl, la Russie joue crânement la carte nucléaire”, The Conversation, 23 avril 2021
https://theconversation.com/plus-de-trois-decennies-apres-tchernobyl-la-russie-joue-cranement-la-carte-nucleaire-159574

Another important factor that raises serious concerns over Framatome/Siemens Energy's I&C trade with Rosatom is the dual use capability of their advanced hardware and software technology. Rosatom is an enormous nuclear enterprise spanning all areas of nuclear technology and materials, including Russia's nuclear weapons program. Of particular relevance is Rosatom's design, installation and maintenance of nuclear reactors within Russia's ballistic missile submarine (SSBN) program.

It is also crucial that more light is shed on the end use of the dual-use-technology that Framatome and Siemens Energy have delivered to Rosatom: technology that could benefit Russia's nuclear military program, including submarine reactor operations. Given that Rosatom is responsible for all areas of Russia's nuclear program, from reactors to weapons and submarines, there can be no confidence in any Rosatom assurances of end use compliance. Thus, while Russia attacks the democratic state of Ukraine, wielding the threat of a nuclear strike, there is a very real risk that European companies have been providing Russia with nuclear technology that could be weaponized.

New alliances with Rosatom since Russia's full-scale invasion of Ukraine

A new Franco-Russian nuclear company has been created since the full-scale invasion of Ukraine. In 2023, a joint-venture was created between Advanced Nuclear Fuel (ANF), a subsidiary of Framatome/EDF, and TVEL, a subsidiary of Rosatom. In order to circumvent the German ban relative to Russia's invasion of Ukraine in February 2022, the agreement sealing the creation of this joint-venture was signed in France.

Framatome/EDF has therefore joined forces with Russia to produce fuel for Russian-designed nuclear power plants located in Europe. A way of replacing one dependency with another. Approval for this collaboration at the Lingen site in Germany, operated by Framatome's French subsidiary, is still pending from the German authorities.

Rosatom, the first company to attack and illegally occupy a foreign nuclear power plant in Ukraine, still avoids sanctions

That Rosatom, despite being directly involved in the armed invasion of a sovereign nation, has avoided any kind of censure from the European Union, highlights the genius of the tool created by Vladimir Poutine to establish geopolitical domination and economic dependence on many countries. The nuclear octopus has a stranglehold on European countries that have Russian-designed nuclear power plants, and those, such as France, that have an economic interest in continuing trade with this nuclear power.

While the implementation of European sanctions on Russian fossil fuels has been progressing rapidly over the last months, those mentioned for the nuclear sector remain uncertain. However, the effects of dependence on Russian fossil fuels and nuclear power are comparable. In May 2022, Greenpeace reported that Russian energy firms Gazprom, Lukoil and Rosatom used lobbying connections reminiscent of nesting Russian dolls to influence the inclusion of fossil gas and nuclear energy in the EU taxonomy of sustainable investments [5].

For Anastasiya Shapochkina, Senior Lecturer in Geopolitics, "in addition to increasing Russia's political influence within the EU, the construction of new nuclear power plants strengthens economic ties between the Russian supplier and European customer countries for decades to come, with an effect comparable to that of a gas pipeline. [...] Nuclear power allows Moscow to help define Europe's future energy mix, which may give it the opportunity to advance its agenda on other issues, particularly gas." [6]

Stop fueling the war, stop reinforcing Russia's influence on European energy policies

In order to end its dependence on Russian nuclear power and stop indirectly financing the war, as well as its collaboration with the criminal enterprise Rosatom, it is urgent that the European Union add the Russian nuclear giant to its sanctions list.

France should already, set an example. French companies should terminate their contracts with Rosatom, the company that, for the first time in the history of nuclear power, took control of a power plant that did not belong to it, participated in Occupation, Torture, and Nuclear Safety Breaches at the Zaporizhzhia NPP [7].

As Russia intensifies its attacks on Ukraine's energy system with the aim to plunge the country into energy insecurity, as Russia continues to brandish the nuclear threat by seeking to restart the reactors at the Zaporizhzhia power plant [8], it is time to comprehensively sanction Russian fossil fuels and nuclear energy.

The facts against nuclear energy are piling up

Jan van Evert

Recent reports have investigated all the aspects of nuclear energy and concluded among other things that it is too expensive and that building nuclear power plants takes too long. This may not be a surprise, but there are more problems that have been ignored in most studies of nuclear power impacts on climate.

The German Heinrich Böll foundation has calculated that the cost of electricity from a new nuclear power plant has risen by almost half over the past 15 years, while for example, they have fallen significantly for the generation of wind (- 63%) and solar energy (-83%). The German Fraunhofer foundation for solar energy systems published a cost comparison that shows that nuclear power is one of the most expensive energy sources. The cost of electricity for a nuclear power plant ranges from 13.6 to 49 eurocent per kilowatt-hour (kWh), whereas solar power only costs between 4.1 and 14.4 cents/kWh. Wind power has a comparable price ticket.

That means that nuclear power is approximately 3,5 times more expensive than the other two sources.

The 2024 mean cost of electricity for a new nuclear plant in the United States is about 18.2 cents/kWh. That is a lot more than the 5 to 6 cents/kWh price tag of onshore wind and utility-scale solar power. Thus, new nuclear electricity in the USA is three to four times the cost per unit of electricity of new wind and solar. A good portion of the high cost of nuclear power is due to its long planning-to-operation time. On top of all this, the cost of operating existing nuclear reactors has increased so much that many existing reactors are shutting down early or have to be subsidised.

The cost for the disposal of radioactive waste is also driving up the total costs. The German government estimates that the total cost of nuclear waste disposal will be around 170 billion euros by 2100. This cost is not included in the price tags mentioned above. Returning

[7] Seizing Power: Rosatom's Complicity in Occupation, Torture, and Nuclear Safety Breaches at the Zaporizhzhia NPP
https://truth-hounds.org/en/cases/seizing-power/

[8] Dangerous Russian game in ZNPP is ongoing: why the 10th power cut will not be the last
https://www.pravda.com.ua/eng/columns/2025/10/30/8005083/

to nuclear power would be very difficult for Germany. The law would have to be changed to achieve that and the decommissioning process of all nuclear power plants has passed the point of no return. In the USA alone, about 500 million dollars is spent yearly to safeguard nuclear waste from about one hundred civilian nuclear reactors. Such waste must be stored for hundreds of thousands of years.

The second most important aspect to be considered is building time. The time to construct a nuclear reactor depends significantly on regulatory requirements and costs. It has increased to 12 to 23 years worldwide and to 17 to 23 years in North America and Europe. This is much longer than the time needed for wind and solar power. The result of this is that the longer the time lag between the planning and operation of a nuclear power plant, the more CO_2 emissions from existing coal and gas fired power plants. This problem is conveniently ignored by pro-nuclear lobbyists.

But even when a nuclear reactor is up and running, it indirectly emits more CO_2 than it seems. The background grid, which consists primarily of fossil fuel powered plants, emits pollution when a nuclear plant is down for maintenance, fuel rod replacement or refurbishing. The total opportunity-cost (background-grid) emissions due to nuclear not operating during one of these periods average to 64 to 102 grams of CO_2-equivalent per kilowatt-hour of electricity generated. These emissions are higher than the lifecycle emissions of nuclear power.

On top of this, nuclear power plants contribute to global warming and air pollution in even more ways: heat and water-vapour emissions during the operation and carbon dioxide emissions due to the covering of soil or clearing of vegetation during the construction of a nuclear plant, uranium mine, and nuclear waste site. Each of these categories represents an actual emission or emission risk, yet all of these emissions, except for lifecycle emissions, are incorrectly ignored in virtually all studies of nuclear power impacts on climate.

If we add up all direct and indirect emissions from nuclear power, the total is 78 to 178 grams of CO2-equivalent per kilowatt-hour of electricity. These emissions are 9 to 37 times the estimated emissions from onshore wind.

All together, there remains not a single reason to build new nuclear power plants. The Intergovernmental Panel on Climate Change (IPCC) also concludes that the economic, social and technical feasibility of nuclear power have not improved over time:

“The political, economic, social and technical feasibility of solar energy, wind energy and electricity storage technologies has improved dramatically over the past few years, while that of nuclear energy and Carbon Dioxide Capture and Storage (CCS) in the electricity sector has not shown similar improvements.”

Sources:

https://web.stanford.edu/group/efmh/jacobson/WWSStillNMN/StillNMN.html

https://www.enbw.com/unternehmen/themen/klimaschutz/kernkraft-kosten.html

Why new nuclear power is a bad way to balance solar and wind

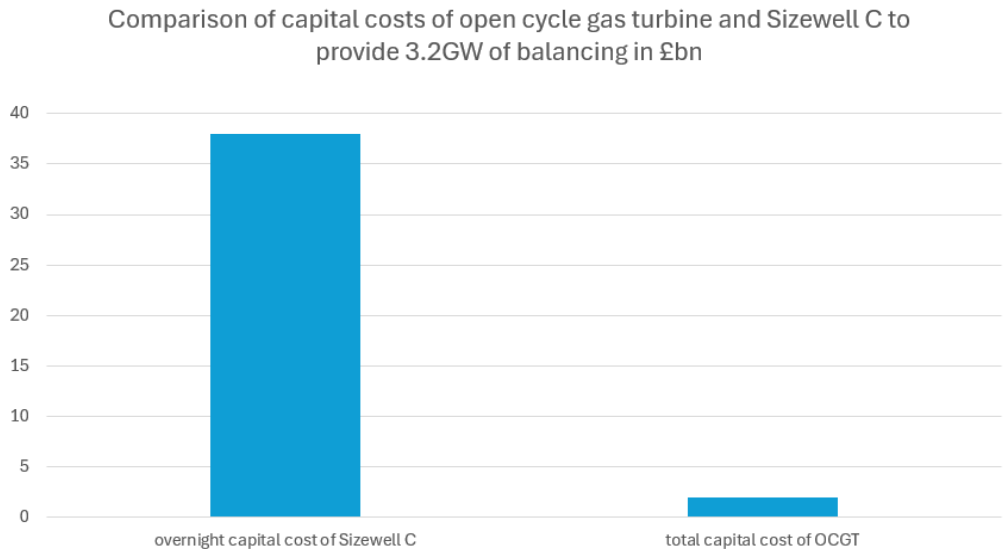
David Toke

In the UK it has almost become an accepted truth in the media that new nuclear power is needed because there is no other practical or cheaper way to balance fluctuating wind and solar power. Yet not only is this demonstrably false, but it actually runs counter to the way that the UK electricity grid is going to be balanced anyway. Essentially the UK's increasingly wind and solar dominated grid is going to be balanced by gas engines and turbines that are hardly ever used. But you would never guess this from the coverage. Usually the line goes that on windless and sunny days nuclear power is needed to balance wind and solar. But the truth is that adding Sizewell C will not help solve the problem - not even bankrupting the country with several more nuclear power stations will help solve this problem. Instead, we need a system where a) renewables generate the energy, b) batteries help smooth the system and where c) gas turbines or engines provide capacity rather than generate much energy.

Nuclear power (even with Sizewell C and the odd so-called 'small' modular reactor) do not add up to more than about 15 per cent of peak demand. So where is the rest of the balancing coming from? The answer of course is gas fired power plant, which will needed for increasingly small periods of time as solar, wind and ever cheaper batteries build up. That's the way the UK's clean power plan will work in practice. The extras nuclear plant are, in effect, a bit of enormously expensive window dressing.

Sadly, this point is not well understood. This is because there is little understanding of the difference in the role of gas plant between a) providing capacity and b) its role in providing electricity. We are going to need gas plant capacity, but only if the gas plant actually produce electricity for as little time as possible. More and more batteries will make this easier and cheaper. See my post HERE discussing this.

Figure 1



The Government's clean power plan (see HERE) suggests that no more than 5 per cent of power supplies will be needed to be supplied by gas. This is as the Government's renewable energy buildout achieves its objectives - by 2030 (or maybe a bit later!). In other words we shall have a lot of gas power plant on standby that will hardly be ever used. But that is not a problem because simple gas fired power plant are many times cheaper per MW compared to nuclear power plant. This is demonstrated by Figure 1.

This Figure 1 compares a) the £40 billion estimated cost of building the 3.2 GW Sizewell plant in terms of co-called 'overnight' costs (i.e. without adding interest charges) (see HERE) with b) a cost for building the same capacity of gas fired power plant open cycle gas turbines (OCGT). OCGT costs are assumed to be around £600,000 (£0.6 million) per MW which means around £1.9 billion for 3.2 GW of capacity. The cost comparison illustrates the fact that in order to balance fluctuating renewable energy plant we need more flexible standby gas plant, not more nuclear power.

Costs and benefits of more nuclear power

There is no doubt here that building more nuclear power is an immense waste of money. The comparison in Figure 1 implies that the UK taxpayers and electricity consumers will lose most of the £40 billion spent on Sizewell C (likely to be a lot more in practice as cost overruns and interest payments are added). Indeed the Treasury has already spent or committed, by 2030, over £17billion of taxpayers money to be spent on Sizewell C without any chance of the scheme generating electricity until after 2040.

It is not as if the extra nuclear plant will actually take us much closer to eliminating gas power completely. You can see this from the case of France, where they now generate around two-thirds of their electricity from nuclear power with the rest coming from renewables, waste-to energy plant, and fossil fuels. Yet even in France, in 2024, there are still residual amounts generated from fossil fuels even with the very large proportion of power coming from nuclear power. In 2024 just under 4 per cent of total electricity was generated from fossil fuels, mainly gas.

Are there any benefits? Well, the nuclear power industry gains, obviously. But the running costs of the system are not going to be lower. That is because the operating costs of a given capacity of nuclear power plant are not going to be lower than the equivalent capacity of gas-fired plant. It is the energy burning that makes gas power expensive, and the gas fired power plant will be burning very little of that. All that will be left will be maintenance and insurance costs for the gas plant. Nuclear power plant are rather more complicated institutions that also include fuel costs.

But how much gas will be saved with the extra nuclear power plant? Probably not very much. If, under the Government's clean power plan gas will still be responsible for doing most of the balancing. They will only be producing 5 per cent of the electricity. But how much difference will adding Sizewell C make? This adds a further 7 per cent of generation of energy production on top of the other 15 per cent or so nuclear biomass and hydro production (generally called 'firm' capacity) currently in operation. However Sizewell C will make little impression on windless days compared to the gas fired power plant.

Maybe Sizewell C might save a bit of gas, lets say, to be charitable, 0.5 per cent out of the 5 per cent of annual gas generation that will remain. This would save around £200 million a year in avoided gas costs at current prices - that is if it were not for other factors. This is not much of an annual return on over £40 billion.

However there are also costs to the system of operating inflexible nuclear power plant which reduce or completely negate even these savings. This is because of the way British nuclear power plant are being contracted (e.g. the Hinkley C contract). They are encouraged

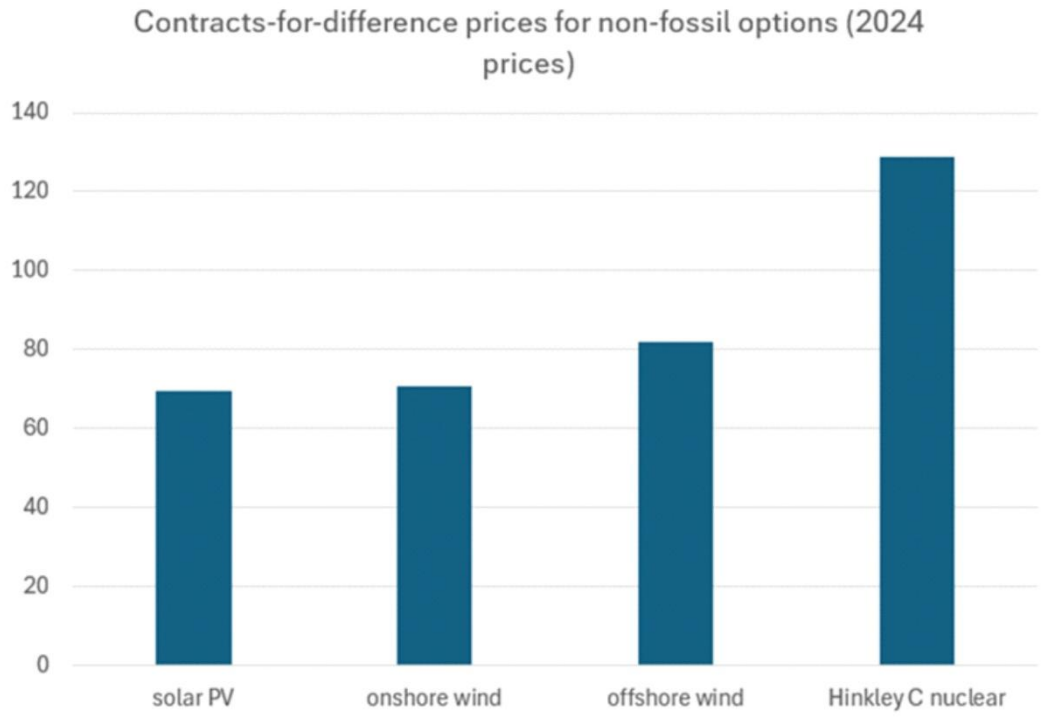
to run all of the time. This means that they will displace a lot of renewable energy, thus wasting the value of that generation. So maybe the new nuclear power will not save any money from running costs at all! It may be argued that a solution is to make new nuclear power plant 'load follow'. However this will not be accepted by new nuclear's investors (basically the Government and EDF) since it will reduce the already miserable project returns to nothing.

Apart from that, new nuclear power is a much more costly option compared to renewables when energy production is concerned, as can be seen in Figure 2. This compares prices of contracts-for-difference issued for onshore and offshore wind and solar PV farms. The figure shown here for Hinkley C (the £92.50 for 35 years contract expressed in 2024 prices) is likely a big underestimate. This because EDF (or rather the French taxpayer since EDF is state-owned) has been paying for large cost overruns in building the project.

The most flexible generators around are open cycle gas fired plant (OCGTs) and gas engines (to be distinguished from combined cycle gas turbines - CCGTs - which are less flexible. CCGTs are built to maximise electricity production, not to provide capacity as such. We do not need any more CCGTs, but we do need more simple gas turbines and gas engines to provide capacity in the occasional times when there is not enough wind or sun.

In terms of eliminating the carbon emissions, the 40 billion would get much higher returns on energy efficiency. For example, setting up a scheme to pay £15000 each to 500,000 residents not on the gas grid to switch to heat pumps will likely save as much carbon as Sizewell C is likely to save. The residents will be switching from oil fired and gas bottle fired heating. Doing this will cost rather less than a fifth of the cost of Sizewell C. There are various other possibilities to spend the money better as well to reduce carbon emissions.

Figure 2



But then, for many of nuclear power supporters, building new nuclear power is not really seen as being about cutting carbon emissions. Otherwise Nigel Farage would not be in favour of it! Nuclear power appeals to a sort of militaristic approach to energy policy. But military defence and war is not at all the same as producing affordable sustainable energy.

Getting rid of all carbon emissions from electricity, heat and transport

Getting rid of the last 5 per cent of non-fossil electricity generation is the most difficult. But doing it through nuclear power is unachievable. We would need something like green hydrogen, produced from renewable energy, and kept in storage. I wrote a blog post about this HERE.

There are other possible solutions, and no doubt they will develop as technology progresses. But of course, apart from putting together demonstration schemes, we do not need to do this in the next few years. What we do need to do now is, as well as rapidly expanding renewable energy, is to expand electrification into the low hanging fruit of decarbonisation. That means, as first stops, electrifying heat and transport. Building more nuclear power plant merely wastes the meagre funds that are being currently spent on decarbonisation.

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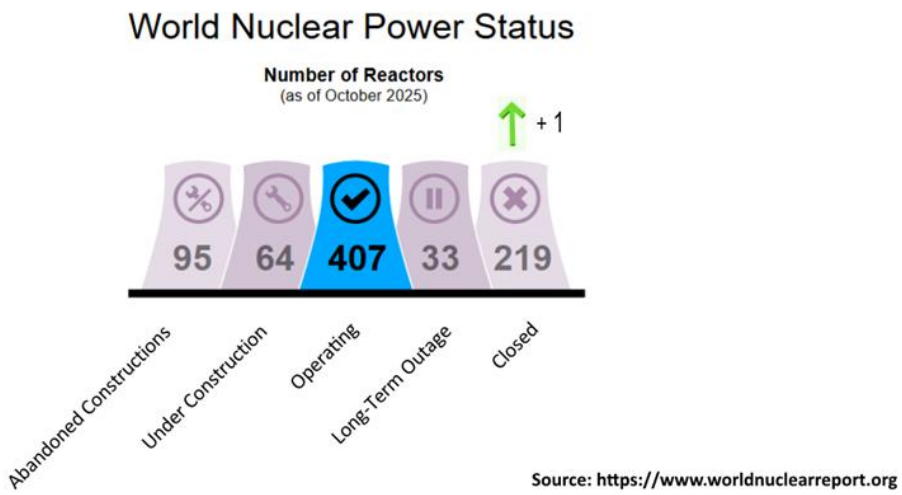

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- ✓ In Belgium; Tihange I is closed.