Constructive

Contention 1: Russia

Russia's economy is at the brink --- oil is Putin's last straw.

Matthews 25 [Owen Matthews, Degree in Modern History at Oxford University, 3-13-2025, The Russian economy is on the **brink of collapse** and Putin knows it, The Independent, https://www.the-independent.com/news/world/europe/russia-economy-putin-ukraine-war-deal-talks-trump-b2714371.html, Willie T.] **edited for objectionable language**

How close is Russia's economy to collapse? As Donald Trump's negotiators open direct talks with the Kremlin, Kyiv's European allies hope that a final push on sanctions against Russia could be Ukraine's last – and best – hope of victory. Mr Trump has warned that the US could impose a "devastating" financial blow on Russia if Putin refuses to accept the ceasefire agreement. "There are things you can do that wouldn't be pleasant in a financial sense. I can do things financially," he said in the Oval Office.

Putin intended his full-scale invasion of Ukraine to be a three-day operation that would force regime change in Kyiv. Neither Putin nor his military or economic planners anticipated a grinding war that now soaks up over **40 per cent of Kremlin spending**.

Nor did they expect Europe to impose serious sanctions, and even less did they anticipate the destruction of three of the four Gazprom gas pipelines under the Baltic Sea that before the war supplied over 30 per cent of Europe's gas.

The result in Russia has been **rampant inflation**, currently running at over 9 per cent, [redacted] **[staggering] interest rates** of 21 per cent and runaway price hikes on staple goods that far **outpace the headline inflation rate** and have hit ordinary Russians hard.

Last summer the price of **eggs jumped by 42 per cent, bananas by 48 per cent, tomatoes by 39.5 per cent and potatoes by 25 per cent**. The Russian ruble has lost over **half of its value** since Putin first invaded Crimea in 2014, and over $600bn of the Kremlin's foreign currency reserves have been frozen in Western banks.

More than **1,000 Western businesses** – including Ikea and McDonald's – pulled out, as did Western car manufacturers. Imports of Western goods – especially technology – are now **expensively routed through sanctions-busting neighbours** like Kazakhstan and Georgia. And last month Russian utility companies hiked prices for electricity by up to **250 per cent.**

"Everyone drives Chinese cars these days, but there are no spare parts," says Alexandra, 39, a former journalist who lives in Moscow and whose ex-husband is fighting in Ukraine. "The only foreign cars you buy are right-hand-drive [from Japan]. Anyone with a mortgage is paying crazy interest. People complain how expensive everything has become."

Russia spent more on its military in 2024 than the rest of Europe combined, according to the International Institute for Strategic Studies' latest Military Balance report – a staggering $462bn, if adjusted for purchasing power. The Kremlin's spending splurge on its war effort has produced some winners, notably the 1.5 million troops currently serving in Putin's army who are paid up to $2,500 a month to fight – four times the average salary in Russia's most impoverished provinces.

Massive losses on the battlefield have **worsened labour shortages**, with a record-low unemployment rate of 2.4 per cent. Factories are **running at capacity and beyond**. Russia's economy has "reached the **limits of its productive capacity** while demand continues to be stimulated," Central Bank chief Elvira Nabiullina warned the Russian parliament in November, predicting a fatal combination of economic stagnation and inflation known as "stagflation".

For the first three years of the war, the Kremlin's war spending fuelled GDP growth which peaked at a staggering 5.4 per cent in early 2024. But 2025 will be the year that growth flatlines, experts predict.

The Kremlin has been able to afford its spending spree thanks, mostly, to India and China, which have continued to import Russian oil in record quantities. The EU has in theory capped the price that customers can pay for Russian Urals crude at $60 a barrel – somewhat below the current market price of $67. But so-called "attestation fraud" – such as making up the difference in fake transportation and other costs – makes the rules easy to bend.

Natural gas has **never been sanctioned** by the EU at all – and until 1 January of this year, 13 per cent of Europe's piped gas was still being shipped from Russia through Ukrainian pipelines to Slovakia and Hungary.

Ukrainian fire and fury are currently doing damage to Russia's war economy that near-**nonexistent European sanctions have failed to achieve**

Southern Europe **continues to import** millions of cubic meters of Russian gas via Turkey. And despite its posturing, Europe still sources more than 15 per cent of its liquefied natural gas or LNG from Russia – with some 17.8m tonnes of LNG docking in European ports in 2024, **up by more than 2 million tonnes from the year before**, according to analysts Rystad Energy.

In fact the only really effective "sanctions" on the Russian energy sector – which accounts for over **two-thirds of government revenues** – have been in the form of Ukrainian drone attacks on Russian oil refineries, pumping stations and storage facilities. Ukrainian fire and fury are currently doing damage to Russia's war economy that European "sanctions" have failed to achieve.

International pressure has made it harder, but not impossible, for the Russian war machine to obtain important components such as semiconductors. And sanctions have certainly "achieved the crucial goal of leaving Russia's economy highly unstable in the medium to long term", according to Oliver Ruth of London's Royal United Services Institute.

The current crazy levels of expenditure are unsustainable, so Putin has a strong economic incentive to bring his war to an end. Ukraine's economy is also under attack.

But on the flip side, even as Russia's economy slips into stagflation Ukraine's economy is doing far worse. Concerted Russian assaults, damage to vital energy infrastructure and mass emigration have inflicted catastrophic damage of up to 40 per cent of the country's pre-war GDP. Kyiv's budget payments to millions of soldiers and state employees are currently being paid by the EU. Without those subsidies – the lion's share of the €60bn in direct financial support so far sent by Brussels – Ukraine's government finances would instantly collapse.

Ukraine's European allies hoped that sanctions would force Putin into taking an early off ramp and bring his **economy crashing down**. That hasn't yet happened yet – largely because Europe has been unable to kick its addiction to Russian gas, and the US did not want to risk a global **oil price spike by cutting off Russian exports.**

But while they have **not brought Putin to his knees**, they have made the war disastrous for Russia. As Moscow and Washington begin talks in Riyadh, and European leaders hold their own emergency meeting, keeping up economic pressure on Putin is the real weapon that they still have left in their arsenal.

Sanctions won't come.

Bush 25 [Daniel Bush, Master of Arts in U.S. politics @ Columbia & B.A. from NYU, 3-13-2025, If Trump wants new pressure on Moscow, oil and gas is 'only thing left', Newsweek, https://www.newsweek.com/if-trump-wants-new-pressure-moscow-oil-gas-only-thing-left-2044476, Willie T.] **brackets in original**

Perhaps Trump's **best available option** to pressure Moscow is the one thing he might be **least willing to do**, experts said: put a much tighter squeeze on Russia's oil and gas exports, which provide Russia with its **main source of revenue** and help pay for the war in Ukraine.

"If you're trying to get to a quicker settlement to the conflict in Ukraine, that's what you go after, those continued [Russian] energy sales," said Emily Kilcrease, a senior fellow at the Center for a New American Security. "It's the only thing left."

But Kilcrease said the Trump administration may be hesitant to take a "full-blown approach on energy-related sanctions against Russia, because that would cause additional turmoil" during a **moment of rising economic uncertainty** at home over the president's trade policies.

Trump's **domestic energy agenda** also makes it harder for him to go after the **heart of Russia's economy**. He has blamed his predecessor for the rise in energy prices that was largely driven by Russia's invasion of Ukraine, and ran on a promise to cut costs and lower inflation. A new spike in prices at the pump sparked by tougher energy sanctions on Russia could backfire with voters, analysts said.

"President Trump came in **promising to drive prices at the pump down** by half. That highlights the **delicate needle** he has to thread in engaging with Russia on energy right now," said Mark Finley, an energy expert at Rice University's Baker Institute. "I suspect they'll be very cautious about sanctions that would risk taking Russian **barrels off the market place."**

Russia has found ways to skirt the sanctions, however, including by relying on a so-called "shadow fleet" of vessels to continue exporting oil by sea. Russia has also continued exporting natural gas to parts of Europe and ramped up its energy exports to China, India and other countries that have not participated in the sanctions.

Russian **oil and gas revenue increased by 26 percent** to $108 billion last year, a Reuters report shows. The European Union spent more on Russian oil and gas in 2024 than it did on financial assistance to Ukraine, according to a study published last month by the Centre for Research on Energy and Clean Air.

So far, the West "hasn't wanted to put **real pressure** on Russia," Oleksandr Merezhko, the chairman of the Ukraine Parliament's Foreign Affairs Committee, said in a phone interview with *Newsweek*. Trump could do that, he said, "by depriving Russia of the profits it receives from selling oil and gas."

There are several steps the U.S. and allies could take, Merezhko and others said. They include lowering the price cap on Russian oil, cracking down harder on the shadow fleet operators and placing secondary sanctions on companies and trading partners like China that continue buying Russian energy.

Affirming decreases oil demand AND insulates Americans from sanctioning Russia.

Zadrowski 24 [William Zadrowski, Squadron Commander @ the USAF Academy & bound for B.S. in Military and Strategic Studies, 12-8-2024, Nuclear Energy: The Overlooked Energy Solution, Modern Diplomacy, https://moderndiplomacy.eu/2024/12/08/nuclear-energy-the-overlooked-energy-solution/, Willie T.]

The U.S. faces a persistent energy worry. Over the last few years, **electricity demand has soared** while U.S.-based energy suppliers have tried their best to keep up. While energy demand usually fluctuates throughout the year due to varying weather conditions and as the seasons change, the U.S. Energy Information Administration has shown that energy demand has steadily increased over the last fifty years. This can be attributed to population growth and the expansion of electricity production to meet society's rapidly growing energy needs. While total electricity supply has adequately met the increasing demand over the last fifty years, the steadily increasing need for greater electricity places the U.S. in a vulnerable situation – one that can become susceptible to disruptions and shortages. The power sector already experiences immense strain during peak electricity consumption, namely during periods of intense weather such as heatwaves, snowstorms, and other weather phenomena. Considering the **already-strained power sector** in the U.S., further concerns about energy security in the U.S. center around the U.S.'s ability to create **viable alternative energy solutions** to ensure energy demand is met with adequate supply in the event of energy disruptions.

Nuclear Energy: Where It's Been and Where It's Going

The U.S.'s energy consumption portfolio **consists largely of fossil fuels**, accounting for more than **eighty percent** of the U.S.'s total energy consumption in 2023. Putting aside environmental concerns and considerations, the U.S. needs to invest more in another energy source capable of matching fossil fuel consumption in the near future. The best solution to this concern is nuclear energy. Although the U.S. consumes a significant proportion of available electricity from nuclear sources, roughly nine percent, nuclear energy has the potential to **supplement the U.S.'s dependency** on fossil fuels. The nuclear power industry cannot replace the need for fossil fuels, nor should it, but it would provide a safety net for supply chain disruptions and create alternatives to domestic energy consumption. This would prove especially important when considering the fragility of fossil fuel imports from foreign sources and the detriment to national security should there be a fossil fuel shortage in the U.S. and/or abroad. For this to happen, though, obstacles to nuclear power production must be overcome.

The U.S. already has **nuclear energy production** facilities and infrastructure to contribute to the existing energy portfolio, but not nearly at the same scale as fossil fuels. Why might this be? The short answer might be that there exist **high initial costs to producing the infrastructure and plants** required to make a nuclear reactor; however, the more likely reason would be widespread public opposition to and negative perception of nuclear energy production in the U.S. As many American citizens could point out, nuclear energy's past is riddled with catastrophic meltdowns and lasting environmental impacts – things that pose obvious issues with public support investment into nuclear energy production. Notable incidents such as the Chornobyl meltdown, the Fukushima disaster, and the Three Mile Island Accident are well-known examples the public tends to associate with nuclear energy. The risk of a nuclear meltdown and severe environmental effects from accidents at nuclear power facilities are legitimate concerns and should not be ignored, however, nuclear power plant infrastructure and production technology have progressed significantly, partially influenced by these notable disasters to prevent similar accidents from ever occurring in the future. The nuclear power industry is not the same as it was some twenty years ago – it has seen significant increases in safety, regulation, and output optimization through new technologies. If the public can continue moving towards greater support for widespread nuclear power production, which appears to be trending that way in recent years, nuclear energy as the **main source of consumer energy** consumption in the U.S. is a real possibility.

Nuclear Energy as a Domestic **Alternative to Fossil Fuels**

Nuclear power production for energy's sake is not the primary reason for the needed increase in nuclear power output. The need for increased output stems from the vulnerabilities in the U.S.'s energy supply and demand trends. Over the last few years, the U.S. has increased its crude oil exports and became a net exporter of crude oil in 2021, according to the U.S. Energy Information Administration. The U.S. being able to produce more crude oil than it consumes is great for energy security interests since it means the U.S. is less dependent on foreign oil, at least when compared to when the U.S. was a net importer of foreign oil. A decreased dependency on foreign fossil fuel imports provides a host of benefits to the U.S. One of these is the **increased stability** of fossil fuel supply. Considering that the U.S.'s largest source of crude oil and other fossil fuel imports are from areas of the world with complex geopolitical concerns, such as armed conflict, crude oil supply chains face the ever-persistent threat of disruption, whether from direct conflict or supply management used as a tool of coercion, For example, countries that export crude oil may use their production capabilities as a tool of coercion and pressure by restricting the supply of their exports to certain markets, often those that align with their political goals and ideals. This disruption of crude oil was seen following the start of the Russo-Ukraine war, where shortly after the invasion of Ukraine, Russian oil exports were drastically decreased to Western countries following embargoes and sanctions, namely put in place by those in the European Union (EU) and the U.S. These sanctions were designed to be a form of hard power in which the EU and the U.S. **aimed to deter Russian aggression** in hopes that it would accomplish a political end. Whether or not these sanctions are producing their desired effect is beside the point, but they resulted in the **increase in crude oil prices** in the U.S. and abroad, since a major exporter of crude oil, Russia, could not supply crude oil to the U.S. In terms of international diplomacy, the U.S. pursued an option to deal with Russia and its invasion of Ukraine which had **immediate effects on the U.S. economy** and the fossil fuel industry. Whether it proved successful for U.S. interests is yet to be determined, but one thing is certain – if the U.S. had a greater energy consumption available to consumers from nuclear power, crude oil prices may not have increased, as less crude oil and fossil fuels would be needed to power homes, businesses, and other everyday electricity consumers since nuclear power could have **reduced the demand for fossil fuels**.

Decreased demand means <u>more exports</u>.

Rua 13 [Antonio Rua, Senior Economist @ Banco de Portugal & Associate Professor of Economics @ Nova School of Business and Economics, September 2013, Is there a role for domestic demand pressure on export performance?, European Central Bank, https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1594.pdf, Willie T.]

Typically, export performance is modeled as a function of the foreign demand for a country's output and a country's price competitiveness indicator. In general, the foreign demand is proxied by the evolution of imports in the trade partners and its relative evolution vis-à-vis exports is used as a measure of market share developments. The relative price advantage of a country over its competitors is often captured by the real exchange rate. Ceteris paribus, a depreciation makes the country's products cheaper relative to its competitors in the foreign market, which will raise the corresponding demand and increase exports leading to an increase of the market share. These factors are essentially related to the demand side. In fact, <u>most studies **do not consider supply** side variables explicitly when modeling exports</u>. However, it has been recently widely acknowledged that such determinants are far from able to fully explain export performance (see, for example, Fagan et al. (2001, 2005), di Mauro and Forster (2008), European Commission (2010), Dieppe et al. (2012)). Such evidence reinforces the need to search for other factors that may influence exports dynamics.

In line with some previous literature, this paper suggests considering <u>domestic demand</u> pressure as <u>an additional explanatory variable. In fact, it is likely that domestic conditions influence firms willingness or ability to supply exports</u>. In a context of high domestic demand pressure, firms will work at full capacity and will not be able to follow, in the short-run, external demand increases. In contrast, <u>during a domestic recession, firms will be able to **allocate more resources** to exports</u>. In other words, <u>in periods of **slacking** domestic demand firms try to **compensate** for the decline in domestic sales through increased efforts to export</u> while in boom periods production can be mainly sold on the domestic market. Early work focusing on the short-run effects of domestic demand pressure on exports includes Ball et al. (1966), Smyth (1968), Artus (1970, 1973), Zilberfarb (1980), Faini (1994), Sharma (2003), among others. <u>In those studies it was found a significant negative effect of domestic demand pressure on exports for several countries, including the United Kingdom, **the United States**, Germany, Israel, Turkey, Morocco and India.</u> Thus, <u>when modeling export performance, one should take into account not only the driving forces of external demand but also **domestic demand**</u>, as the former affect exports from the demand side and the latter from the supply side. More recently, there has been theoretical and empirical research at the firm level that allows for a better understanding of the negative relationship between domestic demand and exports. Such developments will also contribute to influence the macroeconometric modeling of exports.

In this paper, we revisit the theoretical role of domestic demand pressure on exports and assess its importance on modeling the export performance of the Portuguese economy.1 Besides the recent literature at firm level, such assessment is also motivated by the fact that the standard exports modeling approach is unable to capture properly the Portuguese export performance over the most recent period. In particular, it has been observed a significant and continuous increase of exports market share which cannot be explained by developments on price competitiveness indicators. Such phenomenon is happening along with a dramatic fall of domestic demand. In fact, this relationship could be particularly important in the current economic situation, not only in Portugal but also in other European countries under macroeconomic adjustment and facing strong declines of domestic demand

Empirically, increased supply lowers oil prices --- decks Russia's <u>military</u> and <u>economy</u>.

Cooper 24 [Luke Cooper, Associate Professorial Research Fellow In International Relations @ The London School Of Economics and Political Science, 11-10-2024, Will oil decide the fate of the Russia-Ukraine War?, International Politics and Society Journal, https://www.ips-journal.eu/topics/foreign-and-security-policy/will-oil-decide-the-fate-of-the-russia-ukraine-war-7836/, Willie T.]

Saudi Arabia's decision to increase oil supply at a time of falling global demand could **jeopardise** the Russian war effort. With Russia already selling its oil at discounted rates and with higher production costs, a low-price environment in oil markets may impact its ability to **finance its aggression** in Ukraine.

Russia and Saudi Arabia have **previously clashed** in oil markets. For a brief one-month period at the outset of the Covid-19 pandemic, Russia launched a foolish price war, increasing production as the world moved into lockdown. Once Saudi Arabia responded in kind, the oil price **went into freefall.** In an illustration of how geopolitics 'overdetermines' oil markets, the trigger for the negotiations that brought the crisis to an end was allegedly US President Donald Trump's threat to withdraw American military assistance from Saudi Arabia. Under this geopolitical pressure and collapsing market demand, making a **price war potentially ruinous for all parties**, Russia and Saudi Arabia stepped back, agreeing to the supply cuts required to stabilise world prices.

As recounted in Cambridge professor Helen Thompson's Disorder: Hard Times in the 21st Century, the oil supply glut in 2014 – 2016 was also shaped by the competitive postures of the United States, Russia and Saudi Arabia. Then as now, Saudi Arabia increased the supply of oil into the world market at a time of falling demand with the economic aim of disincentivising American investment in shale oil and the geopolitical aim of pressuring Russia and Iran to retreat from their support for the Assad regime in Syria. That Russia was able to weather the financial crisis produced by the combination of Western sanctions and the Saudi expansion in oil supply, emerging with the Assad regime intact and Russia's hold on occupied southern and eastern Ukraine stable, provides a salutary warning for the hope that the present conjuncture may prove problematic for Putin's regime. But with Russia facing both much **more radical external sanctions** – in effect its near-removal from the Western trade and financial order altogether – and **fighting an enormously costly all-out war** against Ukraine, the **conjuncture** of late 2024 poses a **far more serious challenge.**

The limits of military Keynesianism

Trends in the global oil market **bear down heavily on Russia's strategic choices**. By 2030, the International Energy Agency anticipates that global supply capacity will outstrip demand by some 8 million barrels per day, a situation they describe as 'staggering' and 'unprecedented' (outside of the Covid-19 pandemic). As Iran and the Gulf States have oil wells close to the surface, making them cost-efficient to extract from, these states are in a much more commercially advantageous position to cope with falling oil prices. Their breakeven price for new drilling projects is also far lower than that of their international competitors, including Russia and the United States.

By moving towards a more competitive posture, Saudi Arabia is challenging America's more expensive production but also tacitly acknowledging that the OPEC+ group has a diminished price-setting power. For Russia, this is the worst of both worlds. Unlike the United States, it has an oil-dependent economy, which benefits from the cartel power of OPEC+. Yet, unlike Saudi Arabia, its oil is not cheap to extract, making it poorly equipped to deal with low-price conditions. This drives a short-term escalatory logic for Russia's war on Ukraine, requiring rapid battlefield successes prior to the emergence of low-price oil market conditions.

With oil accounting for between **30-50 per cent of annual state budget** revenues since 2014, Russia is, fundamentally, a petrostate.

Russia's successful adaption of its domestic economy to the war effort has been an important story of the full-scale invasion to date. The Russian state has utilised a suite of policies that Volodymyr Ishchenko, Ilya Matveev and Oleg Zhuravlev identify as 'military Keynesianism', with war-related spending stimulating demand in the economy. They note, in particular, the important distributional effects of this in terms of wage growth and industrial expansion, how this may have impacted support for the war effort among the Russian working classes and the internal limits that these policies have encountered in the form of acute labour shortages constraining economic output.

Putting the Russian war economy in a global context that recognises its oil dependency can help us build a **fuller picture of its vulnerabilities**. While sanctions have ruptured Russia's relationship to Western markets, this does not make its war economy autarchic. On the contrary, revenues from oil exports are **critical**. As the Oxford Institute for Energy Studies has argued, the Russian economy is dualistic in the sense that it may be divided between revenue-generating sectors (of which the most important is oil) and revenue-dependent sectors that are sustained through the distribution of rents. With oil accounting for between 30-50 per cent of annual state budget revenues since 2014, Russia is, **fundamentally, a petrostate**. The Putin regime manages these rents and has **drawn on them** to fund military aggression in Ukraine.

While Russia has not been publishing trade data since the full-scale invasion, estimates from Bruegel suggest that, despite its successful application of military Keynesian instruments, it continues to **fund its trade deficit** in non-fossil fuel goods through the sale of fossil fuels (delivering an overall surplus). As these imports are necessary to meet the **needs of the Russian populace** and the state's war effort, maintaining the flow of oil rents is critical.

Russia has faced rising costs while selling to markets at a discounted rate (advantaging non-Western buyers in general and India and China in particular).

It's instant AND turns case.

Baltvilks 22 [Witajewski; Expert @ the Centre for Climate and Energy Analyses @ the Polish National Centre for Emission Management; April 26; euractiv; "How the green paradox and climate policy can become Putin's nightmare," https://www.euractiv.com/section/energy/opinion/how-the-green-paradox-and-climate-policy-can-become-putins-nightmare/; DOA: 3-21-2025] tristan

Russia's invasion of Ukraine **pushed** global **oil** and **gas prices** even **higher** than they stood in 2021 because of the Russian **export restriction**. Many experts believe that further sanctions on Russia, including the gradual isolation of Russia in the sphere of global trade, would **keep** oil and gas **prices high** in the medium term.

Ironically, **high** global **prices imply** that many Asian **countries** are more likely to **purchase** Putin's **oil**, especially if it is **offered** at a **lower price**. Should this happen, Putin's oil revenues will remain high, and sanctions by G7 countries will not achieve their primary goal.

This risk can be avoided if sanctions are complemented by a firm climate policy.

The ability of climate policy to influence the oil market and oil prices is illustrated in the so-called green paradox. The green paradox is a hypothetical scenario in which the **announcement** of a rigid **climate policy** becomes a **signal** for **oil producers** that the **demand** for oil will **end** soon, motivating them to **sell** as **much** as they **can** as soon as they can.

Flooding the **market** with oil **depresses** its **price** and **incentivises consumers** to **use more**. If this were to happen, emissions would increase, **rendering** the climate **policy ineffective**. The green paradox is particularly relevant in the context of oil markets, but the mechanisms of the paradox can also apply to natural gas and coal.

Until recently, the green paradox was a problem for climate change economists, but the one who should be most concerned is, in fact, Vladimir Putin. The green paradox has the potential to turn radical climate policy into a weapon against Putin's regime. It is especially important because Russia, the second-largest worldwide gas producer and the third-largest oil producer, currently uses fossil fuels as a weapon against the West for the purpose of pacification.

A **clear** and credible **commitment** by the largest economies in the world to halve the consumption of oil over the next two decades would be a **clear signal** to all oil producers that their **resources** will soon **lose value**. **No producer** with low extraction costs will **keep** its **reserves** for the **future** – they will **attempt** to **pump** their **oil** into the market as long as it **exists**.

Low-cost oil from Saudi Arabia and the United Arab Emirates will, at least partly, **crowd out** the more **expensive product** from **Russia**, Venezuela and Iran. Even if that crowding out is not complete, the low oil price will **render** these countries' **oil revenues negligible**. In Russia, where **oil rents** constitute more than **9% of** the nation's **GDP** (**36%** of public-sector **revenue**), this will unavoidably **complicate** the **financial landscape** of the regime.

A <u>losing warfront</u> ensures <u>nukes</u>.

Stein 24 [Janice Stein, founding director of the Munk School of Global Affairs & Public Policy and the Belzberg Professor of conflict management with the Department of Political Science at the University of Toronto, "How impossible is the risk of nuclear escalation in Ukraine?", Bulletin of the Atomic Scientists, 20 December 2024, https://thebulletin.org/2024/12/how-impossible-is-the-risk-of-nuclear-escalation-in-ukraine/ //akang]

In the bizarre interregnum since the US presidential elections, world leaders have been calling President-elect Donald Trump in Florida before his inauguration on January 20. Some of them worry that the ongoing war between an increasingly desperate Ukraine that kills a Russian general in Moscow as it did this week and an emboldened Russia could spin out of control through miscalculation. The darkest scenario is one that culminates in escalation when Russia detonates a nuclear weapon. How likely is such a scenario in the few weeks left before inauguration day?

The likelihood of nuclear escalation cannot be estimated. The atomic bombings of Hiroshima and Nagasaki by the United States in 1945 are the only cases of the use of nuclear weapons. That strategy was deliberate, not a product of miscalculation, and can best be described as "escalate to de-escalate." There is no case of nuclear escalation through miscalculation from conventional war to nuclear fighting. No estimate of likelihood has any validity unless there are a large enough number of cases to generate a probability distribution. <u>Nuclear escalation occurs in a world of what Oxford University's John Kay calls "**radical uncertainty**" in which historical information provides **no reliable guidance.**</u>

One way to think about nuclear escalation in the context of Russia's current war against Ukraine is to build scenarios in which Russia uses a nuclear weapon and then trace a logically compelling pathway back to the present. It then becomes possible to ask what conditions could enable such a pathway to escalation.

<u>Tactical nuclear weapon. In one scenario that has been discussed, Russia explodes a tactical nuclear weapon to **force Ukraine** to end the fighting and agree to cede Crimea and the four Ukrainian provinces that Russia **is currently occupying**</u> and claiming as its own. Under what conditions is it possible that Russia might adopt such a strategy? Detonating a single tactical nuclear weapon would provide very limited battlefield advantage to Russian forces, and there is some risk that the radioactive fallout could blow back and inflict harm on nearby Russian troops.

Nor would the damage from a single tactical nuclear weapon be grave enough to so demoralize the Ukrainian public that it would buckle under the pressure. If anything, the use of a tactical nuclear weapon would likely radicalize Ukrainians who have been reluctantly moving toward grudging acceptance of a ceasefire.

Were Russia to use a tactical nuclear weapon, such a strategy might backfire. The Ukrainian public might well rally around the flag, unite behind its leader, and stiffen its resistance to ceasefire proposals that are increasingly the subject of discussion inside Ukraine.

Finally, the detonation of a single tactical nuclear weapon—however small its payload—would break the "nuclear taboo" that has held for almost eight decades. **<u>In</u>** October 2022, encouraged by the United States, Russia's key partners—China and India—signaled their strong opposition to the use of any nuclear weapon under any circumstances. Now isolated from the West, Russian President Vladimir Putin would not want to alienate his fellow leaders of the nine BRICS countries, which include China, India, and Iran.

There is, therefore, no compelling logic that supports the use of even a single tactical nuclear weapon. What conditions could change that logic?

<u>Russia could face a situation where its forces are being pushed back and **out of Ukraine**.</u> Putin faced a version of that scenario in the autumn of 2022 when Ukraine's armed forces were pushing the Russian army back. It was then that the CIA issued the estimate that there was a 50 percent chance that Russia would use a nuclear weapon.

After Ukrainian troops broke through and pushed Russian forces back from Kharkiv in the northeast and Kherson in the south, US intelligence overheard a conversation among senior Russian military commanders about when and how Moscow might use a tactical nuclear weapon in Ukraine. Putin was reportedly not part of these conversations. That intelligence was circulated inside the US government in mid-October. In addition, there are unconfirmed reports that Russia moved some tactical weapons out of storage and loosened operational controls that would make the use of a tactical nuclear weapon easier. It was these two developments that pushed up the US intelligence estimate that Russia might use a nuclear weapon.

Around the same time, Russian Defense Minister Sergei Shoigu, in one of his calls with US Defense Secretary Lloyd Austin, accused Ukraine of planning to use a "dirty bomb." Concern among Western officials grew that Putin was preparing a false flag operation. Only a long phone call between Gen. Mark Milley, then chairman of the US Joint Chiefs of Staff, and Russian Gen. Valery Gerasimov, reduced the tensions. The most senior military officer from each country discussed Russia's doctrine governing the use of nuclear weapons and reassured one another. This episode tells us that even when Russian forces were retreating in Ukraine, Putin did not break the nuclear taboo.

Russia has since **significantly lowered the threshold** of when it would use nuclear weapons. In November 2024, Putin signed a decree amending Russia's nuclear doctrine in two important ways. The doctrine now declares that Russia has the right to use nuclear weapons against a non-nuclear state that attacks Russia or its **allies** and is supported by a nuclear power. In addition, Russia's nuclear doctrine released in 2020 declared that Russia would use nuclear weapons in response to a conventional attack when the very **existence of the state is in jeopardy**. The new amendment lowers that threshold to a conventional attack that is a critical threat to Russia's sovereignty or territory.

Putin also railed against the Biden administration's decision in November to allow Ukraine to use US-supplied longer-range Army Tactical Missile Systems, or ATACMS, against military installations inside Russia and warned that this decision was tantamount to NATO declaring war on Russia. Moscow then launched the Oreshnik, an intermediate-range ballistic missile equipped with multiple warheads, against Ukraine. The missile can carry nuclear warheads. Despite the bellicose rhetoric and the new missile launch, Russia has not loosened operational controls on any tactical nuclear weapons nor moved any of these weapons out of storage. Instead, Gerasimov again reassured the current chairman of the Joint Chiefs of Staff, Gen. Charles Q. Brown Jr., in a phone call that the missile launch was planned long before the announcement about the ATACMS.

Extinction!

Sarg 15 [Dr. Stoyan Sarg, 10-9-2015, Director of the Physics Research Department at the World Institute for Scientific Exploration, PhD in Physics, "The Unknown Danger of Nuclear Apocalypse," Foreign Policy Journal, https://www.foreignpolicyjournal.com/2015/10/09/the-unknown-danger-of-nuclear-apocalypse/, accessed: 11-5-2023] // sid

With the new NATO plan for installation of nuclear tactical weapons in Europe, nuclear missiles may reach Moscow in only 6 minutes, and the opposite case is also possible in the same time. The question is: how can we be sure that this will not be triggered by a human error or computer malfunction. An adequate reaction dictated by the dilemma "to be or not to be" and the concept of preventive nuclear strike may **lead to a nuclear consequence** that is difficult to stop. At the present level of distributed controlled systems and military global navigations, this will lead to **unstoppable global nuclear war.** However, there is **something not predicted**, of which the military strategists, politicians and powerful forces are not aware. Probably, it will not be a nuclear winter that they hope to survive in their underground facilities. The most probable consequence will be a partial **loss of the Earth's atmosphere** as a result of one or many powerful simultaneous tornadoes caused by the nuclear explosions. In a tornado, a powerful **antigravitational effect** takes place. The official science does not have an adequate explanation for this feature due to an incorrect concept about space. The antigravitational effect is **not a result of the circling air**. It is a specific physical effect in the aether space that is **dismissed in physics** as it is currently taught. Therefore, the effective height of this effect is **not limited to the height of the atmosphere.** Then in the case of many simultaneous powerful tornadoes, an effect of **suction of the earth atmosphere** into space might take place. Such events are **observed on the Sun** and the present physical science does not have an explanation for them. The antigravitational effect is accompanied by **specific electric and magnetic fields** with a twisted shape. This is observed in tornado events on the Sun. Some effects in the upper Earth atmosphere known as sprites have a similar **combination of electrical and magnetic fields** but in a weaker form. They are also a mystery for contemporary physical science.

At the time of atmospheric nuclear tests, made in the last century, a **number of induced tornadoes are observed** near the nuclear mushroom as shown in Figure 1.

The strongest **antigravitational effect**, however, occurs in the central column of the formed nuclear mushroom. The analysis of underwater nuclear tests also indicates a **strong antigravitational effect**. It causes a rise of a vertical column of water. In the test shown in Figure 2, the vertical column contains millions tons of water. Thermonuclear bombs are **multiple times more powerful**. The largest thermonuclear bomb of the former Soviet Union tested in 1961 is 50 megatons. It is 3,300 times more powerful than the bomb dropped by USA on Hiroshima at the second world war and may kill millions.

It is known that Mars once had liquid water and consequently an atmosphere that has mysteriously disappeared. If the scenario described above takes place, the **Earth will become a dead planet** like Mars. The powerful politicians, military adventurers and their financial supporters must be aware that even the most secured underground facility wi**ll not save them** if a global nuclear conflict is triggered. Their disgraced end will be more miserable than the deaths of the **billions of innocent human beings**, including the animal world.

Contention 2: Renewables Tradeoff

Renewables are solving the climate crisis now

Bremmer 25 [Ian Bremmer, PhD in political science from Stanford University & Executive Committee Member of a UN High-level Advisory Body, 2-11-2025, Trump Will Not Kill the Global Energy Transition, Project Syndicate, https://www.project-syndicate.org/commentary/trump-will-not-kill-global-energy-transition-by-ian-bremmer-2025-02, Willie T.]

Despite Donald Trump's promise to boost fossil-fuel production, the **economic and technological forces** driving the clean-energy revolution cannot be stopped. The global transition will power forward, even if America has abandoned climate leadership, and even if the road ahead includes a few more bumps.

But Trump couldn't kill the green transition during his **first term**, and he can't kill it this time, either. The reason is simple: **Technological breakthroughs**, steep **learning curves**, and **plummeting costs** have made clean energy **cheaper than fossil fuels** in most places. Moreover, the revolution was just getting started in 2017, whereas now it has reached escape velocity. Its momentum is being driven not by politics or government intervention, but by **markets.** The fact that **deep-red (Republican-leaning) Texas** leads the United States in renewables deployment is a case in point. Politics will no longer hold back the American energy transition.

This is not to say that politics won't slow the US transition. The Trump administration is already taking steps to loosen environmental and climate regulations, promote domestic oil and gas production, support gas-fired power plants, and end incentives to adopt clean energy and electric vehicles (EVs). The president's day-one executive orders expanded the federal lands available for oil and gas exploration, reversed former President Joe Biden's suspension of approvals for new liquefied natural gas terminals, and paused new wind projects on federal land and coastal waters. Aided by Republican majorities in Congress, Trump will seek to repeal roughly half of the Inflation Reduction Act's outlays, including its provisions supporting EVs and offshore wind, as well as the IRA's investment and production tax credits.

Yet that will not be enough to halt the forward movement of the US energy transition. Despite Trump's claims of a "national energy emergency," the US has been a net energy exporter since 2019 and already produces more oil than any country in history. Yet with prices low and US oil and gas output already at record levels, fossil-fuel production will struggle to rise much higher in the near term, regardless of what Trump does.

NEW YORK – Donald Trump's return to the White House has raised fears that the global energy transition will be thrown into reverse. The US president has vowed to "drill, baby, drill," roll back environmental regulations, and end the "green new scam." As Earth continues to warm – last month was the hottest January on record, and 2024 was the first year with global average temperatures exceeding 1.5° Celsius above pre-industrial levels – many worry that we are about to witness a worldwide slowdown in the shift away from fossil fuels.

The deployment of clean energy will therefore **continue**, driven by increasing power demand and declining costs – **especially for solar.** American electric **utilities** will still invest aggressively in renewables to keep pace with **rising energy use** and ensure **grid adequacy**, even as new gas-fired power plants expand, too. US

automakers will not abandon their long-term EV plans just because the Trump administration has eliminated subsidies and canceled funding for charging infrastructure. Besides, **Democratic-controlled states** will continue pursuing ambitious standard-setting decarbonization policies, as they did during Trump's first term. Perhaps more importantly, meaningful parts of the **IRA will remain in place** because of their political support with **Republican constituencies**, which have benefited disproportionately from the new investments and job creation. Next-generation clean-energy technologies – nuclear, geothermal, and carbon capture and storage – will continue receiving support.

Renewables are crucial to meeting 2030 goals. Lockhart 24

Chelsea Bruce-Lockhart, 2-9-2024, "Why wind and solar are key solutions to combat climate change", Ember, https://ember-energy.org/latest-insights/why-wind-and-solar-are-key-solutions-to-combat-climate-change/ // Lunde

Once installed, virtually no greenhouse gases are emitted as a result of wind and solar power generation, and they pay off the energy related to their manufacturing and construction within a matter of months. Their existence prevents the continuous burning of fossil fuels for decades. Over the course of a typical 3 megawatt wind turbine's 25 year lifespan, 154,484 tonnes of coal would need to be burned to produce the equivalent amount of power. This would emit around 400,000 tonnes of CO_2 into the atmosphere – roughly the same as driving an average petrol car around the equator 50,000 times. Global power sector emissions would have been 20% higher in 2022 if all the electricity from wind and solar had instead come from fossil generation. Building a global net zero power sector by 2045 – compatible with the goal of keeping global warming below 1.5 degrees – will, as modelled by the IEA, require the expansion of many types of clean power. But the necessary near-term solutions for cutting power sector emissions already exist. It is possible that technologies currently in development could change the landscape of what's most efficient for scaling up clean power beyond 2030. But with the speed of transition required, wind and solar are crucial for keeping the world on track for 1.5C this decade.

Unfortunately, aff investment trades off with renewables due to grid structure and investor incentive. The best longitudinal models prove. Sussex 20

University of **Sussex** [university in England]; citing Benjmin K Sovacool [Professor of Energy Policy @USussex], "Two's a crowd: Nuclear and renewables don't mix," October 5, 20**20**; accessed 4/9/25 https://www.sciencedaily.com/releases/2020/10/201005112141.htm // Oliver J

That's the finding of new analysis of **123 countries** over **25 years** by the University of Sussex Business School and the ISM International School of Management which reveals that nuclear energy programmes around the world **tend not** to deliver sufficient carbon emission reductions and so **should not be considered** an effective low carbon energy source.

Researchers found that unlike renewables, countries around the world with larger scale national nuclear attachments do not tend to show significantly lower carbon emissions -- and in **poorer countries** nuclear programmes actually tend to associate with relatively **higher emissions**.

Published today in Nature Energy, the study reveals that nuclear and renewable energy programmes do not tend to co-exist well together in national low-carbon energy systems but instead crowd each other out and limit effectiveness.

Benjmin K Sovacool, Professor of Energy Policy in the Science Policy Research Unit (SPRU) at the University of Sussex Business School, said: "The evidence clearly points to nuclear being the least effective of the two broad carbon emissions abatement strategies, and coupled with its tendency not to co-exist well with its renewable alternative, this raises serious doubts about the wisdom of prioritising investment in nuclear over renewable energy. Countries planning large-scale investments in new nuclear power are risking **suppression of greater climate benefits** from alternative renewable energy investments."

The researchers, using **World Bank and International Energy Agency data** covering 1990-2014, found that nuclear and renewables tend to exhibit lock-ins and path dependencies that **crowd each other out**, identifying a number of ways in which a combined nuclear and renewable energy **mix is incompatible**. These include the configuration of electricity transmission and distribution systems where a **grid structure** optimized for larger scale centralized power production such as conventional nuclear, will make it more **challenging**, **time-consuming** and **costly** to introduce small-scale distributed renewable power. Similarly, **finance** markets, regulatory institutions and employment practices structured around large-scale, base-load, long-lead time construction projects for centralized thermal generating plant are **not well designed** to also facilitate a multiplicity of much smaller short-term distributed initiatives.

Renewables are comparatively better than nuclear for the climate. Lovins 21

[Amory B. Lovins is an adjunct professor of civil and environmental engineering at Stanford University who has advised major firms and governments in over 70 countries for 49 years, Dec 17, 2021, “Why Nuclear Power Is Bad for Your Wallet and the Climate,” // Arham S

https://news.bloomberglaw.com/environment-and-energy/why-nuclear-power-is-bad-for-your-wallet-and-the-climate]

Does climate protection need more nuclear power? No—just the opposite. Saving the most carbon per dollar and per year requires not just generators that burn no fossil fuel, but also those deployable with the least cost and time. Those aren’t nuclear. Making 10% of world and 20% of U.S. commercial electricity, nuclear power is historically significant but now stagnant. In 2020, its global capacity additions minus retirements totaled only 0.4 GW (billion watts). **Renewables** in contrast added 278.3 GW—**782x more capacity**—able to **produce** about **232x more** annual **electricity** (based on U.S. 2020 performance by technology). **Renewables** swelled supply and **displaced carbon as much every 38 hours as nuclear did all year**. As of early December, 2021’s score looks like nuclear –3 GW, renewables +290 GW. Game over. The world already invests annually $0.3 trillion each, mostly voluntary private capital, in energy efficiency and renewables, but about $0.015–0.03 trillion, or 20–40x less, in nuclear—mostly conscripted, because investors got burned. Of 259 US power reactors ordered (1955–2016), only 112 got built and 93 remain operable; by mid-2017, just 28 stayed competitive and suffered no year-plus outage. In the oil business, that’s called an 89% dry-hole risk. Renewables provided all global electricity growth in 2020. Nuclear power struggles to sustain its miniscule marginal share as its vendors, culture, and prospects shrivel. World reactors average 31 years old, in the U.S., 41. Within a few years, old and uneconomic reactors’ retirements will consistently eclipse additions, tipping output intopermanent decline. World nuclear capacity already fell in five of the past 12 years for a 2% net drop. Performance has become erratic: the average French reactor in 2020 produced nothing one-third of the time. China accounts for most current and projected nuclear growth. Yet China’s 2020 renewable investments about matched its cumulative 2008–20 nuclear investments. Together, in 2020 in China, sun and wind generated twice nuclear’s output, adding 60x more capacity and 6x more output at 2–3 times lower forward cost per kWh. Sun and wind are now the cheapest bulk power source for over 91% of world electricity. Nuclear Power Has No Business Case Nuclear power has bleak prospects because it has no business case. New plants cost 3–8x or 5–13x more per kWh than unsubsidized new solar or windpower, so new **nuclear power** produces 3–13x fewer kWh per dollar and therefore **displaces** 3–**13x less carbon** per dollar **than** new **renewables. Thus buying nuclear makes climate** change **worse**. End-use efficiency is even cheaper than renewables, hence even more climate-effective. Arithmetic is not an opinion. Unsubsidized efficiency or renewables even beat most existing reactors’ operating cost, so a dozen have closed over the past decade. Congress is trying to rescue the others with a $6 billion lifeline and durable, generous new operating subsidies to replace or augment state largesse—adding to existing federal subsidies that rival or exceed nuclear construction costs. But no business case means no climate case. Propping up obsolete assets so they don't exit the market blocks more climate-effective replacements—efficiency and renewables that save even more carbon per dollar. Supporters of new subsidies for the sake of the climate just got played. Fashionably rebranded "Small Modular" or "Advanced" reactors can't change the outcome. Their smaller units cost less but output falls even more, so SMRs save money only in the sense in which a smaller helping of foie gras helps you lose weight. They'll initially at least double existing reactors' cost per kWh; that cost is ~3–13x renewables' (let alone efficiency's)**; and renewables' costs will halve again before SMRs can scale.** Do the math: 2 x (3 to 13) x 2 = 12–52-fold. Mass production can't bridge that huge cost gap—nor could SMRs scale before renewables have decarbonized the US grid. Even free reactors couldn't compete: their non-nuclear parts cost too much. Small Modular Renewables are decades ahead in exploiting mass-production economies; nuclear can never catch up. It's not just too little, too late: **nuclear hogs market space, jams grid capacity, and diverts investments** that more-climate-effective carbon-free competitors then can't contest. Meanwhile, SMRs' novel safety and proliferation issues threaten threadbare schedules and budgets, so promoters are attacking bedrock safety regulations. NRC's proposed Part 53 would perfect long-evolving regulatory capture—shifting its expert staff's end-to-end process from specific prescriptive standards, rigorous quality control, and verified technical performance to unsupported claims, proprietary data, and political appointees' subjective risk estimates. But that final abdication can't rescue nuclear power, which stumbles even in countries with impotent regulators and suppressed public participation. In the end, physics and human fallibility win. History teaches that lax regulation ultimately causes confidence-shattering mishaps, so gutting safety rules is simply a deferred-assisted-suicide pact. Modern renewable generation keeps rising faster than nuclear output ever did in its 1980s heyday. During 2010–20, renewables reduced global power-sector carbon emissions 6x more than coal-to-gas switching (ignoring methane escape), and 5x more than nuclear growth.

AND the aff slows transition from fossil fuels.

Schroeder 25 [Patrick Schröder, senior research fellow @ the Chatham House Environment and Society Centre & PhD in Environmental Studies from Victoria University of Wellington, 3-4-2025, Nuclear Power Is the Cuckoo in the Climate Policy Nest, Foreign Policy, https://foreignpolicy.com/2025/03/04/nuclear-power-australia-britain-reactors/, Willie T.]

It is fair to say that nuclear has become a cuckoo in the climate policy nest: a potentially **disruptive** presence during the energy transition. Nuclear power has entered climate policy discussions in **various countries** in a way that threatens to **dominate, divert, or disrupt** the focus on other short-term solutions, such as **fast deployment** renewable energy technologies.

A 2024 study by the Institute for Energy Economics and Financial Analysis found not only that SMRs are still "**too expensive**" and "too slow" to build, but also that investments in SMRs risk **taking resources away** from the carbon-free and lower-cost renewable technologies that are available today. The researchers concluded that this could delay the transition from fossil fuels forward **significantly** in the coming 10 years.

Recent data released by the International Energy Agency's World Energy Outlook confirmed that renewable energy sources are going to remain the main drivers of the green transition despite the prognosed surge in nuclear energy production; the EU's nuclear power production dropped from 2010 to 2023, leading the technology's share in electricity production to fall from 29 percent to 23 percent.

The long construction times of **10-15 years**, substantial public financing required, and **frequent delays** further underscore that this technology cannot serve as a timely climate solution, especially when the U.N. Intergovernmental Panel on Climate Change emphasizes that global decarbonization must accelerate **steeply within the five years** (carbon dioxide emissions should decline by about 45 percent from 2010 levels by 2030) and continue over the next decades to reach net zero by 2050.

Delaying the transition kills millions

Pearce 23 [Joshua M. Pearce, "Quantifying Global Greenhouse Gas Emissions in Human Deaths to Guide Energy Policy", August 19, 2023, MDPI, https://www.mdpi.com/1996-1073/16/16/6074] roy

2.4. Marginal Carbon Emissions-Related Deaths The estimates made in Section 2.1, Section 2.2 and Section 2.3 are very rough but provide a useful rule of thumb for gaging a first approximation. The 1000-ton rule makes it clear that there is a marginal human death cost to every amount of warming, no matter how small. Thus, **every 0.1 °C degree of warming** can be expected to **cause 100 million deaths.** Similarly, every 0.001 °C of warming will cause a million deaths. If humanity misses the 2 °C target or any of the more granular goals to stop 'dangerous climate change' [75], which appears likely according to AI models [76], rather than relax and accept it, **all efforts to reduce carbon emissions can be viewed as lifesaving.**

AND risks extinction by 2030 due to tipping points

Nogue 23 [Sandra; Lecturer in Paleoenvironmental Science @ the University of Southampton; 3-23-2023; OUP Academic; "Catastrophic climate change and the collapse of human societies," https://academic.oup.com/nsr/article/10/6/nwad082/7085016; DOA: 3-24-2025] nikhil **brackets in original**

The scientific community has focused the agenda of studies of climate change on lower-end warming and simple risk analyses, because more realistic complex assessments of risk are more difficult, the benchmark of the international targets is the Paris Agreement goal of limiting warming to <2°C, and the culture of climate science is to try to avoid alarmism [1]. Current fires, prolonged droughts, floods and heat waves, together with the consequent **food insecurity**, **civil unrest** and **migrations**, however, are opening the eyes not only of most scientists but also of most people all over the world to the need for considering, at least, the potential catastrophic effects of the collapse of ecosystems and society due to the current **emergency** of climate change.

The projections for the climate of the coming decades are, as we all know, worrying. The worst-case scenarios in the 2022 Intergovernmental Panel on Climate Change (IPCC) report project temperatures by the next century that last occurred in the Early Eocene, reversing 50 million years of cooler climates within two centuries. The Pliocene and Eocene provide the best analogues for near-future climates [2]. Climates like those of the Pliocene are likely to prevail as soon as **2030** and unmitigated scenarios of emissions of greenhouse gases (GHGs) will produce climates like those of the **Eocene** for the coming decades. This situation is particularly alarming because human societies are locally adapted to a specific climatic niche with a mean annual temperature of ~13°C [3]. We can thus logically expect that current and future warming may **easily overwhelm** societal adaptive capacity.

These climate projections could be even more detrimental if models would not neglect, as they currently do, **feedback in the carbon cycle** and potential **tipping points** that could generate higher GHG concentrations [4]. Examples include the apparent slowing of dampening feedbacks such as the natural carbon-sink capacity [5,6], the loss of carbon due to increasing frequencies and intensities of fire at northern latitudes [7], **droughts and fires** in the Amazon [8] or the thawing of Arctic permafrost that releases methane and CO_2 [9]. This feedback is also likely not proportional to warming, as is sometimes assumed. Instead, abrupt and/or irreversible changes may be triggered at a temperature threshold [7]. Particularly worrying is a 'tipping cascade' in which **multiple tipping elements** interact in such a way that tipping one threshold increases the likelihood of **tipping another** [4,10].

Climate change also interacts with **other anthropogenic stressors** such as changes in **land use**, loss of **biod**iversity, **nutrient imbalances**, **pollution** and an **overuse** of available resources that are crossing the planetary safety boundary limits and operating as a possible **catastrophic** mix. This mix may exacerbate society vulnerabilities and cause multiple indirect stresses such as economic damage, loss of land and water, and food insecurity that can merge into system-wide synchronous failures. These cascading effects are not only biophysical or biogeochemical, but they also affect human society, generating **conflicts**, **political instability**, systemic financial risks, the spread of **infectious diseases** and the **risk of spillover**. For example, there is evidence that the 2007–10 drought contributed to the conflict in Syria [11].

Anthropogenic climate change interacting with these other stressors could thus cause a global catastrophe, in a **worldwide societal collapse**. Kemp et al. [1] have reminded us that although we have reasons to suspect it, such potential collapsing futures are rarely studied and poorly understood. The closest research is the search for evidence of tipping dynamics and estimating thresholds, timescales and impacts of potential tipping points [4]. We advocate for considering them while using the available knowledge acquired from historical and prehistorical examples of local and regional collapses, transformations and resilience of human societies also driven by climate and unsustainable use of resources (Fig. 1).

Contention 3 is Accidents

Trump is decking NRC independence allowing companies to skip steps causing Fukushima 2.0

Macfarlane 25 [Allison Macfarlane, Professor and director of the School of Public Policy and Global Affairs at the University of British Columbia, 2-21-2025, Trump just assaulted the independence of the nuclear regulator. What could go wrong?, Bulletin of the Atomic Scientists, https://thebulletin.org/2025/02/trump-just-assaulted-the-independence-of-the-nuclear-regulator-what-could-go-wrong/, GZR]

President Trump, through his recent Executive Order, has **attacked independent regulatory agencies in the US government**. This order gives the Office of Management and Budget power over the regulatory process of until-now independent agencies. **These regulatory agencies include the Federal Elections Commission, the Federal Trade Commission, the Securities and Exchange Commission, the Federal Energy Regulatory Commission**—and my former agency, the Nuclear Regulatory Commission, which I chaired between July 2012 and December 2014.

An independent regulator is free from industry and political influence. **Trump's executive order flies in the face of this basic principle by requiring the Office of Management and Budget to** "**review**" **these independent regulatory agencies' obligations** "for consistency with the President's policies and priorities." **This essentially means subordinating regulators to the president**.

In the past, the president and Congress, which has oversight capacity on the regulators, stayed at arm's length from the regulators' decisions. This was meant to keep them isolated, ensuring their necessary independence from any outside interference. Trump's executive order implies there are no longer independent regulators in the United States.

Independent regulators should not only be free from government and industry meddling; they also need to be adequately staffed with competent experts and have the budget to operate efficiently. They also need to be able to shut down facilities such as nuclear power plants that are not operating safely, according to regulations. To do this, they need government to support their independent decisions and rulemaking.

Independence matters. When I was chairman, I traveled the world talking about the importance of an independent regulator to countries where nuclear regulators exhibited a lack of independence and were subject to excessive industry and political influence. It is ironic that the US Nuclear Regulatory Commission—often called the "Gold Standard" in nuclear regulation—has now been captured by the Trump administration and lost its independence. So much for the Gold Standard; the Canadian, the French, or the Finnish nuclear regulator will have to take on that mantle now.

To understand what is at stake, one needs to look no further than the Fukushima accident in March 2011, **which showed the world how a country's economic security is vulnerable to a captured regulator**. After a magnitude 9.0 earthquake followed by a massive tsunami, the Fukushima Daiichi nuclear power plant, with its six reactors on Japan's east coast, lost offsite power. The tsunami flooded their backup diesel generators, and the plant fell into the station blackout, leading to the complete loss of all power on site.

With no power to operate pumps to get cooling water into the reactors' cores or into spent fuel storage pools, three reactor cores melted down—the first within hours of loss of power—with a concomitant release of large amounts of radionuclides due to containment breaches from hydrogen explosions.

Firefighters desperately tried to get water into the spent fuel pool of Unit 4 to ensure that pool water did not boil off since the pumps were no longer working. Should the spent fuel rods have become uncovered and no longer cooled, the fuel's temperature would rapidly increase, and the fuel rods would melt, causing the release of even larger amounts of radiation material into the atmosphere threatening the Tokyo metropolitan area. Fortunately, the emergency workers got water to the pool within a few days of the fuel being uncovered.

Nonetheless, 160,000 people evacuated from the area near the reactors and along the corridor of radiation contamination to the northwest of the Fukushima Daiichi plant. Overnight, the agricultural and fishing industries near Fukushima were devastated. **Within a year after the accident, all 54 reactors in Japan were shut down**—**a loss of about a third of the country's electricity supply**. More expensive diesel plants had to be set up to compensate for some of the missing power. The direct economic costs of the accident were estimated to be on the order of $200 billion—and even that number excluded the costs of replacing the lost power and multiple reactor shutdowns due to the reassessment of seismic hazards. **Nearly 14 years later, only 13 nuclear reactors have been turned back on, and 21 have been permanently shut down**. (The other 20 reactors are waiting for regulatory and prefecture approval.)

An independent investigation by the Diet (Japan's house of parliament) into the cause of the Fukushima accident concluded unequivocally that: "**The TEPCO Fukushima Nuclear Power Plant accident was the result of collusion between the government, the regulators and TEPCO, and the lack of governance by said parties**. They effectively betrayed the nation's right to be safe from nuclear accidents." Japan's government and nuclear industry continue to struggle with the clean-up of the Fukushima site, and it purposely began in 2023 to release still-contaminated water into the Pacific Ocean. Nearby countries responded by banning fishing products from the region.

As the industry often says, **a nuclear accident anywhere is a nuclear accident everywhere**. After the Fukushima accident, the US nuclear industry spent over $47 billion in safety upgrades to respond to lessons learned from the Fukushima accident. **These included the realization that not only more than one reactor could fail at a single power plant**, but also that backup generators needed to be in safe locations, not subject to flooding and other forms of failure; that generic fittings for pumps and equipment were needed so that any nearby equipment could be connected during an accident; that containments should be able to be vented remotely; that natural events such as earthquakes and flooding could be underestimated in the original reactor designs; and that spent fuel pools needed to provide real-time data in accident conditions. The upgrades that resulted from these lessons have greatly increased the safety of reactors in the United States and elsewhere. They were required because each of these upgrades was deemed necessary to address the lessons learned by the independent regulator. On its own, the industry might not have undertaken any of these measures.

What could go wrong? **Several possible outcomes could occur because of Trump's new executive order assaulting the independence of the Nuclear Regulatory Commission** (NRC).

Proponents of small modular reactors, for instance, **have pressured Congress and the executive branch to reduce regulation** and hurry the NRC's **approval of their novel—and unproven—reactor designs. They wish their reactors could be exempted from the requirements that all other designs before them have had to meet**: **detailed evidence that the reactors will operate safely** under accident conditions. Instead, **these proponents**—some **with no experience in operating reactors**—**want the NRC to trust their simplistic computer models** of reactor performance **and essentially give them a free pass to deploy their untested technology** across the country.

An accident with a new small modular reactor (SMR) would perhaps not make such a big mess: After all, the source term of radiation would be smaller than with large reactors, like those currently operating in the United States. But the accident in Japan demonstrated that countries should expect that more than one reactor at a given site can fail at the same time, and these multiple failures can create even more dire circumstances, impeding the authorities' ability to respond to such a complex radiological emergency. At Fukushima, the first explosion at Unit 1 generated radioactive debris that prevented emergency responders from getting close to other damaged reactors nearby. Since designers plan to deploy multiple SMR units to individual sites, such an accidental scenario appears feasible with SMRs.

Since its creation in 1975, the Nuclear Regulatory Commission has had an excellent and essential mission: to ensure the safety and security of nuclear facilities and nuclear materials so that humans and the environment are not harmed. **Trump's incursion means the agency will no longer be able to fully follow through with this mission independently**—and Americans will be more at risk as a result. **If any US reactor suffers a major accident, the entire industry will be impacted**—and perhaps **its 94 reactors in operation will even be temporarily shut down**. Can the industry and the American people afford the cost of losing the independence of the nuclear regulator?

AND Energy Secretary Chris Wright has a history of neglecting safety.

Accountable 25 [Accountable US (Accountable.US (A.US) is a nonpartisan, 501(c)3 organization that shines a light on special interests that too often wield unchecked power and influence in Washington and beyond.) February 4, 2025, Watchdog: Senate Confirms Oil Man & Serial Workplace Safety Violator Chris Wright as Trump's Energy Secretary", https://accountable.us/watchdog-senate-confirms-oil-man-serial-workplace-safety-violator-chris-wright-as-trumps-energy-secretary/, GZR]

WASHINGTON, D.C. – Following the Republican-led Senate's vote to confirm Chris Wright as **U.S. Energy Secretary**, Accountable.US Executive Director Tony Carrk released the following statement: "The choice of Chris Wright to run the powerful Energy Department was based on what's best for the bottom line of Donald Trump's big oil megadonors, not everyday consumers and workers. With his Project 2025 ties and financial stakes in the big oil and nuclear industry, Wright is just the wealthy insider Trump needs to carry out his plans for padding profits of energy special interests – even if it means higher prices at the pump. And with Wright's company's history of violating workplace safety standards and anti-discrimination laws, he's now in the driver's seat to sweep such problems under the rug for his industry friends." BACKGROUND: Conflicts Of Interest With Energy Companies **Chris Wright is a member of the board of Oklo nuclear company and has business before the Department of Energy. Oklo's application before the Nuclear Regulatory Commission was previously denied due to a lack of information about accidents and safety. Chris Wright claims he will step down from the board, but questions remain about whether he will fairly regulate and ensure accountability from energy industries** when he has spent so much of his career working for and serving on the boards of oil and gas and nuclear energy companies. Project 2025 Wright has been on the board of the Western Energy Alliance, an oil industry trade group that authored many of Project 2025's oil and gas provisions. Chris Wright has been a member of the board of Western Energy Alliance (WEA) WEA is an oil industry trade group. WEA's president authored the oil and gas provisions of Project 2025. Project 2025 would eliminate "key offices at the DOE, including the Office of Energy Efficiency and Renewable Energy, the Office of Clean Energy Demonstrations, the Office of State and Community Energy Programs, the Office of Grid Deployment, and the Loan Programs Office." Workplace Safety and Racial Harassment **Questions remain whether Wright will look the other way when energy companies violate safety standards** and anti-discrimination laws, considering his company, Liberty Energy, was frequently fined over workplace safety standards and paid $265,000 to settle lawsuits from black and Hispanic employees who faced hostile work environment and were called slurs. **Under Chris Wright's leadership, Liberty Energy has faced at least three separate penalties for workplace and safety violations** since 2023. Liberty Energy, in 2024, paid $265,000 to settle an EEOC discrimination lawsuit after black and Hispanic field mechanics faced racial harassment.

Affirming gives Wright the keys.

Lynch 25 [James Lynch, news writer for National Review & B.A. in Political Science from Notre Dame, 2-7-2025, Chris Wright Makes Unleashing Nuclear Power Priority for American Energy Abundance, National Review, https://www.nationalreview.com/news/chris-wright-makes-unleashing-nuclear-power-priority-for-american-energy-abundance/, Willie T.]

In a letter to sent Thursday, American Nuclear Society CEO Craig Piercy suggested that Wright focus securing congressional appropriations to fulfill his promises about advancing the nuclear power industry and supporting innovative reactors.

"Many in the industry think additional government support will be needed to reach nth-of-a-kind nuclear plant construction **costs**, while others believe rising electricity demand alone will take care of that in time," the letter reads.

"Either way, as secretary of energy, you will **need appropriations** to engineer any kind of nuclear 'win.' You will spend more time than you think **preparing budgets**, arguing with the Office of Management and Budget over what's included, and then defending said budgets on Capitol Hill. Don't let the bean counters steal from you!"

Accidents cause BioD Loss.

Olsson 11 [Henrik von Wehrden, Joern Fischer, Patric Brandt, Viktoria Wagner, Klaus Kümmerer, Tobias Kuemmerle, Anne Nagel, Oliver Olsson, Patrick Hostert, 12-28-2011, Chair of Material Resources, Institute of Environmental Chemistry, Leuphana University Lüneburg, Scharnhorststr, 1, 21335 Lüneburg, Germany "Consequences of nuclear accidents for biodiversity and ecosystem services," Society for Conservation Biology, https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/j.1755-263X.2011.00217.x, DOA: 3/30/2025] JZ

To characterize and quantify the potential **consequences of nuclear accidents for biodiversity and ecosystem services, we reviewed 521 published studies investigating the impacts of the Chernobyl disaster**, which, until now, has been the only available baseline event to empirically judge the consequences of catastrophic nuclear accidents (see online Supplementary Material for Methods). Specifically, our study aimed to (1) provide a summary of the spatial and temporal patterns of the documented effects of the Chernobyl disaster on a wide range of organisms, and (2) discuss the implications of nuclear accidents for the provision of ecosystem services, again, drawing on documented evidence in the aftermath of the Chernobyl accident. We conclude with four tangible take-home messages, intended to be **directly relevant to debates about the future of nuclear energy.**

Consequences or impacts to species

Spatially, the documented effects of the Chernobyl disaster broadly follow known fallout patterns (Figure 1). However, variance in radiation levels is extremely high, not only between but also within sites. At a given study location, radiation levels have been shown to vary from 44,300 to 181,100 Becquerel per kilogram (Bq/kg) for mushrooms in southern Sweden (Mascanzoni 2009), from 3,000 to 50,000 Bq/kg for bats in Chernobyl (Gashchak et al. 2010), and from 176 to 587,000 Bq/kg for higher plants in southwestern Russia (Fogh & Andersson 2001); the latter equals almost a hundred times the threshold (600 Bq/kg) set by the European Union for Food that is deemed safe for consumption. High variance in radiation levels means that fallout maps based on extrapolations, models, and climate forecasts are not sufficient to evaluate radiation levels on a fine scale—field data are critically important for this purpose. Furthermore, radiation levels measured in the field and predicted fallout patterns based on meteorological data sometimes do not match (McAulay & Moran 1989), because additional factors, such as dry deposition, are not accounted for by climatic predictors (Arvelle et al. 1990). In addition, **some regions and types of ecosystems are systematically underrepresented in studies to date. For example, existing data is sparse for marine and aquatic ecosystems** (Figure 1).

Although many measurements were undertaken in the aftermath of the Chernobyl accident worldwide, existing **studies are greatly biased toward few taxonomic groups** (Figures 2 and 3). Most studies have focused on topsoil measurements and accumulation in the plant layer, which is where radiation can be most easily measured. **Despite this bias, it is clear that for most well-studied groups, greatly elevated radiation levels can occur up to thousands of kilometers away from the disaster site.** For example, recorded radiation levels in mushrooms were up to 13,000 Bq/kg in Denmark in 1991 (Strandberg 2003) and up to 25690 Bq/kg in Norway in 1994 (Amundsen et al. 1996).

The consequences of elevated radiation levels in many parts of a given ecosystem remain poorly understood, but are likely substantial. For example, rats showed changes in sleep behavior after drinking water poisoned with "only" 400 Bq/l (Lestaevel et al. 2006), and onions have shown a significantly elevated rate of chromosomal aberrations at levels as low as 575 Bq/kg (Kovalchuk et al. 1998).

Although numerous studies have investigated physiological and morphological alterations in the vicinity of the Chernobyl accident site, hardly any studies have quantified the possibility of such alterations at larger distances. This could be a major shortcoming, because **radiation levels are known to be greatly increased in some organisms even at large distances from the accident site** (see earlier)—physiological or morphological alterations, therefore, are plausible, at least in isolated instances. Where such alterations occur, their long-term consequences on the ecosystem as a whole can be potentially profound (Kummerer & Hofmeister 2009).

The legacies of the environmental consequences of the Chernobyl accident are still prevalent today, 25 years after the event. Although many studies have shown a peak in radiation immediately after the catastrophe and then a continuous decline, **radiation levels measured throughout the ecosystem are still highly elevated.** For example, radiation levels in mosses (Marovic et al. 2008), soil (Copplestone et al. 2000), and glaciers (Tieber et al. 2009) have remained greatly elevated in several locations around Europe. The long-lasting legacy of the Chernobyl accident was also illustrated by intense wildfires in the Chernobyl region in 2010, which caused a renewed relocation of radioactive material to adjacent regions (Yoschenko et al. 2006). The persistence of high radiation levels can be attributed partly to the half-life rates of the chemical elements involved (e.g., 31 years for Caesium-137; 29 years for Strontium-90; and 8 days for Iodine-131).

In addition to elevated radiation levels, **morphological and physiological changes are by definition long-term in nature, and can even be permanent** if **genetic alterations occur**. For example, a range of bird species now have developed significantly smaller brains inside the core zone around the Chernobyl reactor site compared to individuals of the same species outside this zone (Møller et al. 2011). The consequences of such changes on long-term evolutionary trajectories remain largely unknown.

Lethal mutations following exposure to nuclear fallout have been observed in various plant (Abramov et al. 1992; Kovalchuk et al. 2003) and animal species (Shevchenko, et al. 1992; Zainullin et al. 1992), yet research has mainly been conducted within the Chernobyl region. Morphological changes have also been observed in a wide array of species, including plants (Tulik & Rusin 2005), damselflies (Muzlanov 2002), diptera (Williams et al. 2001), and mice (Oleksyk et al. 2004). In addition, some studies have documented.

Physiological effects, such as changes in the leukocyte level (Camplani et al. 1999) and reduced reproduction rates (Møller et al. 2008). **Changes in genetic structure** have been recorded in various organisms, including fish (Sugg et al. 1996) and frogs (Vinogradov & Chubinishvili 1999). More broadly, elevated radiation can **negatively affect the abundance of entire species groups**, such as insects and spiders (Møller & Mousseau 2009a), raptors (Møller & Mousseau 2009b), or small mammals (Ryabokon & Goncharova 2006).

How low levels of radiation affect different species is poorly understood; studies have suggested that low levels of radiation can have a **persistent influence on mutation rates** in Drosophila (Zainullin et al. 1992), and can weaken **immune (Malyzhev 1993) and reproductive systems (Serkiz 2003) of small mammals;** but again, most studies have been restricted to the Chernobyl accident area. A more obvious measure of permanent change is widespread death of organisms living in the direct vicinity of the disaster site (Figures 1 and 2).

Food web and ecosystem impacts

In addition to effects on individual species, **biological accumulation through the food web can negatively affect some species**—particularly those at higher trophic levels and those depending on strongly affected food items. Bioaccumulation poses a risk to affected species because it **exacerbates exposure to elevated radiation levels, and hence, leads to increased chances of physiological or morphological alterations.** For example, can radiation levels in top predators remain elevated for a long time even when species at lower trophic levels show negligible radiation levels, as demonstrated for the Trench (Tinca tinca) in the Kiev Reservoir (Koulikov 1996).

Extinction!

Torres 16 [Phil Torres, biologist, science communicator, 2-10-2016, "Biodiversity Loss and the Doomsday Clock: An Invisible Disaster Almost No One is Talking About," Common Dreams, https://www.commondreams.org/views/2016/02/10/biodiversity-loss-and-doomsday-clock-invisible-disaster-almost-no-one-talking-about, DOA: 3/30/2025] JZ

But there's another global catastrophe that the Bulletin neglected to consider -- **a catastrophe that will almost certainly have conflict** multiplying **effects no less than climate change. I'm referring here to biodiversity loss** -- i.e., the reduction in the total number of species, or in their population sizes, over time. The fact is that in the past few centuries, the loss of biological diversity around the world has accelerated at an incredible pace. Consider the findings of a 2015 paper published in Science Advances. According to this study, we've only recently entered the **early stages of the sixth mass extinction event in life's entire 3.5 billion year history.** The previous mass extinctions are known as the "Big Five," and the last one wiped out the dinosaurs some 65 million years ago. Unlike these past tragedies, though, the current mass extinction -- called the "Holocene extinction event" -- is almost entirely the result of a one species in particular, namely Homo sapiens (which ironically means the "wise man").

"If the environment implodes under the weight of civilization, then civilization itself is doomed."

But **biodiversity loss isn't limited to species** extinctions. As the founder of the Long Now Institute, Stewart Brand, suggests in an article for Aeon, one could argue that a more pressing issue is the reduction in population sizes around the globe. For example, the 3rd Global Biodiversity Report (GBO-3), published in 2010, found that the total abundance of vertebrates -- a category that includes mammals, birds, reptiles, sharks, rays, and amphibians -- living in the tropics declined by a whopping 59% between 1970 and 2006. In other words, the population size of creatures with a spine more than halved in only 36 years. The study also found that farmland birds in Europe have declined by 50% since 1980, birds in North America have declined by 40% between 1968 and 2003, and nearly 25% of all plant species are currently "threatened with extinction." The latter statistic is especially worth noting because many people suffer from what's called "plant blindness," according to which we fail "to recognize the importance of plants in the biosphere and in human affairs." Indeed, plants form the very bottom of the food chains upon which human life ultimately depends.

Even more disturbing is the claim that amphibians "face the greatest risk" of extinction, with "42% of all amphibian species ... declining in population," as the GBO-3 reports. Consistent with this, a more recent study from 2013 that focused on North America found that "frogs, toads and salamanders in the United States are disappearing from their habitats ... at an alarming and rapid rate," and are projected to "disappear from half of the habitats they currently occupy in about 20 years." The decline of amphibian populations is ominous because amphibians are "ecological indicators" that are more sensitive to environmental changes than other organisms. As such they are the "canaries in the coal mine" that reflect the overall health of the ecosystems in which they reside. **When they start to disappear,** bigger problems are sure to follow.

Yet another comprehensive survey of the biosphere comes from the Living Planet Report -- and its results are no less dismal than those of the GBO-3. For example, it finds that the global population of vertebrates between 1970 and 2010 dropped by an unbelievable 52%. Although the authors refrain from making any predictions based on their data, the reader is welcome to extrapolate this trend into the near future, noting that as **ecosystems** weaken**, the likelihood of** further population losses increases. This study thus concludes that humanity would "need 1.5 Earths to meet the demands we currently make on nature," meaning that we either need to reduce our collective consumption and adopt less myopic economic policies or hurry up and start colonizing the solar system.

Other studies have found that 20% of all reptile species, 48% of all the world's primates, 50% of all freshwater turtles, and68% of plant species are currently threatened with extinction. There's also talk about the Cavendish banana going extinct as a result of a fungus, and research has confirmed that honey bees, which remain "the most important insect that transfers pollen between flowers and between plants," are dying out around the world at an alarming rate due to what's called "colony collapse disorder" -- perhaps a good metaphor for our technologically advanced civilization and its self-destructive tendencies.

Turning to the world's oceans, one finds few reasons for optimism here as well. Consider the fact that atmospheric carbon dioxide -- the byproduct of burning fossil fuels -- is not only warming up the oceans, but it's making them far more acidic. The resulting changes in ocean chemistry are inducing a process known as "coral bleaching," whereby coral loses the algae (called "zooxanthellae") that it needs to survive. Today, roughly 60% of coral reefs are in danger of becoming underwater ghost towns, and some 10% are already dead. This has **direct consequences for humanity because coral reefs "provide us with food, construction materials (limestone) and new medicines,"** and in fact "more than half of new cancer drug research is focused on marine organisms." Similarly, yet another study found that ocean acidification is becoming so pronounced that the shells of "tiny marine snails that live along North America's western coast" are literally dissolving in the water, resulting in "pitted textures" that give the shells a "cauliflower" or "sandpaper" appearance.

Furthermore, human-created pollution that makes its way into the oceans is carving out vast regions in which the amount of dissolved oxygen is too low for marine life to survive. These regions are called "dead zones," and the most recent count by Robert Diaz and his colleagues found more than 500 around the world. The biggest dead zone discovered so far is located in the Baltic Sea, and it's been estimated to be about 27,000 square miles, or a little less than the size of New Hampshire, Vermont, and Maryland combined. Scientists have even discovered an "island" of trash in the middle of the Pacific called the "Great Pacific Garbage Patch" that could be up to "twice the size of the continental United States." Similar "patches" of floating plastic debris can be found in the Atlantic and Indian oceans as well, although these are not quite as impressive. The point is that "Earth's final frontier" -- the oceans -- are becoming vast watery graveyards for a huge diversity of marine lifeforms, and in fact a 2006 paper in Science predicts that there could be virtually no more wild-caught seafood by 2048.

Everywhere one looks, the biosphere is wilting -- and a single bipedal species with large brains and opposable thumbs is almost entirely responsible for this worsening plight. If humanity continues to prune back the Tree of Life with reckless abandon, we could be forced to confront a global disaster of truly unprecedented proportions. Along these lines, a 2012 article published in Nature and authored by over twenty scientists claims that humanity could be **teetering on the brink of a catastrophic, irreversible collapse of the global ecosystem**. According to the paper, there could be **"tipping points" -- also called "critical thresholds" -- lurking in the environment that, once crossed, could initiate radical and sudden changes in the biosphere**. Thus, an event of this sort could be preceded by little or no warning: everything might look more or less okay, until the ecosystem is suddenly in ruins.

We must, moving forward, never forget that just as we're minds embodied, so too are we bodies environed, meaning that **if the environment implodes under the weight of civilization, then civilization itself is doomed.** While the threat of nuclear weapons deserves serious attention from political leaders and academics, as the Bulletin correctly observes, it's even more imperative that we focus on the broader "contextual problems" that **could inflate the overall probability of wars and terrorism in the future.** Climate change and biodiversity loss are both conflict multipliers of precisely this sort, and each is a contributing factor that's exacerbating the other. If we fail to make these threats a top priority in 2016, the **likelihood of nuclear weapons -- or some other form of emerging technology, including biotechnology and artificial intelligence -- being used in the future will only increase.**

Perhaps there's still time to avert the sixth mass extinction or a sudden collapse of the global ecosystem. But time is running out -- the doomsday clock is ticking.

Independently, accidents turn *GLOBAL* sentiment against nuclear which kills aff solvency --- Fukushima proves.

Paillere 20 [Dr. Henri PAILLERE has over 26 years of experience in the nuclear energy sector and is currently working as Head of the Planning and Economic Studies Section at the International Atomic Energy Agency, 11-27-2020, Nuclear Power 10 Years After Fukushima: The Long Road Back, IAEA, https://www.iaea.org/newscenter/news/nuclear-power-10-years-after-fukushima-the-long-road-back, Willie T.]

At the beginning of the new millennium, amid growing awareness of the link between energy-related greenhouse gas emissions and climate change, the notion of a 'nuclear renaissance' became popular. Scientists and policy makers identified low carbon nuclear power as a potential protagonist in the transition to clean energy.

However, the accident at the Fukushima Daiichi Nuclear Power Plant, operated by the Tokyo Electric Power Company (TEPCO), on 11 March 2011 dealt a blow to plans for swiftly scaling up nuclear power to address not only climate change, but also energy poverty and economic development. As the global community turned its attention to strengthening nuclear safety, several countries opted to phase out nuclear power.

Following efforts to strengthen nuclear safety and with global warming becoming ever more apparent, nuclear power is regaining a place in global debates as a climate-friendly energy option. That is due to its vital attributes: zero emissions during operation, 24/7 availability, a small land footprint and the versatility to decarbonize 'hard-to-abate' sectors in industry and transportation. But even as technology-neutral organizations such as the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA) recognize nuclear power's ability to address major global challenges, the extent to which this clean, reliable and sustainable source of energy will achieve its full potential remains uncertain.

The Fukushima Daiichi accident and public acceptance in some countries continue to *cast a shadow* over nuclear power's prospects. Furthermore, in some major markets, nuclear power lacks a favourable policy and financing framework that recognize its contributions to climate change mitigation and sustainable development. Without such a framework, nuclear power will struggle to deliver on its full potential, even as the world remains as dependent on fossil fuels as it was three decades ago.

Impact on electricity generation

The biggest immediate blow to nuclear electricity generation came in Japan. With public confidence in nuclear power at record low levels following the accident, authorities suspended operations at 46 of the country's 50 operational power reactors. Nuclear energy, a strategic priority since the 1960s, supplying almost a third of Japan's electricity, was suddenly shelved. In 2019, nuclear power provided only 7.5% of Japan's electricity. Just nine nuclear power reactors have resumed operation.

Meanwhile, public and government opinion turned against nuclear power in some other countries as well. Germany, less than three months after the accident, decided to phase out nuclear power entirely by 2022. All but six of the country's 17 power reactors have since been permanently shut down. Nuclear power produced about 12% of the country's electricity in 2019 compared with around 25% before the accident at Fukushima Daiichi, while coal-fired plants remained the largest source of electricity, according to the IEA. Elsewhere, Belgium confirmed plans to exit nuclear power by 2025. In Italy, a government-backed plan to bring back nuclear power, shuttered since 1990, fizzled. And countries such as Spain and Switzerland decided not to build new nuclear plants. Between 2011 and 2020, some 48 GWe of nuclear capacity was lost globally as a total of 65 reactors were either shut down or did not have their operational lifetimes extended.

Rebuttal

A2 Fusion

Their Merrifield 23 evidence is tagged as “investment will jumpstart fusion” but it specifically says policies will jumpstart investment not that investment will jumpstart fusion. It never specifically isolates investment as key, don’t grant them that hold the line there they don’t fiat policy.

1. No scaling --- lack of land, tritium, and the government won’t use it for the grid.

Frank 23 [Joshua Frank, award-winning California-based journalist + coeditor of CounterPunch + author of the book Atomic Days: The Untold Story of the Most Toxic Place in America, 1-3-2023, Nuclear Fusion Isn’t the Silver Bullet We Want It to Be, The Nation, https://www.thenation.com/article/environment/nuclear-fusion-fossil-fuel-risks/, Willie T.]

“In a brief moment lasting less than 100 trillionths of a second, 2.05 megajoules of energy—roughly the equivalent of a pound of TNT—bombarded the hydrogen pellet,” explained New York Times reporter Kenneth Chang. “Out flowed a flood of neutron particles—the product of fusion—which carried about 3 megajoules of energy, a factor of 1.5 in energy gain.”

As with so many breakthroughs, there was a catch. First, 3 megajoules isn’t much energy. After all, it takes 360,000 megajoules to create 300 hours of light from a single 100-watt light bulb. So Livermore’s fusion development isn’t going to electrify a single home, let alone a million homes, anytime soon. And there was another nagging issue with this little fusion creation as well: it took 300 megajoules to power up those 192 lasers. Simply put, at the moment, they require 100 times more energy to charge than the energy they ended up producing.

“The reality is that fusion energy will not be viable at scale anytime within the next decade, a time frame over which carbon emissions must be reduced by 50% to avoid catastrophic warming of more than 1.5°C,” says climate expert Michael Mann, a professor of earth and environmental science at the University of Pennsylvania. “That task will only be achievable through the scaling up of existing clean energy—renewable sources such as wind and solar—along with energy storage capability and efficiency and conservation measures.”

Tritium Trials and Tribulations

The secretive and heavily secured National Ignition Facility, where that test took place, is the size of a sprawling sports arena. It could, in fact, hold **three football fields**. Which makes me wonder: How much space would be needed to do fusion on a commercial scale? **No good answer** is yet available. Then there’s the **trouble with** that isotope tritium needed to help along the fusion reaction. It’s not easy to come by and

costs about as much as diamonds, around $30,000 per gram. Right now, even some of the bigwigs at the Department of Defense are worried that we're **running out** of usable tritium.

"Fusion advocates often boast that the fuel for their reactors will be cheap and plentiful. That is certainly true for deuterium," writes Daniel Clery in Science. "Roughly one in every 5,000 hydrogen atoms in the oceans is deuterium, and it sells for about $13 per gram. But tritium, with a **half-life of 12.3 years**, exists naturally only in **trace amounts** in the **upper atmosphere**, the product of cosmic ray bombardment."

Fusion boosters brush this unwelcome fact aside, pointing out that "tritium breeding"—a process in which tritium is endlessly produced in a loop-like fashion—is entirely possible in a fully operating fusion reactor. In theory, this may seem plausible, but **you need a bunch** of tritium to jumpstart the initial chain reaction, and **doubt abounds** that there's enough of it out there to begin with. On top of that, the reactors themselves will have to be lined with a lot of lithium, itself an expensive chemical element at $71 a kilogram (copper, by contrast, is around $9.44 a kilogram), to allow the process to work correctly.

Then there's also a commonly repeated misstatement that fusion doesn't create significant radioactive waste, a haunting reality for the world's current fleet of nuclear plants. True, plutonium, which can be used as fuel in atomic weapons, isn't a natural byproduct of fusion, but tritium is the radioactive form of hydrogen. Its little isotopes are great at permeating metals and finding ways to escape tight enclosures. Obviously, this will pose a significant problem for those who want to continuously breed tritium in a fusion reactor. It also presents a concern for people worried about radioactivity making its way out of such facilities and into the environment.

"Cancer is the main risk from humans ingesting tritium. When tritium decays it spits out a low-energy electron (roughly 18,000 electron volts) that escapes and slams into DNA, a ribosome, or some other biologically important molecule," David Biello explains in Scientific American. "And, unlike other radionuclides, tritium is usually part of water, so it ends up in all parts of the body and therefore can, in theory, promote any kind of cancer. But that also helps reduce the risk: any tritiated water is typically excreted in less than a month."

If that sounds problematic, that's because it is. This country's aboveground atomic bomb testing in the 1950s and 1960s was responsible for most of the man-made tritium that's lingering in the environment. And it will be at least 2046, 84 years after the last American atmospheric nuclear detonation in Nevada, before tritium there will no longer pose a problem for the area.

Of course, tritium also escapes from our existing nuclear reactors and is routinely found near such facilities where it occurs "naturally" during the fission process. In fact, after Illinois farmers discovered their wells had been contaminated by the nearby Braidwood nuclear plant, they successfully sued the site's operator, Exelon, which, in 2005, was caught discharging 6.2 million gallons of tritium-laden water into the soil.

In the United States, the Nuclear Regulatory Commission (NRC) allows the industry to monitor for tritium releases at nuclear sites; the industry is politely asked to alert the NRC in a "timely manner" if tritium is either intentionally or accidentally released. But a June 2011 report issued by the Government Accountability Office cast doubt on the NRC's archaic system for assessing tritium discharges, suggesting that it's anything but effective. ("Absent such an assessment, we continue to believe that NRC has no assurance that the Groundwater Protection Initiative will lead to prompt detection of underground piping system leaks as nuclear power plants age.")

Consider all of this a way of saying that if the NRC isn't doing an adequate job of monitoring tritium leaks already occurring with regularity at the country's nuclear plants, how the heck will it do a better job of tracking the stuff at fusion plants in the future? And as I suggest in my new book, Atomic Days: The Untold Story of the Most Toxic Place in America, the NRC is plain awful at just about everything it does.

Instruments of Death

All of that got me wondering: If tritium, vital for the fusion process, is radioactive, and if they aren't going to be operating those lasers in time to put the brakes on climate change, what's really going on here?

Maybe some clues lie (as is so often the case) **in history**. The initial idea for a fusion reaction was proposed by English physicist Arthur Eddington in 1920. More than 30 years later, on November 1, 1952, the first full-scale US test of a thermonuclear device, "Operation Ivy," took place in the Marshall Islands in the Pacific Ocean. It yielded a mushroom-cloud explosion from a fusion reaction equivalent in its power to 10.4 Megatons of TNT. That was 450 times more powerful than the atomic bomb the United States had dropped on the Japanese city of Nagasaki only seven years earlier to end World War II. It created an underwater crater 6,240 feet wide and 164 feet deep.

"The Shot, as witnessed aboard the various vessels at sea, is not easily described," noted a military report on that nuclear experiment. "Accompanied by a brilliant light, the heat wave was felt immediately at distances of thirty to thirty-five miles. The tremendous fireball, appearing on the horizon like the sun when half-risen, quickly expanded after a momentary hover time."

Nicknamed "Ivy Mike," the bomb was a Teller-Ulam thermonuclear device, named after its creators Edward Teller and Stanislaw Ulam. It was also the United States' first full-scale hydrogen bomb, an altogether different beast than the two awful nukes dropped on Japan in August 1945.

Those bombs utilized fission in their cores to create massive explosions. But Ivy Mike gave a little insight into what was still possible for future weapons of annihilation.

The details of how the Teller-Ulam device works are still classified, but historian of science Alex Wellerstein explained the concept well in The New Yorker:

The basic idea is, as far as we know, as follows. Take a fission weapon—call it the primary. Take a capsule of fusionable material, cover it with depleted uranium, and call it the secondary. Take both the primary and the secondary and put them inside a radiation case—a box made of very heavy materials. When the primary detonates, radiation flows out of it, filling the case with X rays. This process, which is known as radiation implosion, will, through one mechanism or another…compress the secondary to very high densities, inaugurating fusion reactions on a large scale. These fusion reactions will, in turn, let off neutrons of such a high energy that they can make the normally inert depleted uranium of the secondary's casing undergo fission."

Got it? Ivy Mike was, in fact, a fission explosion that initiated a fusion reaction. But ultimately, the science of how those instruments of death work isn't all that important. The takeaway here is that, since **first tried out in that monstrous Marshall Islands** explosion, fusion has been intended as a **tool of war**. And, sadly, so it remains, **despite all the publicity** about its possible use some distant day in relation to climate change. In truth, any fusion breakthroughs are potentially of critical importance not as a remedy for our warming climate but for a **future apocalyptic world of war**. Despite all the fantastic media publicity, that's how the US government **has always seen it** and that's why the latest fusion test to create "energy" was **executed in the utmost secrecy** at the Lawrence Livermore National Laboratory. One thing should be taken for granted: The American government is interested **not** in using fusion technology to power the energy grid, but in using it to further strengthen this country's already massive arsenal of **atomic weapons.**

Consider it an irony, under the circumstances, but in its announcement about the success at Livermore—though this obviously wasn't what made the headlines—the Department of Energy didn't skirt around the issue of gains for future atomic weaponry. Jill Hruby, the department's undersecretary for nuclear security, admitted that in achieving a fusion ignition, researchers had "opened a new chapter in NNSA's science-based Stockpile Stewardship Program." (NNSA stands for the National Nuclear Security Administration.) That "chapter" Hruby was bragging about has a lot more to do with "modernizing" the country's nuclear weapons capabilities than with using laser fusion to end our reliance on fossil fuels.

"Had we not pursued the hydrogen bomb," Edward Teller once said, "there is a very real threat that we would now all be speaking Russian. I have no regrets." Some attitudes die hard.

Buried deep in the Lawrence Livermore National Laboratory's website, the government **comes clean** about what these fusion experiments at the $3.5 billion National Ignition Facility (NIF) are really all about:

NIF's high energy density and inertial confinement fusion experiments, coupled with the increasingly sophisticated simulations available from some of the world's most powerful supercomputers, increase our understanding of **weapon physics**, including the properties and **survivability of weapons-relevant materials**…. The high rigor and multidisciplinary nature of NIF experiments play a key role in attracting, training, testing, and retaining new generations of skilled stockpile stewards who will **continue the mission** to protect America into the future.

Yes, despite all the media attention to climate change, this is a rare yet intentional admission, surely meant to frighten officials in China and Russia. It leaves little doubt about what this fusion breakthrough means. It's not about creating future clean energy and never has been. It's about "protecting" the world's greatest capitalist superpower. Competitors beware.

Sadly, fusion **won't save the Arctic** from melting, but if we don't put a stop to it, that breakthrough technology could someday **melt us all.**

2. Consistency and handling plasma is impossible --- err neg to reject aff delusion.

Locke 14 [Susannah Locke, master's degree in science, health, and environmental journalism from NYU, 4-16-2014, Nuclear fusion could be the perfect energy source — so why can't we make it work?, Vox, https://www.vox.com/2014/4/16/5580192/the-comprehensive-guide-to-fusion-power, Willie T.]

Which approach to fusion has the best chance of success?

If people had to pick one, most would put their money on ITER. That's because NIF only researches fusion power as a side project — its main task is performing studies that help maintain and test the US nuclear arsenal.

there's a good chance **no one** will succeed

However, there's also a good chance that no one will succeed in producing practical fusion power. What scientists are currently doing are research projects that **won't be hooked up to the power grid.** And getting a machine to do fusion for a **split second** every once in a while is nothing compared with building an actual power plant that can **withstand the trauma** of doing fusion **all the time.**

It's a major engineering challenge, and some say that making a commercial power plant will be even harder than getting fusion to work in the first place.

Why is fusion power so difficult?

One big reason is that it requires working with plasma, which is **really tricky**. Because plasmas aren't that common on Earth, scientists had **very little experience** with them until they started studying fusion.

Plasma is **difficult to hold**: The plasma used in fusion-energy research is **hundreds of millions** of degrees Fahrenheit. You can't hold it using a solid container, because the **container would just melt.** Instead, physicists have to corral it using electromagnetic fields or work with it so quickly (in less than a billionth of a second) that holding it isn't an issue.

Plasma is difficult to compress: If you don't compress plasma from all sides perfectly evenly, it will **squish out** wherever it can. Scientific American explained this well: "Imagine holding a large, squishy balloon. Now squeeze it down to as small as it will go. No matter how evenly you apply pressure, the balloon will **always squirt out** through a space between your fingers. The same problem applies to plasmas. Anytime scientists tried to clench them down into a tight enough ball to induce fusion, the plasma would find a way to **squirt** out the sides."

Will we ever get fusion power?

The folks associated with ITER say that they'll have plasma in the reactor in 2020 and will be doing fusion by 2027. But the project has been dogged by delays, not to mention a very negative review of its management recently. So take those dates with a giant grain of salt.

fusion research has a long history of always being **20 years away**

More broadly, fusion power research has a very **long history of always promising** that success is just 20 years away. It also has had its share of **wackos**, **hucksters**, and well-meaning, but **blindly optimistic** scientists. For a good, pessimistic argument of why fusion power will never happen, check out journalist Charles Seife's Slate piece from a few years back.

The uniqueness to their internal link relies on American hegemony being down but nowhere in STAC or the entire does it say that. STAC literally tells us that the US has a robust STEM industry and they concede in uniqueness that we already researched fusion so it already created jobs. Don't do the heg work for them hold the line there.

Also no warrant why its the most likely implementation of the aff

A2 AI

1. AI energy intensity rapidly decreasing and companies solve now.

Ramachandran '24 [Vijaya; Director for Energy & Development @ the Breakthrough Institute, Board Member of the Energy for Growth Hub, PhD in Business Economics from Harvard University; July 9; Breakthrough Institute; "Unmasking the Fear of AI's Energy Demand," https://thebreakthrough.org/journal/no-20-spring-2024/unmasking-the-fear-of-ais-energy-demand; DOA: 3-24-2025] tristan

In a detailed thread on X, MIT Innovation Fellow and former National Economic Council director Brian Deese argues that forecasters consistently overestimate electricity demand, in part because they emphasize static load growth over efficiency gains. Deese points out that in the early 2000s, analysts predicted surging electricity demand. Instead, U.S. electricity demand has stayed flat for two decades. And although data center energy use is increasing, energy intensity (energy use per computation) has decreased by 20% every year since 2010. Nvidia—one of the largest companies designing graphics processing units (GPUs) for gaming, professional visualization, data centers, and automotive markets—is continuously improving the energy efficiency of its GPUs. Its new AI-training chip, Blackwell, for example, will use 25 times less energy than its predecessor, Hopper. Deese points out that analysts may be double-counting energy use by data centers because technology companies initiate multiple queries in different utility jurisdictions to get the best rates.

A (carbon-heavy) query to ChatGPT suggests AI and data service providers have considerable room to improve the energy efficiency of data center infrastructure using various measures:

Virtualization and Consolidation: Virtualization technology can be used to consolidate servers and reduce the number of physical machines running. This can lead to significant energy savings by optimizing server utilization rates.

Efficient Cooling Systems: Cooling accounts for a substantial portion of a data center's energy consumption. Implementing efficient cooling techniques such as hot/cold aisle containment, using free cooling when ambient temperatures allow, and employing modern cooling technologies like liquid cooling can reduce energy usage.

Energy-Efficient Hardware: Energy-efficient servers, storage devices, and networking equipment can be a priority, as can the use of products with high energy efficiency ratings (such as ENERGY STAR certified devices), with use configurations optimized for lower power consumption.

Power Management Software: Power management tools and software can monitor and adjust power usage based on demand. This includes dynamically adjusting server power levels during periods of low activity (e.g., using power capping techniques).

Optimized Data Center Layout: Data center layouts can be designed to minimize energy waste and optimize airflow. This includes proper rack layout, efficient cable management, and ensuring equipment is placed to minimize cooling requirements.

Energy-Efficient Data Storage: Efficient data storage technologies and practices, such as data de-duplication and compression, can be used to reduce the overall storage footprint and associated energy requirements. Continuous monitoring and optimization will also help.

Electricity demand from electric vehicles (EVs) may prove to be comparable or even higher than that of AI. The Princeton REPEAT model estimates the demand for electricity in the United States at 391 TWh for EV transportation (light-duty vehicles and other electric transport) in 2030, which is similar to BCG's 2030 estimates for data centers (320 - 390 TWh). Rystad Energy predicts EV usage will grow from 18.3 TWh to 131 TWh for the same period. Despite the additional energy demand, policymakers strongly encourage the purchase of EVs and the construction of charging infrastructure, while commentators seem relatively unconcerned about EV charging needs. This may be because EVs are seen to be filling an existing societal need for transportation, as well as a solution to the problem of climate change. Even though AI has potential to raise productivity and improve lives, it is a new and energy-intensive technology whose value runs counter to the priorities of the environmental community.

No matter the level of future AI use, AI's energy demand will make it more difficult—if not impossible—to dismiss the intermittency challenges associated with powering commercial and industrial loads with wind and solar energy. Data centers' real-time power demand requires continuous, dispatchable power which cannot be provided solely by renewables without significant excess generation capacity and large amounts of cheap storage.

Technology companies like Microsoft and Google are taking steps to meet their data center energy needs. Microsoft recently inked an agreement with Constellation Energy to supply its data center with nuclear-produced power. Other firm clean energy sources may also play crucial roles in decarbonizing AI energy consumption. Last year, Google partnered with Fervo Energy to power its Nevada-based data center with geothermal power. At least one hydropower developer—Rye Development—is planning to develop hydroelectric facilities to match data center electricity use.

The bottom line is that we do not need to fear AI's challenge to the energy grid. Utilities and tech companies will meet increased demand by using a mix of energy sources, including clean and firm electricity supplies like nuclear energy, geothermal power, and even hydropower. AI is not the first—and nor will it be the last—game changer in society's energy consumption. The discourse on AI's energy footprint must therefore shift from apprehension to proactive problem-solving, focused on energy efficiency gains and diversification of clean energy sources, driven by the notion that a high-energy planet is essential for human progress.

This tells us two things

1) **Even if there are more data centers the energy needed for each one is decreasing as processes become more efficient, so on net less energy will be needed**
2) **Even if they win more energy is needed companies are adapting without the aff.**

Their own Kahl uniqueness ev concedes that at the rate we are going we are continue staying ahead of China - aff not needed.

2. Nuclear energy fails to meet AI demand--- delays, costs, unreliability, and weather.

CAN 24 [No Author, Europe's leading NGO coalition fighting climate change with over 200 member organizations, 3-19-2024, Myth buster: Nuclear energy is a dangerous distraction, Climate Action Network Europe, https://caneurope.org/myth-buster-nuclear-energy/] BZ

Fact #2: New nuclear construction is too slow

Myth #2: New nuclear is an effective solution to align Europe to the Paris Agreement and keep global temperature increase to 1.5°C

A rapid transition requires the use of existing technologies and solutions which can most quickly be rolled-out such as renewables, primarily solar and wind, energy efficiency, and system flexibility. For years, new nuclear energy projects in Europe have been plagued with delays and, coupled with an untrained workforce, are unable to support the speed of decarbonisation necessary. New nuclear plants typically take 15-20 years for construction, hence failing to address immediate decarbonisation needs to 2030. Indicatively, France's six new reactors are estimated by its network operator to enter into use in 2040-2049, much too late to have any meaningful impact on emissions reduction needed already now, with a view to pathways to 2040, and beyond, for a sustainable future.

The decision to build the UK's Hinkley Point C nuclear reactor was announced in 2007 with an operational start date of 2017, however it has been delayed several times over, and is now estimated to start in 2031. In France, the Flamanville project is 16 years into construction and hitting new delays, while Finland's Olkiluoto took a full 18 years to come online.

Nuclear power is too expensive

When compared to renewables, the latest analysis from World Nuclear Industry Status Report, using the data from Lazard, determines that the levelized cost of energy (LCOE) for new nuclear plants makes it the most expensive generator, estimated to be nearly four times more expensive than onshore wind, while unsubsidized solar and wind combined with energy storage (to ensure grid balancing) is always cheaper than new nuclear.

Recent European projects in Slovakia, the UK, France, and Finland demonstrate the dramatic rising costs. EDF admitted that the costs for the British nuclear facility Hinkley Point C will skyrocket to 53.8 billion euros for the scheduled 3.2 GW power plant, more than twice as much as scheduled in 2015 when the plant was approved. The French project in Flamanville was originally projected to cost 3.3 billion euros when it began construction in 2007, but has since risen to 13.2 billion euros (16.87 billion euros in today's money). The Finnish Olkiluoto-3 project 1.6GW reactor cost 3 times more than the original forecast price, reaching 11 billion euros. Slovakia's second generation reactors Mochovce 3 and 4 ballooned costs to 6.4 billion euros from an initially estimated 2.8 billion. Slovenia's president announced that a new 1.6GW reactor would cost 11 billion euros, following the Finnish example, demonstrating that these high prices are here to stay.

Renewables and energy efficiency are cheaper alternatives

When compared against energy savings, analysis by Hungarian NGO Clean Air Action Group highlights that it is more economically efficient to invest in the renovation of households to save energy than in the construction, operation, and decommissioning of a new nuclear reactor. These findings were confirmed by a separate study by Greenpeace France, that showed that by investing 52 billion euros in a mix of onshore wind infrastructure/photovoltaic panels on large roofs, it would be possible to avoid four times more CO_2 emissions than by investing the same amount in the construction of six EPR2 nuclear reactors by 2050, while electricity production triples. By investing 85 billion euros of government subsidies in energy savings by 2033, it would be possible to avoid six times more cumulative CO_2 emissions by 2050 than with the construction program of six EPR 2 reactors. This would also make it possible to lift almost 12 million people out of energy poverty in a decade.

In order to finance new and ongoing projects, the EU has approved State Aid for nuclear, in the case of Hungary, Belgium, and the United Kingdom, while national governments seek support schemes. Despite making references to technology-neutrality, this creates an unlevel playing field slanted against renewable energy. Given the significant investment gap to achieve 2030 climate targets, and the limited fiscal space of many Member States, investments in nuclear risk diverting precious public resources into projects of poor value-for-money compared to alternatives in a renewables-based system, while reducing the availability of public resources for all other components of the energy transition. Such a choice would equally fail to reduce prices for consumers in the context of the current fossil fuel energy crisis. Nuclear power includes many additional hidden costs The costs would be even larger if accounting for "unpaid externalities" borne by taxpayers and the public at large, from nuclear accident risks that are impossible to insure against by private actors. The costs of decommissioning of a nuclear power plant, which can cost 1-1.5 billion euros per 1000 MW, are often borne by the public as these costs are poorly taken into account when planning a new nuclear installation. The cost associated with storing radioactive waste for hundreds of thousands of years is also often undervalued, alongside costs associated with radioactive leaks from plants or storage facilities, as demonstrated by the radioactive leaks in the UK Sellafield site, causing tension with Ireland and Norway. To lower costs, attempted lowering of safety and environmental standards can be expected, posing risks to communities, nature, and society at large, also as a burden to future generations.

Myth #3: New innovation will solve the issues of cost and inflexibility

Fact #3: Small Modular Reactors are not coming to save us

Argued to be more flexible, decentralised, smaller, and cheaper than existing nuclear designs, countries are wasting public resources in favour of non-existent Small Modular Reactor (SMRs), riddled with the same limitations as their predecessors, and presenting poor value-for-money compared to existing alternatives. The focus on SMRs risks delaying the development of renewable energy technologies already available at the moment, and thereby prolonging the usage of fossil fuels., ,

Burdened by the same high capital costs, SMRs would have to run near constantly to reduce losses, thereby further congesting the grid and making them useless in providing back-up power needed for peak hours against renewables and energy storage.

Small Modular Reactors are untested

Only few SMRs in China and Russia are currently in operation. Since the technology has not been tested yet at commercial scale, claims that the industry is making about their supposedly faster construction and lower costs are therefore purely speculative at this stage. An SMR project that was planned in the US state of Utah, was terminated in November 2023 as local authorities that were meant to buy the electricity pulled out due to rising costs. The same company that failed with this project intends to build SMRs in Romania, Kazakhstan, Poland and Ukraine.

Fact #4: Studies demonstrate that 100% renewable by 2040 is feasible and favourable

Myth #4: A 100% renewable energy system is unfeasible, and renewables must work together with nuclear

The Paris Agreement Compatible (PAC) scenario, developed by civil society and experts, emphasises renewables-based electrification and energy demand reduction, calling for determined and heightened attention to enable a 100% renewables-based EU energy system by 2040, and foresees no need for nuclear power in Europe. A fully renewables-based energy system even functions in times of low wind and at night, when the sun is not shining. The solution to still provide the required amount of power needed during these times is a combination of flexibility (such as energy storage) and demand-side measures. The myth of the need for nuclear baseload has been debunked for years. The energy system can be reliably and safely managed with 100% renewables and system flexibility.

Nuclear power production is not reliable: Nuclear power units across Europe have been proven as unreliable in providing power when needed. Future climatic conditions, such as heatwaves, droughts, flooding and rising sea-levels only increase the likelihood of future nuclear power plant disconnections and pose further security risks. In 2022, on average French nuclear reactors had 152 days with zero-production. Over half of the French nuclear reactor fleet was not available during at least one-third of the year, one-third was not available for more than half of the year, and 98% of the year 10 reactors or more did not provide any power for at least part of the day.

That proves nuclear energy's high capacity A) isn't true France is the only example in this round empirics flow neg B) either way climate events in the future disconnect plants and delay data centers