Contention 1 is Meltdowns

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).

C2 is Terrorism

Risk of nuclear terror is growing

Moulton 25 [Cyrus Moulton, 3-12-2025, "'Risks of nuclear terrorism are high and growing.' New tools, alliances, renewed focus needed, group led by Northeastern expert recommends.", Northeastern Global News, https://news.northeastern.edu/2024/06/18/nuclear-terrorism-risks-research/]

For roughly 80 years, the United States has managed the threat of nuclear terrorism through nonproliferation treaties, agency programs, intelligence activities, international monitoring support and more, withstanding the Cold War, the fall of the Soviet Union, and 9/11. A National Academies committee led by Northeastern University's Stephen Flynn wants to ensure the U.S. remains prepared. "The issue of **nuclear terrorism remains very** much a **real** one, there are enormous stakes involved and the risks are high, but the issue has been falling off the radar screen of the American public over the last 15 years, and the skill set of people involved in managing it is aging out," says Flynn, professor of political science and founding director of the Global Resilience Institute at Northeastern. "We really need to keep our eye on the ball. It was quite timely for Congress to call for an assessment of this risk and provide recommendations for staying on top of this issue." In the 2021 National Defense Authorization Act, Congress mandated the U.S. Department of Defense and the U.S. Department of Energy's National Nuclear Security Agency to work with the National Academy of Sciences, Engineering and Medicine to assess the current state of nuclear terrorism and nuclear weapons and materials and advise the government on how to handle such issues. Flynn, an expert on national and homeland security, was appointed chair of the committee in 2022. The committee released its final report on Tuesday. The report finds that a lot has changed since the issue of nuclear terrorism was forefront in Americans' minds following 9/11 and the buildup to the Iraq War. "We had a war on terror after 9/11, but that didn't succeed in eliminating the terrorsim threat," Flynn says. "Terrorism continues to morph**." The outbreak of the Israel-Hamas War**, which occurred as the committee finalized its report, demonstrates this morphing of terrorism. The **involvement of Hezbollah as a proxy of Iran,** and the involvement of Hamas — both groups are designated terrorist groups by the U.S. State Department — **highlight a world where non-states and nuclear-seeking states collaborate in warfare**, Flynn says. "The designation between non-state vs. state actors is blurry," Flynn says. "The assessment reveals we have to be focused on where those two things may overlap." Also "blurring" is the line between domestic terrorism and international terrorism, Flynn says. "Particularly when you look on the far right, **international terror groups are recruiting Americans** into these organizations**, and Americans are reaching out to extremist** organizations that have terrorism elements," Flynn says.

Right wing nuclear terror, too.

Earnhardt et al 21 (Becca Earnhardt is a Research Associate with the Nuclear Security program at the Stimson Center. Brendan Hyatt is a nuclear security intern at the Stimson Center. Nickolas Roth serves as a senior director of Nuclear Materials Security at the Nuclear Threat Initiative, January 14, 2021, "A threat to confront: far-right extremists and nuclear terrorism", Bulletin of the Atomic Scientists, https://thebulletin.org/2021/01/a-threat-to-confront-far-right-extremists-and-nuclear-terrorism/, DOA 4/11/23) KC

Last March, neo-Nazi Timothy Wilson was killed during a shootout as he was planning to bomb a hospital treating COVID-19 patients. Like other neo-Nazis, Wilson viewed the pandemic and increased unrest among the American public as an opportunity to popularize Nazi ideas, spark further chaos, and accelerate societal collapse.[1] This past week, Ashli Babbitt was shot and killed while storming the US Capitol as part of a right-wing uprising; several years earlier, she was an employee of the Calvert Cliffs nuclear plant, exhibiting violent behavior during this period. [2] Acts of violence by **far-right extremists** are on the rise in the United States. Until now, most of these incidents have lacked sophistication, but a critical question for national security experts is whether US far-right extremist groups that espouse violence can carry out something catastrophic. Every president serving in the last two decades has said that nuclear terrorism is a significant national security threat. Analysis of this threat has been, for good reason, mostly focused on foreign extremist groups, but recent events raise questions of whether there should be greater focus in the United States on far-right, domestic extremist threats. These extremists **represent a unique danger because of their prevalence in** federal institutions such as **the military and** the potential that they **might infiltrate nuclear facilities, where they could access sensitive information and nuclear materials.** The far-right extremist nuclear terrorism threat, which has some history, is amplified today by an ideology focused on accelerating the collapse of society and a documented interest in pursuing nuclear terrorism. Officials need to act decisively to better understand and mitigate this threat. Far-right narratives of nuclear terror. The intersection between violent far-right extremist ideology and catastrophic terrorism goes back decades. In The Turner Diaries, a 1978 novel labeled the "bible of the racist right," the protagonists use acts of nuclear terror in service of the creation of a "white world." Protagonists bomb nuclear installations, seize nuclear weapons, target missiles at New York City and Tel Aviv, and ultimately destroy the Pentagon in a suicidal nuclear attack.[3] The International Centre for Counterterrorism ties the Diaries to "at least 200 murders and at least 40 terrorist attacks/hate crimes" in the last 40 years.[4] This includes Timothy McVeigh's 1995 bombing of the Alfred P. Murrah Federal Building in Oklahoma City, resulting in the deaths of 168 people.[5] McVeigh, however, is not the only far-right terrorist to be inspired by the Diaries. In 2011, violent far-right extremist Anders Breivik's terror attacks killed 77 people in Norway. Dozens of pages in his 1,500-page "manifesto" discuss the execution of diffe**rent acts of nuclear terrorism.**[6] **An increasingly active generation of violent far-right extremist groups and actors have adopted an especially dangerous ideology that is compatible with an act of nuclear terror: accelerationism.**[7] Violent far-right extremists who adopt accelerationism view societal collapse as inevitable and seek to hasten that collapse in service of "total revolution"—the complete destruction of the existing system of governance.[8] Violent far-right extremists who adopt accelerationism hope to set off a series of violent chain events, with violence begetting more violence, destabilizing society.[9] **Indiscriminate, highly destructive acts of terror—like a nuclear attack—are therefore perfect tools to sow chaos and accelerate this societal collapse**. In Siege, one of the defining theoretical works of violent far-right accelerationism, author and accelerationist leader James Mason writes that, "[White supremacists] will be the single survivor in a war against the System, a TOTAL WAR against the System."[10] In a recent act of violent far-right extremist terrorism, Brenton Tarrant, the Australian perpetrator of the 2019 terrorist attack on Christchurch masjidain in New Zealand, wrote about accelerationism in his manifesto.[11] Groups with nuclear interests. Inspired by the ideas of accelerationism, the modern breed of violent far-right extremism is becoming more destructive, and nuclear weapons certainly fit into this profile of catastrophic violence. The intention to bring about a cataclysmic clash of civilizations bears resemblance to better known terrorist organizations like Al Qaeda and Aum Shinrikyo, both of which have pursued nuclear weapons. As director of intelligence and counterintelligence at the US Department of Energy, Rolf Mowatt-Larssen, once observed, "Osama bin Ladin has signaled a specific purpose for using WMD in al Qaeda's quest to destroy the global status quo, and to create conditions more conducive to the overthrow of apostate regimes throughout the Islamic world."[12] Like Al-Qaeda, violent far-right extremists support the creation of a new society that is in line with their own ideology. **One of the most notable and violent far-right extremist groups that have adopted accelerationism and operate in the United States is the Atomwaffen Division (AWD**).[13] **The organization's name translates from German to "the nuclear weapons division," indicating that its members have an explicit interest in nuclear terrorism.** Brandon Russel, a former Florida National Guard member and an AWD co-founder, is one case of an aspiring nuclear terrorist. A heavily armed Russel and a fellow AWD member were recently arrested while in route to the Turkey Point nuclear power plant. During the investigation officials found that Russel lived in an apartment with two AWD co-conspirators; in the apartment was a prominently placed copy of the Turner Diaries and a framed photo of Oklahoma City Bomber Timothy McVeigh. **The trio stockpiled weapons and explosives with the intent to blow up, among other targets, a nuclear power plant. In their apartment, police found pipe bomb components, traces of the explosive hexamethylene triperoxide diamine, and detonators. Police also detected two radioactive materials—thorium and americium—in his bedroom**.[14] **AWD was not the first far-right extremist in America to consider using radioactive or nuclear materials in a terrorist attack. Several previously documented attempts by violent far-right extremists to commit acts of radiological terror indicate a longstanding interest among far-right actors in highly destructive, non-conventional acts of terror**.[15] In 2004, National Socialist Movement member Demetrius Van Crocker attempted to build a dirty bomb to blow up a courthouse.[16] In 2008, James Cummings, a white supremacist, obtained four 1-gallon containers of a mix of depleted uranium and thorium-232. He planned to use these materials to assemble a dirty bomb.[17] In 2013, a member of the Ku Klux Klan who worked at General Electric carried out research on radiation dispersal devices, learning what level of emission was required to kill humans.[18] Could they really pull it off? While some violent far-right extremists are clearly motivated to carry out catastrophic terrorist attacks, a question remains: Do they possess the means and opportunity to conduct an act of nuclear terrorism? There is no public evidence violent far-right extremist groups have obtained the resources or exhibited the requisite operational sophistication to carry out an act of nuclear terrorism. Many of the plots involving far-right extremists and nuclear terrorism have been poorly conceived and were unlikely to succeed. These incidents, however, likely do not provide a complete picture of the threat, because **publicly accessible information on the capability of these groups is limited, creating ambiguity about their general capabilities.** Moreover, predicting the capability of specific terrorist groups has proven to be exceptionally difficult. In January 2014, for example, Director of National Intelligence James Clapper did not list the Islamic State as a terrorist threat in his testimony to the Senate Select Committee on Intelligence. Yet, within months, the Islamic State had seized major portions of Syria and Iraq and declared a global caliphate.[19] Intelligence on potential lone-wolf actors is even more difficult to gather. **The most concerning evidence that violent far-right extremists might have access to nuclear weapons or weapons-useable material lies in their presence in the US military and other parts of the federal government. The presence of white supremacists in the military is well-known and well-documented. A 2019 poll revealed that 36 percent of active-duty military troops had witnessed evidence of white supremacist ideology in the military.**[20] **In 2020 alone, there were several recent examples of active service members being arrested for plotting far-right extremist acts of terrorism. In January 2020, Coast Guard Lt. Christopher Hasson was sentenced to 13 years in prison for planning a "mass casualty attack" in support of white nationalism**.[21] **In February, former Master Sgt. Cory Reeves was discharged from the Air Force because of his ties to white supremacist organizations.**[22] **And in June 2020, Private Ethan Melzer, a neo-Nazi in the US Army, attempted to provide information about US troops abroad, "including whereabouts, movement and security details," to both white supremacist and jihadist groups. He gave this information with the intention of coordinating a suicidal, mass casualty "jihadi" attack on those troops.**[23] **There is also evidence of violent far-right extremism in other government institutions. For example, in May 2018, Matthew Gebert, a State Department employee working on Pakistani and Indian energy policy, led a double life.** He headed the Washington, D.C. chapter of the white supremacist group The Right Stuff, socialized with major white supremacist figures like Mike Peinovich and Richard Spencer, and secretly hosted a white nationalist podcast titled "The Fatherland."[24] In a May 2018 episode of "The Fatherland," Gebert announced, "We need a country founded for white people with a nuclear deterrent. And you watch how the world trembles." This pattern of insider threats raises key questions: How many violent far-right extremists are in the government? What materials or information do violent far-right extremists in government have access to? Are they sophisticated enough to steal nuclear material or sabotage a nuclear facility, or aid another actor on the outside? **To what extent have violent far-right extremists penetrated**

organizations like national laboratories or nuclear material production facilities, where they might be able to acquire highly-enriched uranium or plutonium—the building ~~blocks for constructing an improvised nuclear~~ device~~? The need to screen for far-right extremists. The US government needs to develop processes that ensure violent far-right extremists do not have access to nuclear weapons, weapons-useable nuclear materials, radiological material, or sensitive information about nuclear weapons or material~~

Subpoint A: Reactor Attacks. Nuclear facilities are vulnerable targets

Narasimha et al 7 [Roddam Narasimha, Arvind Kumar, Stephen P. Cohen, and Rita Guenther, Editors, 2007, "Science and Technology to Counter Terrorism: Proceedings of an Indo-U.S. Workshop", National Academies Press, https://nap.nationalacademies.org/catalog/11848/science-and-technology-to-counter-terrorism-proceedings-of-an-indo]

How many of the most dangerous targets are there? In the United States there are 103 operating power reactors at 65 sites. India has 14 power reactors at 6 sites, and 8 more reactors under construction. Worldwide there are 440 power reactors and 32 more under construction.35 Each reactor site has a spent-fuel storage pool containing typically several times as much long-lived radioactivity as a reactor. In addition, large civil fuel-reprocessing plants are in operation at La Hague (France), Sellafield (England), and Chelyabinsk region (Russia); similar but smaller commercial plants operate at Tokai-Mura (Japan) and Marcoule (France). How vulnerable are these targets? Reassuring statements from nuclear-industry groups and advocates are easy to find.36 However, the more balanced National Academy of Sciences study, Making the Nation Safer,37 and a range of other papers by unbiased analysts suggest that the picture is mixed. The prevalent view is that it would not be easy to attack a nuclear-energy facility in a manner that succeeds in releasing a large quantity of radioactivity. At the same time, experts agree that such an attack is not impossible and may not even be unlikely over the course of time unless additional protective measures are taken that can offset the likely increases in the capabilities of terrorists.38 What is the possibility of an attack on a nuclear reactor? Containment buildings at a few U.S. reactors located near airports were explicitly designed to survive the impact of a 707-class airliner moving at around 200 knots (representing speeds on approach to landing or shortly after take-off). The design-basis threat for containment buildings at all other nuclear reactors was not an external impact but an internal steam explosion. Despite this fact, the U.S. Nuclear Regulatory Commission (NRC), in retrospective analyses, determined that most containment buildings would be able to survive the impact of a 727-class jetliner traveling at 500 knots **It is less likely that U.S. reactor** containment**s would survive the impact of** a 767-class airliner traveling at 500 knots. Further, it is noteworthy that some reactor containments outside of the United States are less robust than those inside the country. The impact of **a light aircraft packed with high explosives** could be problematic for many containments both in the United States and abroad. Reactors are generally protected by extra shielding inside the containment, but it is difficult to determine whether this extra protection would prove sufficient against the kinds of attacks from the air that are now plausible. Safety-related systems outside of the main containment could also lead to significant releases if they are destroyed at the same time that the containment is damaged by an attack from the air. Sabotage by intruders armed with high explosives is another scenario. If the intruders were to possess detailed National Academies of Sciences, Engineering, and Medicine. 2007. Science and Technology to Counter Terrorism: Proceedings of an Indo-U.S. Workshop. Washington, DC: The National Academies Press. https://doi.org/10.17226/11848. knowledge of reactor systems, they could likely produce a core melt event and steam explosions capable of breaching the containment, even without benefit of an aircraft impact or light-plane-as-cruise-missile attack from the outside.39 Spent-fuel pools may be more vulnerable than the reactors with which they are associated. The spent fuel in such pools can catch fire if the water is removed. Such fires can be difficult to extinguish and could release large quantities of cesium-137 and other radionuclides. An analysis published in 2003 found that spent-fuel pools in the United States currently hold an average of 400 tons of spent fuel each, containing 35 megacuries (MCi) of cesium-137.40 A 1997 Brookhaven National Laboratory study concluded that a fire at such a spent-fuel pool could release between 10 and 100 percent of the cesium-137 inventory.41 Hence, in an average case, between 3.5 and 35 MCi would be released. This amount can be compared to the approximately 2 MCi of cesium-137 that was released in the Chernobyl accident. Fuel-reprocessing plants contain many reactors' worth of radioactivity but little stored energy. For these plants, large-aircraft impact is probably a bigger risk than sabotage from within. Dry-cask spent-fuel storage, spent-fuel shipping containers, and geologic radioactive-waste repositories are far less vulnerable than are reactors and fuel-reprocessing plants. Large radioactivity releases from attacks on these targets are very unlikely. National Academies of Sciences, Engineering, and Medicine. 2007. Science and Technology to Counter Terrorism: Proceedings of an Indo-U.S. Workshop. Washington, DC: The National Academies Press. https://doi.org/10.17226/11848. Of course, the consequences of a successful terrorist attack on any nuclear-energy facility depend not only on the quantity and kinds of radioactivity released, but also on wind direction, atmospheric-mixing conditions (which govern both vertical and horizontal spreading of the radioactive plume), the distribution of population in relation to the path of the plume, and the extent to which those in the plume's path can be evacuated before it reaches them. Unlike accidents, which occur at random, terrorists carefully choose the site of their attacks. Further, they might even succeed in choosing weather conditions that would maximize the impacts of an attack.42 The 1997 Brookhaven study estimated the consequences of a spent-fuel pool fire at a pressurized water reactor to be 54,000 to 143,000 extra cancer deaths; 2,000 to 7,000 square kilometers of agricultural land condemned; and economic costs of $117 to $556 billion from evacuation **Excessive "non-cited violations" by the Nuclear** Regulatory Committee (**NRC**) **constitute a** second **sign of complacency and vulnerability.** Non-cited violations entail no penalty and no follow-up. Most of the security shortcomings that are identified in routine NRC inspections are classified as non-cited violations on the grounds "that the problems had no direct immediate adverse consequences at the time they were discovered." This appears to mean that no terrorists were attacking the plant while it was being inspected. This may seem to be a harsh judgment, but the 2003 GAO study reported that in 2000 and 2001, the NRC issued no cited violations and 72 non-cited ones. The non-cited violations included the following instances documented by NRC inspectors. A security guard slept on duty for more than half an hour. The incident was treated as a non-cited violation because no attack had occurred during this period and because neither he nor any other guard at the plant had been found sleeping more than twice during the previous year. A security officer falsified logs to show that he had checked vital area doors and locks when he was actually in another part of the plant. In this case the officer was solely responsible for the security of the particular area because a security upgrade project was under way that had disabled or diverted all the other security for the area. Guards failed to physically search individuals for metal objects after the walk-through detectors and hand scanners indicated that something was present. These **individuals were** then **allowed unescorted access through** the plant's **protected area**. This was treated as a non-cited violation because a similar breach had been observed fewer than two times at that plant in the preceding year. Moreover, the NRC does not systematically collect, analyze, and disseminate 43 General Accounting Office. 2003. Nuclear Regulatory Commission Oversight of Security at Commercial Nuclear Power Plants Needs to Be Strengthened. GAO-03-752. Washington D.C. Page 67 Suggested Citation:"7 Threats to Civil Nuclear-energy Facilities." National Academy of Sciences. 2007. Science and Technology to Counter Terrorism: Proceedings of an Indo-U.S. Workshop. Washington, DC: The National Academies Press. doi: 10.17226/11848.× Save Cancel information relevant to improving plant security. The 2003 GAO report on the security of U.S. nuclear-reactor sites found that the NRC does not have a routine, centralized process for collecting, analyzing, and disseminating security inspections to identify problems that may be common to other plants or to identify lessons learned in resolving a security problem that may be helpful to plants in other regions. NRC headquarters receives inspection reports only when a licensee challenges the findings from security inspections. NRC headquarter officials do not routinely obtain copies of all security inspection reports because headquarters files and computer databases are insufficient to hold all inspection reports.44 National Academies of Sciences, Engineering, and Medicine. 2007. Science and Technology to Counter Terrorism: Proceedings of an Indo-U.S. Workshop. Washington, DC: The National Academies Press. https://doi.org/10.17226/11848. Another sign of complacency and vulnerability is that, in the United States, state laws often constrain the types of weapons that can be used by guard forces, virtually ensuring that they will be less well armed than their attackers. Specifically, state law often forbids the use of automatic weapons by nonfederal guard forces at nuclear power plants. Since attackers will probably be armed with automatic weapons, this asymmetry in weaponry hurts the prospects for the successful defense of nuclear power plants. The existing laws of several states call into question the legality of the use of deadly force to protect private property. Many of the guards at these installations have expressed concern in interviews that were they to use deadly force against intruders, they might be subjected to legal action or punishment. The NRC has recommended that state legislatures and the U.S. Congress pass legislation to remedy this situation, but this has not yet occurred. Many prominent members of the nuclear energy profession appear to be underestimating the terrorism problem, especially in statements prepared for policy makers and the general public. Claims such as, “nuclear power plants are the best protected industrial facilities in the United States” and “attacks on nuclear reactors cannot cause significant harm to the public” are common. The first claim is misleading because, although it might be accurate, it says nothing about whether or not the degree of protection is adequate relative to the threat. The second claim is wrong: the harm that could result from successful attacks on nuclear reactors has been established by many independent studies. Nor is the threat purely hypothetical: actual threats against, or attacks upon, nuclear power reactors have already been reported in Argentina, Lithuania, Russia, South Africa, South Korea, and western Europe.

History proves

Denton 87 [J Denton, 1987, "International Terrorism - The Nuclear Dimension", Ncjrs Virtual Library, https://www.ojp.gov/ncjrs/virtual-library/abstracts/international-terrorism-nuclear-dimension-0

There are already warning signs that the threat of nuclear terrorism must be addressed. Between 1966 and 1977, 10 terrorist attacks were conducted against European nuclear installations. In 1979, environmental terrorists inflicted heavy damage to a French nuclear plant, and in 1982, five rockets were fired into the French Creys-Malville nuclear facility. **Between 1969 and 1975, there were 14** actual and attempted **bombings of U.S. nuclear facilities and 240 bomb threats**. While being held by the Italian Red Brigades, General Dozier was interrogated about NATO and U.S. nuclear weapon locations, and members of Germany's Red Army Faction have been apprehended with maps and drawings of nuclear storage sites and security patrol routes. The efforts of Libya, a supporter of terrorism, to obtain nuclear weapons have been documented. Although the United States has effective domestic protection of weapons, reactors, enrichment facilities, and reprocessing facilities, security for transporting and storing nuclear waste materials must be upgraded. The Anti-Nuclear Terrorism Act has been introduced in the 99th Congress to enhance the screening of nuclear power plant employees who have unescorted access to the facilities. It would be helpful to have legislation or an executive order clearly delineating jurisdiction in the case of a domestic nuclear terrorist threat

Meltdown.

Hodges 19 [Dave Hodges—Editor and Host of The Common Sense Show, internally citing Judy Haar, a recognized expert in nuclear plant failure analyses AND a source at the Palo Verde Nuclear power plant, 12/3/2019, “How the Coming Cascadia Subduction Zone Event Will Produce An Extinction Level Event (Part One)”, The Common Sense Show, https://thecommonsenseshow.com/activism-agenda-21-conspiracy/how-coming-cascadia-subduction-zone-event-will-produce-extinction-level-event-part-one]

A more detailed analysis reveals that the spent fuel pools carry depleted fuel for the reactor. Normally, this spent fuel has had time to considerably decay and therefore, reducing radioactivity and heat. However, the newer discharged fuel still produces heat and needs cooling. Housed in high density storage racks, contained in buildings that vent directly into the atmosphere, radiation containment is not accounted for with regard to the spent fuel racks. In other words, there is no capture mechanism. In this scenario, accompanied by a lengthy electrical outage, and with the emergency power waning due to either generator failure or a lack of diesel needed to power the generators, the **plant could lose the ability to provide cooling. The water will subsequently heat up, boil away and uncover the spent fuel rods** which required being covered in at least 25 feet of water to remain benign from any deleterious effects. Ultimately, **this would lead to fires as well and the release of radioactivity into the atmosphere. This would be the beginning of another Fukushima event** right here on American soil. Both my source and Haar shared exactly the same scenario about how a meltdown would occur. Subsequently, I spoke with Roger Landry who worked for Raytheon in various Department of Defense projects for 28 years, many of them in this arena and Roger also confirmed this information and that the above information is well known in the industry. Now that the danger is exposed, let's ask the earthquake question. When the Canadian Subduction Zone goes critical, this will cause a loss of power. Will the power be restored in 7-30 days, which is the time that all nuclear power plants are designed to be offline and still meet the cooling of the fuel rods question? The answer is frightening. If power is not restored, and that is assuming the structure of the plant is still intact following the earthquake, the authorities would have 1-4 weeks to restore power, at most. In conclusion, we must face the possibility that when we mix in nuclear power plants with the Cascadian Subduction Zone event, **we are facing an extinction level event**.

Subpoint B: Prolif

Pashby 25 Tom Pashby: contributor for the New Civil Engineer. 1/10/25, "US Government assessing risk of SMRs being used to make dirty bombs", New Civil Engineer, https://www.newcivilengineer.com/latest/us-government-assessing-risk-of-smrs-being-used-to-make-dirty-bombs-10-01-2025/ // DOA: 3/13/25)JDE

The risk of small modular reactors (SMRs) being used to provide access to materials for dirty bombs (radioactive explosive devices) is being reviewed by the US Government. The review follows the publication of a paper published in the Science journal looking at the increase in demand for high-assay low-**enriched uranium** (HALEU) which **can be used to fuel** advanced modular reactors (AMRs) and **SMRs.** The paper, titled The weapons potential of high-assay low-enriched uranium posited that "Recent promotion of new reactor technologies appears to disregard decades-old concerns about nuclear proliferation". Scott Kemp , Edwin S. Lyman, Mark R. Deinert, Richard L. Garwin, and Frank N. von Hippel authored the paper, which said: "Preventing the proliferation of nuclear weapons has been a major thrust of international policymaking for more than 70 years. "Now, an explosion of **interest in a nuclear reactor** fuel called high-assay low-enriched uranium (HALEU),**spurred by** billions of dollars in **US Government funding,** threatens to undermine that system of control. "HALEU contains between 10 and 20% of the isotope uranium-235. At 20% 235U and above, the isotopic mixture is called highly enriched uranium (HEU) and is internationally recognised as being directly usable in nuclear weapons. "However, the practical limit for weapons lies below the 20% HALEU-HEU threshold. "Governments and others promoting the use of HALEU have not carefully considered the potential proliferation and terrorism risksthat the wide adoption of this fuel creates." The "terrorism risks" the paper refers to **can be understood to mean the creation of** dirty **bombs**, which are relatively low-tech devices. Conventional explosives are used, rather than fission or fusion reactions, to spread radioactive material. US Government responds to paper announcing review U.S. Department of Energy under secretary for nuclear security and National Nuclear Security Administration (NNSA) administrator Jill Hruby wrote a letter published on 2 January in the peer review 'eLetters' section of the academic paper published on 6 June 2024. Hruby said the paper in Science, and a subsequent debate between the authors the wider nuclear community, promoted the NNSA to respond. "Given concerns about climate change coupled with increased energy demand, nuclear energy is poised for growth," she said. "Advanced and small modular reactors (A/SMRs) using HALEU fuel are under active development "NNSA recognises that reactor type, fuel enrichment level, fuel quantity, and fuel form are important factors in evaluating proliferation risks and believes that risk-informed and adaptive approaches to the proliferation challenges inherent in nuclear energy are warranted." She continued: "NNSA has a program to support U.S. A/SMR developers on security- and safeguards-by-design and promotes best practices for nuclear energy deployment by partnering with the International Atomic Energy Agency (IAEA). "With its national laboratories, NNSA has regularly collected data and evaluated HALEU risks, and is currently finalising plans to commission a National Academies report. Although these reports are largely classified, the information is used to inform programs, develop actions, and make recommendations to stakeholders. "It is important to address proliferation concerns about HALEU and important to responsibly develop A/SMRs. NNSA commits to working with academia, industry, the public, and IAEA to do just that." On 20 January 2025, President Trump will be sworn in for a second term, at which point he will be free to replace public servants with his preferred appointees at organisations including the NNSA. HALEU not being considered in the UK's SMR competition The main focus of SMR developers in the UK is the UK Government's Great British Nuclear (GBN) SMR competition. The competition winner or winners will have the opportunity to build a fleet of SMRs with government support on siting and funding. A GBN source confirmed to NCE that none of the developers in its SMR competition – name the developers – were proposing to use HALEU. NCE has previously explored the topic of whether waste from SMRs could be used to make nuclear warheads after the

Department for Energy Security and Net Zero (DESNZ) did not rule out whether it was investigating this possibility. HALEU still popular in wider SMR research Work on SMRs outside of the GBN competition continues to heat up. Last Energy UK and newcleo are both active in the UK and are pushing for micro modular reactors and advanced modular reactors respectively. King's College London research fellow Ross Peel told NCE that HALEU continues to be popular with SMR developers and the risks faced outside of the USA are similar. Peel has recently authored papers with King's on Insider Threat Security Considerations for Advanced and Small Modular Reactors and Nuclear Industry Views on the Security of Small Modular Reactors: Results of a pilot survey, both published in October 2024. Peel said he has been "very pro-nuclear" for years but is working to help the industry to address his security concerns around SMRs, which he believes is "not where it should be". Peel said: "The article in Science caused a major argument when it came out and since, and is still doing so as more people become aware of it. The American Nuclear Society, for instance, prepared a letter to Science denouncing the article and tearing down the methods used by the authors, who are all highly respected non-proliferation scholars. "HALEU is central to the plans of many developers of novel nuclear technology because of the various benefits it offers. The potential security and proliferation risks are real, however, and proper consideration needs to be given to these. "The technical risks of HALEU in the UK and US are not different, although we do have a different background level of security risk than they do, which means that those technical risks might be experienced and managed in a different way. "Both countries have well-developed nuclear security infrastructure, however, which will help to manage these risks. A lot of concern from both countries will likely be around the export of HALEU fuel to reactors abroad, in foreign countries with less mature nuclear security and non-proliferation systems. "Normalising the possession and use of uranium of up to 20% U-235 means that many states who might concern the US and/or the UK will be able to maintain a justifiable position that is that much closer to possessing nuclear weapons, whilst **non-state actors**(terrorists, criminals, and even simple disgruntled employees at nuclear sites and more) **will** potentially **see their way to accessing a type of nuclear material that they could previously almost never imagine getting hold of.** "Developers should be taking seriously the increased security and proliferation risks associated with HALEU use. I would recommend this be considered from the earliest stages of reactor and fuel design – the decision to use HALEU must be based on a full consideration of all factors, including security risk and proliferation risk. "Technology designers who think about these issues throughout their design process, in an integrated way alongside safety, economics, operability and all the rest, will have the greatest chance of producing well-conceived designs that address risks effectively and produce cost-effective nuclear energy." Mixed oxide (MOX) fuel is touted by some developers like newcleo as a way of reducing the burden on society of nuclear waste by using it to fuel its own AMR design. newcleo said: "Through an innovative combination of existing and proven technologies, and by reviving a nuclear industry model based on the manufacture and multi-recycling of Mixed Oxide (Mox) fuel, newcleo aims to close the nuclear fuel cycle while safely producing clean, affordable, and practically inexhaustible energy required for low carbon economies." Peel continued: "MOX is different to HALEU. MOX is about using a mixture of uranium oxide and plutonium oxide to make the fuel (usually – other oxides can creep in too). Almost all nuclear fuel today is uranium oxide. "HALEU is to do specifically with the uranium within the uranium oxide, specifically, how much of it is uranium-235 vs uranium-238. Most reactors today operate with 2-5% uranium-235 within the overall uranium. HALEU is about moving that into a range of up to 19.999% - going to 20% would make it HEU (highly enriched uranium, which is considered to be unacceptable due to weapons-use risks). "So in theory, you could put HALEU into MOX, although no-one has proposed this as the whole point of putting plutonium in there is to replace the need for uranium-235. If you have both plutonium and HALEU in the same fuel you're effectively doing two complicated and costly processes a bit, rather than focussing on doing one process more." Anti-proliferation body says lots of **SMRs increases weapons risk** The Nuclear Information Service (NIS) describes itself as "an independent, not-for-profit research organisation" which investigates the UK's nuclear weapons programme. NIS director David Cullen said: "This move by the NNSA is a tacit acknowledgement that warnings being raised about the proliferation risks of HALEU are not unfounded. "I hope that some of the results of their study will be made public so that there is a greater understanding of the dangers, which are just as relevant to the UK as to the US. "We don't know very much about what would be done in the UK to mitigate the risk, as none of the SMR reactor designs have progressed very far in getting regulatory approval. "Only the Rolls-Royce SMR has passed the second stage of the Generic Design Assessment (GDA) process, which means that the Office for Nuclear Regulation have not identified any foundational problems with that design." GDA allows regulators to assess the safety, security, safeguards and environmental aspects of new reactor designs before site-specific proposals are brought forward. The GDA process assesses new nuclear power plant designs for deployment in the UK, demonstrating they can be built, operated and decommissioned in accordance with the highest standards of safety, security, safeguards and environmental protection. Cullen continued: "The second stage does assess security and safeguards (i.e. measures to prevent clandestine diversion of nuclear material), but only to identify fundamental flaws. "The third stage of the process is much more detailed. I hope the ONR will have an opportunity to draw upon the work the NNSA is undertaking. "Unfortunately, the industry's vision for SMRs, where a much larger number of smaller reactors are deployed, substantially complicates both counter-proliferation monitoring and ensuring the security of nuclear material. "**Design measures** might be able to counter some of the more opportunistic security threats against an individual site, but they **cannot meaningfully guard against the diversion of nuclear material by SMR operators.** "Fundamentally, **a greater number of sites and more material creates more opportunities for bad actors**. There is no way to design around this basic fact."

This is the missing piece for extremists

NAE 19 (The National Academy of Engineering (NAE) is an American nonprofit, non-governmental organization. It is part of the National Academies of Sciences, Engineering, and Medicine (NASEM), along with the National Academy of Sciences (NAS) and the National Academy of Medicine (NAM), September 16, 2019, National Academy of Engineering , "Prevent Nuclear Terror",https://www.engineeringchallenges.org/challenges/nuclear.aspx, DOA 3/10/25) KC Long before 2001, defenders of national security worried about the possible immediate death of 300,000 people and the loss of thousands of square miles of land to productive use through an act of terror. From the beginnings of the nuclear age, the materials suitable for making a weapon have been accumulating around the world. Even some actual bombs may not be adequately secure against theft or sale in certain countries.Nuclear reactors for research or power are scattered about the globe, capable of producing the raw material for nuclear devices. And the instructions for building explosive devices from such materials have been widely published, suggesting that access to the ingredients would make a bomb a realistic possibility. "It should not be assumed," write physicists Richard Garwin and Georges Charpak, "that terrorists or other groups wishing to make nuclear weapons cannot read." Consequently, the main obstacle to a terrorist planning a nuclear nightmare would be acquiring fissile material — plutonium or highly enriched uranium capable of rapid nuclear fission. Nearly 2 million kilograms of each have already been produced and exist in the world today. It takes less than ten kilograms of plutonium, or a few tens of kilograms of highly enriched uranium, to build a bomb. Fission, or the splitting of an atom's nucleus, was discovered originally in uranium. For a bomb, you need a highly enriched mass of uranium typically consisting of 90 percent uranium-235, a form found at levels of less than 1 percent in uranium ore. Fuel for nuclear power reactors is only enriched 3 percent to 5 percent with respect to this trace form of uranium, and so is no good for explosions. **Highly enriched bomb-grade uranium** is, however, **produced for** some **reactors** (such as those used to power nuclear submarines and for some research reactors) and **might be diverted to terrorists.**

Terrorists can build nuclear weapons if they get materials - numerous studies INCLUDING the Department of Defense prove

Nuclear Threat Initiative 25 ["Nuclear Terrorism", 2025, Nuclear Threat Initiative, https://tutorials.nti.org/nuclear-and-radiological-security/terrorism-nuclear/]

In 2007, the U.S. Air Force inadvertently flew six nuclear weapons across the United States to an air base in Louisiana that was unaware it had received them. [xx] The weapons sat on the runway for nearly 10 hours before being noticed, and without the appropriate security protocols in place [xxi] In 2010, a group of peace activists infiltrated a military base in Belgium housing 10-20 U.S. nuclear weapons and walked around undetected for over an hour [xxi] How difficult would it be for terrorists to acquire weapons-usable nuclear material? In an effort to construct an Improvised Nuclear Device (IND), **the most difficult challenge for terrorists would be acquiring the necessary** quality and quantity of weapons-usable, (i.e., fissile) **material**. A terrorist group is highly unlikely to produce its own fissile material, whether by **enriching uranium** or producing plutonium in a reactor and separating it from spent fuel. These tasks **require technically complex** and expensive **processes**, are difficult to accomplish clandestinely, and are likely beyond the capabilities of a terrorist organization Obtaining fissile material through purchase or theft are the most realistic options for terrorists Seizures of stolen HEU and plutonium indicate terrorists may be able to purchase fissile material on the black market Security breaches at both civilian and non-civilian fissile material sites demonstrate that some stocks may remain vulnerable to theft In 2007, two armed teams attacked the Pelindaba nuclear facility in South Africa, which stores hundreds of kilograms of weapons-grade HEU. One team penetrated an electrified security fence, disabled intrusion detectors without setting off an alarm, shot an employee in the emergency control room, spent 45 minutes inside the facility before being engaged by on-site security forces, and escaped through its original point of entry. [xxiii] While the intruders never infiltrated the HEU storage room, the incident highlighted "substantial weaknesses in the site's detection, assessment, and response arrangements" [xxiv] In 2012, an elderly nun and two peace activists broke into a high-security U.S. nuclear weapon materials site using bolt cutters to break through the perimeter fence and three interior perimeter fences without setting off alarms. [xxv] While the activists lacked malicious intent and did not infiltrate any of the buildings housing nuclear material, a government review of the incident found "troubling displays of ineptitude in responding to alarms, failures to maintain critical security equipment, overreliance on compensatory measures, misunderstanding of security protocols, poor communications, and weaknesses in contract and resource management" [xxvi] If they acquired fissile material, could terrorists construct a nuclear device? Yes. **Numerous studies have determined that a sophisticated terrorist organization with fissile material in hand could accomplish the technical and engineering tasks associated with building a crude nuclear weapon. The [U.S.] Intelligence Community assessed that fabrication of at least a 'crude' nuclear device was within al-Qa'ida's capabilities, if it could obtain fissle material. —Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction A small group of people, none of whom have ever had access to the classified literature, could possibly design and build a crude nuclear explosive device...Only modest machine-shop facilities that could be contracted for without arousing suspicion would be required. —U.S. Office of Technology Assessment (1977) We know that acquiring a weapon or the nuclear-explosive material to make one is the hardest step for terrorists to take and the easiest step for us to stop. By contrast, every subsequent step in the process-building the bomb, transporting it, and detonating it-is easier for the terrorists to take and harder for us to stop. —Sam Nunn, NTI Co-Chairman and Chief Executive Officer If fissile material is available, subnational or terrorist groups can likely produce an 'improvised nuclear explosive device' which will detonate with a significant nuclear yield. —U.S. Department of Defense (1998) Those who say that building a nuclear**

weapon is easy, they are wrong, but those who say that building a crude device is very difficult are even more wrong . —Harold Agnew, former director of Los Alamos National Laboratory.

Even one attack escalates---turns every impact.

Buis 18 [Irma Arguello and Emiliano J. Buis, * founder and chair of the NPSGlobal Foundation, and head of the secretariat of the Latin American and Caribbean Leadership Network. She holds a degree in physics, a Master's in business administration, and completed graduate studies in defense and security, ** lawyer specializing in international law. He holds a PhD from the University of Buenos Aires (UBA), a Master's in Human and Social Sciences from the University of Paris/Panthéon-Sorbonne, and a postgraduate diploma in national defense from the National Defense School, "The global impacts of a terrorist nuclear attack: What would happen? What should we do?," 2018, *Bulletin of the Atomic Scientists*, Vol. 74, Issue 2, pp. 114-119, https://doi.org/10.1080/00963402.2018.1436812, Recut EA]

The consequences of **a terrorist nuclear attack** .A small and primitive 1-kiloton fission bomb (with a yield of about one-fifteenth of the one dropped on Hiroshima, and certainly much less sophisticated; cf. Figure 1), detonated in any large capital city of the developed world, **would cause** an **unprecedented catastrophi**c scenario. [FIGURE 1 OMITTED] An estimate of direct effects in the attack's location includes a death toll of 7,300-to-23,000 people and 12,600-to-57,000 people injured, depending on the target's geography and population density. Total physical destruction of the city's infrastructure, due to the blast (shock wave) and thermal radiation, would cover a radius of about 500 meters from the point of detonation (also known as ground zero), while ionizing radiation greater than 5 Sieverts – compatible with the deadly acute radiation syndrome – would expand within an 850-meter radius. From the environmental point of view, such an area would be unusable for years. In addition, radioactive fallout would expand in an area of about 300 square kilometers, depending on meteorological conditions (cf. Figure 2). [FIGURE 2 OMITTED] But the **consequences** would **go** far beyond the effects in the target country, however, and **promptly** propagate **worldwid**e. Global and national security, economy and finance, international governance and its framework, national political systems, and the behavior of governments and individuals would all be put under severe trial. The severity of the effects at a national level, however, would depend on the countries' level of development, geopolitical location, and resilience. Global security and regional/national defense schemes would be strongly affected. An increase in **global distrust** would **spark** rising **tensions** among countries **and** blocs, that could even lead to the brink of **nuclear** weapons **use** by states (if, for instance, a sponsor country is identified). The consequences of such a shocking scenario would include a **decrease** in states' **self-control**, an **escalat**ion of **present conflicts** and the emergence of new ones, accompanied by an increase in military unilateralism and military expenditures. Regarding the economic and financial impacts, a severe global economic depression would rise from the attack, likely lasting for years. Its duration would be strongly dependent on the course of the crisis. The main results of such a crisis would include a 2 percent fall of growth in global Gross Domestic Product, and a 4 percent decline of international trade in the two years following the attack (cf. Figure 3). In the case of developing and less-developed countries, the economic impacts would also include a shortage of high-technology products such as medicines, as well as a fall in foreign direct investment and a severe decline of international humanitarian aid toward low-income countries. We expect an increase of unemployment and poverty in all countries. Global poverty would raise about 4 percent after the attack, which implies that at least 30 million more people would be living in extreme poverty, in addition to the current estimated 767 million. [FIGURE 3 OMITTED] In the area of international relations, we would expect a breakdown of key doctrines involving politics, security, and relations among states. These international tensions could lead to a collapse of the nuclear order as we know it today, with a consequent setback of nuclear disarmament and nonproliferation commitments. In other words, the whole system based on the Nuclear Non- Proliferation Treaty would be put under severe trial. After the attack, there would be a reassessment of existing security doctrines, and a deep review of concepts such as nuclear deterrence, no-first-use, proportionality, and negative security assurances. Finally, the behavior of governments and individuals would also change radically. Internal chaos fueled by the media and social networks would threaten governance at all levels, with greater impact on those countries with weak institutional frameworks. Social turbulence would emerge in most countries, with consequent attempts by governments to impose restrictions on personal freedoms to preserve order – possibly by declaring a state of siege or state of emergency – and legislation would surely become tougher on human rights. There would also be a significant increase in social fragmentation – with a deepening of antagonistic views, mistrust, and intolerance, both within countries and towards others – and a resurgence of large-scale social movements fostered by ideological interests and easily mobilized through social media. Prevention, preparedness, response Given the severity of the impacts, no country in possession of nuclear weapons or weapons-usable materials can guarantee its full protection against nuclear terrorism or nuclear smuggling for proliferation purposes. Nor is it realistic to conceive of full compensation to others in the international community, if a catastrophic event happens because of any country's acts or omissions. Therefore, we consider that prevention is the only acceptable way forward to preserve global stability.

Nuclear war causes extinction

Starr 14 (Steven Starr: Director, Clinical Laboratory Science Program at the U of Missouri. Senior scientist for Physicians for Social Responsibility. 5/30/14, "The Lethality of Nuclear Weapons: Nuclear War has No Winner", Centre for Research on Globalization, http://www.globalresearch.ca/the-lethality-of-nuclear-weapons-nuclear-war-has-no-winner/5385611 // DOA: 4/1/21)JDE

Paul Craig Roberts held top security clearances. He has repeatedly warned that a US-Russian nuclear war would wipe out the human race, along with all other complex forms of life. As a scientist with expert knowledge, I wish to echo and explain his warning.//// **Nuclear war has no winner**. Beginning in 2006, several of the world's leading climatologists (at Rutgers, UCLA, John Hopkins University, and the University of Colorado-Boulder) published a series of studies that evaluated the long-term environmental consequences of a nuclear war, including baseline scenarios fought with merely 1% of the explosive power in the US and/or Russian launch-ready nuclear arsenals. They concluded that **the consequences of even a "small" nuclear war would include catastrophic disruptions of global climate**[i] **and massive destruction of Earth's protective ozone layer**[ii]. These and more recent studies predict that **global agriculture would be so negatively affected by such a war, a global famine would result, which would cause up to 2 billion people to starve to death**. [iii]//// These peer-reviewed studies – which were analyzed by the best scientists in the world and found to be without error – also predict that **a war fought with less than half of US or Russian strategic nuclear weapons would destroy the human race**.[iv] In other words, a US-**Russian nuclear war would create such extreme long-term damage to the global environment that it would leave the Earth uninhabitable for humans and most animal forms of life**.//// A recent article in the Bulletin of the Atomic Scientists, "Self-assured destruction: The climate impacts of nuclear war",[v] begins by stating://// "A nuclear war between Russia and the United States, even after the arsenal reductions planned under New START, could produce a nuclear winter. Hence, **an attack by either side could**

be suicidal, resulting in self-assured destruction." In 2009, I wrote an article[vi] for the International Commission on Nuclear Non-proliferation and Disarmament that summarizes the findings of these studies. It explains that **nuclear firestorms would produce millions of tons of smoke, which would rise above cloud level and form a global stratospheric smoke layer that would rapidly encircle the Earth. The smoke layer would remain for at least a decade, and it would act to destroy the protective ozone layer** (vastly increasing the UV-B reaching Earth[vii]) as well as block warming sunlight, thus creating Ice Age weather conditions that would last 10 years or longer.//// Following a US-Russian nuclear war, **temperatures in the central US and Eurasia would fall below freezing every day for one to three years; the intense cold would completely eliminate growing seasons for a decade or longer. No crops could be grown, leading to a famine that would kill most humans and large animal populations.//// Electromagnetic pulse from high-altitude nuclear detonations would destroy the integrated circuits in all modern electronic devices**[viii], including **those in commercial nuclear power plants. Every nuclear reactor would almost instantly meltdown; every nuclear spent fuel pool** (which contain many times more radioactivity than found in the reactors) **would boil-off, releasing vast amounts of long-lived radioactivity. The fallout would make most of the US and Europe uninhabitable. Of course, the survivors of the nuclear war would be starving to death anyway**.////

Overall, safeguards fail and reactors get exported.

UCS 21 (*Union of Concerned Scientists, nonprofit science advocacy organization, No date listed, 3-14-2021 from Internet Archive, "'Advanced' Isn't Always Better: Assessing the Safety, Security, and Environmental Impacts of Non-Light Water Nuclear Reactors," https://www.ucsusa.org/sites/default/files/2021-05/ucs-es-AR-3.21-web_May%20rev.pdf)

Nuclear **prolif**eration and **nuc**lear **terror**ism risk is the danger that nations or terrorist groups could **illicitly obtain** nuclear-weapon-usable materials from **reactors** or **fuel cycle facilities. LWRs** operating on a once-through fuel cycle present relatively **low** proliferation and terrorism **risks.** However, any nuclear fuel cycle that utilizes **reprocessing** and **recycling** of spent fuel poses **significantly greater** nuclear **prolif**eration and **terror**ism **risks** than do **LWRs without reprocessing**, because it provides **far greater opportunities** for **diversion or theft** of plutonium and other nuclear-weaponusable materials. International **safeguards** and **security** measures for reactors and fuel cycles with reprocessing are **costly and cumbersome**, and they cannot fully compensate for the **increased vulnerability** resulting from **separating** weapon-usable **materials.** Also **using HALEU** instead of less-enriched forms of LEU **would increase prolif**eration **and terror**ism **risks**, although to a far lesser extent than using plutonium or uranium-233. Nuclear proliferation is **not a risk** in the United States simply because it already possesses nuclear weapons and is designated as a nuclear-weapon state under the Nuclear Non-Proliferation Treaty. As such, it is not obligated to submit its nuclear facilities and materials for **verification** by the International Atomic Energy Agency (IAEA), although it can do so voluntarily. However, US reactor development does have implications for proliferation, both because **US vendors** seek to **export new reactors** to other countries and because **other countries are likely to emulate the US** program. The United States has the responsibility to set a **good** international **example** by ensuring its own nuclear enterprise meets the **highest** nonproliferation **standards.**4

C3 is Tradeoff

Clean energy is <u>rapidly advancing</u> and <u>solves</u> energy needs by <u>2035</u> – Trump is <u>toothless</u>

Beinhocker 25 Eric Beinhocker, 2-28-2025, "The Clean Energy Revolution Is Unstoppable", [Eric Beinhocker is a Professor of Public Policy Practice at the Blavatnik School of Government, University of Oxford. He is also the founder and Executive Director of the Institute for New Economic Thinking at the University's Oxford Martin School. INET Oxford is an interdisciplinary research center dedicated to the goals of creating a more inclusive, just, sustainable, and prosperous economy. Beinhocker is also a Supernumerary Fellow in Economics at Oriel College and an External Professor at the Santa Fe Institute.], https://www.wsj.com/business/energy-oil/thecleanenergyrevolution-is-unstoppable-88af7ed5, DOA 3-25-2025 //Wenzhuo recut //cy

<u>Since</u> Donald <u>Trump's</u> election, <u>clean energy stocks have plummeted</u>, major banks have pulled out of a U.N.-sponsored "net zero" climate alliance, and BP announced it is spinning off its offshore wind business to refocus on oil and gas. Markets and companies seem to be betting that Trump's promises to stop or reverse the clean energy transition and "drill, baby, drill" will be successful. <u>But this bet is wrong</u>. The <u>clean energy **revolution** is being driven by fundamental technological and economic forces that are too strong to stop. Trump's policies can **marginally slow progress** in the U.S. and harm the competitiveness of American companies</u>, but they <u>cannot halt the fundamental dynamics of technological change or save a fossil fuel industry **that will** inevitably **shrink**</u> dramatically in the next two decades. Our research shows that once new technologies become established their patterns in terms of cost are surprisingly predictable. They generally follow one of three patterns. The first is a pattern where <u>costs are volatile over days, months and years but relatively flat over longer time frames</u>. It applies to resources extracted from the earth, like minerals and fossil fuels. The price of oil, for instance, fluctuates in response to economic and political events such as recessions, OPEC actions or Russia's invasion of Ukraine. But coal, oil and natural gas cost roughly the same today as they did a century ago, adjusted for inflation. One reason is that even though the technology for extracting fossil fuels improves over time, the resources get harder and harder to extract as the quality of deposits declines. here is a second group of technologies whose costs are also largely flat over time. For example, <u>hydropower, whose technology can't be mass produced because each dam is different, now costs about the same as it did 50 years ago.</u> Nuclear power costs have also been relatively flat globally since its first commercial use in 1956, although in the <u>U.S. nuclear costs have increased by about a factor of three. T</u>he reasons for U.S. cost increases include a lack of standardized designs, growing construction costs, increased regulatory burdens, supply-chain constraints and worker shortages. A third group of technologies experience predictable <u>long-term declines in cost and increases in performance</u>. Computer processors are the classic example. In 1965, Gordon Moore, then the head of Intel, noticed that the density of electrical components in integrated circuits was growing at a rate of about 40% a year. He predicted this trend would continue, and Moore's Law has held true for 60 years, enabling companies and investors to accurately forecast the cost and speed of computers many decades ahead. <u>Clean energy technologies such as **solar, wind and batteries** all follow this pattern</u> but at different rates. Since 1990, the cost of <u>wind power has dropped by about 4</u>% a year, <u>solar energy by 12%</u> a year and lithium-ion <u>batteries by about 12%</u> a year. Like semiconductors, each of these technologies can be mass produced. They also benefit from advances and economies of scale in related sectors: solar photovoltaic systems from semiconductor manufacturing, wind from aerospace and batteries from consumer electronics. <u>Solar energy is **10,000 times cheaper**</u> today than when it was first used in the U.S.'s

Vanguard satellite in 1958. Using a measure of cost that accounts for reliability and flexibility on the grid, the International Energy Agency (IEA) calculates that electricity from solar power with battery storage is less expensive today than electricity from new coal-fired plants in India and new gas-fired plants in the U.S. We project that by 2050 solar energy will **cost a tenth** of what it does today, making it far cheaper than any other source of energy. At the same time, barriers to large-scale clean energy use **keep tumbling**, thanks to advances in energy storage and better grid and demand management. And **innovations** are enabling the electrification of industrial processes with enormous efficiency gains. The falling price of clean energy has **accelerated** its adoption. The growth of new technologies, from railroads to mobile phones, follows what is called an S-curve. When a technology is new, it grows exponentially, but its share is tiny, so in absolute terms its growth looks almost flat. As exponential growth continues, however, its share suddenly becomes large, making its absolute growth large too, until the market eventually becomes saturated and growth starts to flatten. The result is an S-shaped adoption curve. The energy provided by solar has been growing by about 30% a year for several decades. In theory, if this rate continues for just one more decade, solar power with battery storage could **supply all the world's energy needs by** about **2035**. In reality, growth will probably slow down as the technology reaches the saturation phase in its S-curve. Still, based on historical growth and its likely S-curve pattern, we can predict that renewables, along with pre-existing hydropower and nuclear power, will largely displace fossil fuels by about 2050. For decades the IEA and others have consistently overestimated the future costs of renewable energy and underestimated future rates of deployment, often by orders of magnitude. The underlying problem is a lack of awareness that technological change is not linear but exponential: A new technology is small for a long time, and then it suddenly takes over. In 2000, about 95% of American households had a landline telephone. Few would have forecast that by 2023, 75% of U.S. adults would have no landline, only a mobile phone. In just two decades, a massive, century-old industry virtually disappeared. If all of this is true, is there any need for government support for clean energy? Many believe that we should just let the free market alone sort out which energy sources are best. But that would be a mistake. History shows that technology transitions often **need** a kick-start from **government.** This can take the form of support for basic and high-risk research, purchases that help new technologies reach scale, investment in infrastructure and **policies that create stability** for private capital. Such government actions have played a critical role in virtually every technological transition, from railroads to automobiles to the internet. In 2021-22, Congress passed the bipartisan CHIPS Act and Infrastructure Act, plus the Biden administration's Inflation Reduction Act (IRA), all of which provided significant funding to accelerate the development of the America's clean energy industry. Trump has pledged to end that support. The new administration has halted disbursements of $50 billion in already approved clean energy loans and put $280 billion in loan requests under review. The legality of halting a congressionally mandated program will be challenged in court, but in any case, the IRA horse is well on its way out of the barn. About $61 billion of direct IRA funding has already been spent. IRA tax credits have already attracted $215 billion in new clean energy investment and could be worth $350 billion over the next three years. Ending the tax credits would be **politically difficult,** since the top 10 states for clean energy jobs include Texas, Florida, Michigan, Ohio, North Carolina and Pennsylvania—all critical states for Republicans. Trump may find himself fighting Republican governors and members of Congress to make those cuts. It is **more likely that Trump** and Congress **will take actions that are politically easier,** such as ending consumer subsidies for electric vehicles or refusing to issue permits for offshore wind projects. The impact of these policy changes would be mainly to harm U.S. competitiveness. By reducing support for private investment and public infrastructure, raising hurdles for permits and slapping on tariffs, the U.S. will simply drive clean-energy investment to competitors in Europe and China. Meanwhile, Trump's promises of a fossil fuel renaissance ring hollow. U.S. oil and gas production is already at record levels, and with softening global prices, producers and investors are increasingly cautious about committing capital to expand U.S. production. The energy transition is a one-way ticket. As the asset base shifts to clean energy technologies, large segments of fossil fuel demand **will permanently disappear**. Very few consumers who buy an electric vehicle will go back to fossil-fuel cars. Once utilities build cheap renewables and storage, they won't go back to expensive coal plants. If the S-curves of clean energy continue on their paths, the fossil fuel sector will likely shrink to a niche industry supplying petrochemicals for plastics by around 2050.¶ For U.S. policymakers, supporting clean energy isn't about climate change. It is about maintaining American economic leadership. The U.S. invented most clean-energy technologies and has world-beating capabilities in them. Thanks to smart policies and a risk-taking private sector, it has led every major technological transition of the 20th century. It should lead this one too.

Nuclear energy kills renewables – diverts attention, resources, and monopolizes grids – make them answer every disad

CAN 24 Climate Action Network, 3-18-2024, "POSITION PAPER: The nuclear hurdle to a renewable future and fossil fuel phase-out," [Climate Action Network (CAN) Europe is Europe's leading NGO coalition fighting dangerous climate change. We are a unique network, in which environmental and development organisations work together to issue joint lobby campaigns and maximise their impact], https://caneurope.org/position-paper-nuclear-energy/, DOA 3-25-2025 //Wenzhuo recut //cy

More than three-quarters of the EU's greenhouse gas emissions stem from our energy consumption, therefore it is vital to stop burning fossil fuels to limit temperature rise to 1.5°C, the Paris Agreement target. Together with members, and external experts, we developed our Paris Agreement compatible (PAC) energy scenario, which provides a robust, science-based pathway for Europe's energy landscape. On the basis of this work, CAN Europe advocates for a phase-out of coal by 2030, gas by 2035, and a 100% renewables-based energy system by 2040, which requires the phase-out of nuclear power by then. The disruption of nuclear power can be observed in many countries, not only in Europe. In Dubai, at COP28, CAN was strongly opposed to and called out countries, supporting and signing the pledge led by the USA, UK, France and 18 other countries to globally triple nuclear power in the next 25 years. This goal is much higher than the high bracket of International Energy Agency (IEA) scenarios, already based on improbable hypotheses and risks to distract from the tripling of Renewable Energy capacities that was agreed by a much larger group of countries at COP28. In 2023, there was an **alarming push** and a surge in support **for nuclear power** within the EU political space. This development is creating significant tension with proponents of energy sufficiency and a fully renewable energy system and marks a regressive step in efforts towards a sustainable and just energy transition. While nuclear champions claim that nuclear energy can work hand-in-hand with renewables, it is becoming increasingly clear that nuclear power acts as a significant hurdle to energy efficiency investments, the roll-out of renewables and fossil fuel phase-out in three spheres: the EU political debate, energy system planning, and decentralisation. Climate Action Network International, the global umbrella under which CAN Europe participates, with a community of almost 2000 members from civil society, in more than 130 countries, stands united in opposing new and existing nuclear power stations. In 2020, we reviewed and agreed the CAN Charta, the 'highest' document for all CAN members, the international secretariat and the regional nodes, and we listed under strategies "Promoting a nuclear-free future". A hurdle in the policy debate The starting gun for a renewed attempt at a nuclear renaissance was the inclusion of nuclear in the EU Taxonomy in 2022, and can be seen as the nuclear lobby's blueprint for its future ambitions – creating a large political debate using arguments of "technology neutrality" and a "level playing field" and forming alliances with fossil fuel advocates (in this case, fossil gas) in order to reduce ambition to sustainable solutions. Since then, a French-led campaign, manifested through the 14 Member State "Nuclear Alliance", coupled alongside the lobbying activities of the nuclear industry, has run roughshod through EU energy and climate policy over the last two years. Continuing the narrative of "technology neutrality" and a "level playing field", this mission has aimed at promoting nuclear energy at the direct expense of a transition to a 100% renewable-based energy system, in legislation such as the Renewable Energy Directive, Electricity Market Design and Net Zero Industry Act. Attempting to lower renewable ambition In the context of the Renewable Energy Directive (RED III) revision, France tested the waters in 2023 by calling for a low-carbon 'weighting' in EU renewables target in order to support a higher EU 2030 renewable energy target of 45%, where so-called 'low carbon' energy sources are taken into account when establishing national renewable energy targets. Though this did not see the light, a concession was won on renewable hydrogen and gained provisions to facilitate nuclear-produced hydrogen – risking further watering down a renewables-based technology pathway. The EU Commission launched its proposal for the Net Zero Industry Act (NZIA) in March 2023 as a response to the Inflation Reduction Act (IRA) of the United States. While nuclear was included as a list of technologies that were seen as making a contribution to decarbonisation, the EU Commission President, Ursula von der Leyen, refused to include it in the list of "strategic technologies", which could receive additional support. The list was limited, as to be better targeted, at technologies such as solar, wind, energy storage, heat pumps and grid technologies. The final political agreement has led to the inclusion of "nuclear fission energy technologies" as strategic, while this debate allowed the list to become so extensive it practically loses any strategic element. Delaying fossil phase out via dirty trade-offs During the Electricity Market Design reform, nuclear and fossil fuel promoters in the Parliament attempted to **derail** a deal supporting renewables and flexibility. In the Council, due to the focus of the Nuclear Alliance on the Contracts for Difference (supported by some coal dependent countries) the negotiations were delayed by several months and conversations redirected away from renewables, leading to a deal supporting subsidies for existing and new nuclear reactors and a prolongation of subsidies to coal power plants via capacity mechanisms. Wasting time and diverting attention As the nuclear debate **aggressively** dominates political negotiations, media, and public discourse, it **blatantly diverts critical attention from** advancing the **existing,** affordable, sustainable solutions to the energy transition. This overwhelming focus on nuclear power not only overshadows but also poses a risk of **derailing** the European **energy transition**, hindering progress towards aligning with the ambitious yet achievable goal of a **100% renewable energy** system by 2040. A hurdle to a fully renewables based power system CAN Europe's assessment of the draft National Energy and Climate Plans highlights that not a single Member State plan is aligned to a 1.5ºC compatible trajectory, nor minimum EU climate and energy requirements for 2030. **Increased ambition is required** on energy efficiency, energy savings, renewables and fossil fuels phase-out, while Member States are **betting on false solutions** to the challenge at hand, such as nuclear energy. As highlighted in our NECP analysis, the EU has inadequate renewables expansion, grossly insufficient investment in energy efficiency, late coal phase-out deadlines and gas dependence, while countries such as Bulgaria, Czechia, Estonia, France, Hungary, the Netherlands, Poland, Romania and Slovenia, are considering new nuclear that might never materialise. In 2023, Sweden has revised its 2040 target for 100% renewable electricity to 100% decarbonised electricity, to allow for continued and new nuclear power, and it is now clear that it can only happen with direct state aid. Italy, which voted against nuclear power in a referendum, is now investigating future nuclear power, while delaying quitting coal by 4 years. The largest nuclear power plant in Europe, the Zaporizhzhia Nuclear Power Plant in Ukraine, is currently occupied by the Russian military and Rosatom in an active warzone, but has not prevented Ukraine from including new nuclear power in its reconstruction. The Paris Agreement Compatible (PAC) scenario, on the other hand, emphasises renewables-based electrification, calling for determined and heightened attention to enable a 100% renewable-based EU energy system by 2040, and foresees no need for nuclear power in Europe. 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. 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 CO2 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 CO2 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. 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. 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. Finally, 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. New nuclear construction is too slow 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 2050, 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 does not support energy autonomy Nuclear power units equally fail to pass an "energy security" test, and run counter to the RepowerEU target of enhancing Europe's autonomy, given that more than 40% of the EU's Uranium is imported from Russia and no EU country is currently mining uranium within its own borders . Though Kazakhstan is seen as an alternative, its uranium industry is directly tied to Rosatom. While import bans have been placed on Russian coal and liquified natural gas, and Russian oil and natural gas have been targeted, this has not been the case for uranium. A hurdle to a decentralised future The declaration to triple nuclear power by 2050 signed by only 22 countries, 5 of which do not have nuclear reactors, on the sidelines of COP28 describes nuclear power as "source of clean dispatchable baseload power", a common message of the nuclear industry used to argue against a 100% renewable system and nuclear's use as a substitute for traditional fossil fuel generation. This claim, however, is misleading and outdated. Europe is moving beyond a highly centralised energy system, towards one which is decentralised, digitalised, and able to flexibly adjust to changing patterns of generation and consumption. In a 100% renewable energy system, the need for traditional "baseload" power is obsolete and with distributed energy production, in a far more interconnected European Union, security of supply is better managed. 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. 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. Blocking renewables integration into the electricity grid The inflexibility of nuclear, caused by technical limitations, safety requirements and economic factors, **prevents the feed-in of renewable electricity** into the grid, causing grid congestion and curtailment. Nuclear's dominance over grid capacity can **block the connection of new renewable energy projects**, where even announced and then abandoned plans for a new nuclear unit can delay renewable projects connection, allowing for continued fossil fuel usage. Grid structures designed for large-scale, centralised nuclear power, make it more challenging, time-consuming and costly to introduce small-scale distributed renewable power. An example can be found in Romania where Cernavodă 3 and 4 reactors have reserved grid capacity for years, blocking new renewable energy projects in the Dobrogea region, the most wind-intensive region in the country. Delayed grid investments, due to uncertainty of new nuclear units, have also meant that capacity bottlenecks exist today for renewables online. In the Netherlands, the only current nuclear power station, Borssele is competing for landing space for off-shore electricity. Post-Fukushima, renewables were blocked from connecting to the grid in Japan as the government considered restarting the reactors, despite public opposition to nuclear restarts and support for renewables. Rather than taking the opportunity to invest in grids and integrate renewables twenty years ago, Japan still heavily relies on fossil fuels today. Prolonging the inevitable with nuclear extensions While European governments may be tempted to prolong existing nuclear reactors beyond their original foreseen lifespans, in the context of phasing out Russian gas, costly upgrades to the ageing nuclear fleet, just like investing in new ones, risks diverting investment away from more cost-effective solutions such as renewables, energy efficiency, and system flexibility, in addition to risking lowered safety standards and security of supply as ageing increases unplanned outages. Any prolongation of existing nuclear power plant units risks the continued crowding out of renewable energy sources from the electricity grid, preventing their price-dampening effects on the market. So-called "Small Modular Reactors" European lawmakers are increasingly persuaded by the empty promises of Small Modular Reactors (SMRs). Argued to be more flexible, decentralised, smaller, and cheaper than existing nuclear designs, countries are wasting public resources in favour of a non-existent product, 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. Nuclear energy is too risky and unsafe Nuclear technology inherently carries the risk of severe nuclear accidents with the release of large amounts of radioactivity as shown by catastrophic accidents in Fukushima or Chornobyl. **Extreme** and more frequent **weather** events due to climate change create **unprecedented** risks through storms or flooding that are not captured in planning standards for nuclear plants based on historic frequencies and severeness. Extreme weather events may also indirectly affect nuclear plants, such as breaking dams above nuclear plants or longer disconnection from electricity grids after storms. **Cyber attacks, military aggression** e.g. Russia's occupation of the Zaporizhzhia Nuclear Power Plant, and terrorist attacks, e.g. via drone attacks, could also lead to severe accidents of nuclear plants. Nuclear waste remains a risk worldwide to the health of all living creatures, including humans, for thousands of years after its use in energy production. Management of any future storage facility would still be at risk of natural disasters and decisions of future generations, whereas currently without any long-term solutions risks are increasingly shifting to interim storage which were not planned for the current supply and length of storage. Beyond decarbonisation For heightened climate ambition, renewables, energy efficiency, storage, interconnection and flexibility are best suited to make up this gap in generation and support increased renewables-based electrification, while phasing out fossil fuels in parallel. Given the poor speed and high costs of future nuclear projects, the difficulty to build several units at the same time, and the realities of SMRs, it is unlikely nuclear will be able to cover any significant part of Europe's energy needs by 2040. The future energy system will be far more decentralised, and active consumer and flexibility oriented, which are not the ideal conditions for new nuclear plants. For these reasons stated above, it is in the nuclear industry's interest to delay Europe's progress and keep in place the current centralised, fossil-based energy system, jeopardising climate goals, in the hope that projects are able to materialise in the future, and to lower safety standards to reduce costs. Nuclear energy is also at odds with an energy system based on democratic ownership of energy production, as opposed to renewables. A true democratic debate on nuclear has not been underway, but rather a capture by geopolitical interests and corporations. Problems in three identified spheres, the political debate, energy system planning, and decentralisation have been mapped as current and possible future areas where nuclear advocates may be actively hostile towards renewables and fossil fuel phase out. Though we must look beyond energy and decarbonisation, and have a holistic vision of nuclear power, incorporating drawbacks such as safety, waste, weapon proliferation, uranium dependency, operation in warzones and biodiversity.

Else – climate change escalates – key inflection points

Borenstein 23 Seth Borenstein, 3-20-2023, "Humanity can still stop worst consequences of climate change, but time is running out, IPCC warns," [Borenstein is an Associated Press science writer, covering climate change, disasters, physics and other science topics. He is based in Washington, D.C.], https://www.pbs.org/newshour/science/humanity-can-still-stop-worst-consequences-of-climate-change-but-time-is-running-out-ipcc-warns, DOA 3-26-2025 //wenzhuo

BERLIN (AP) — Humanity still has a chance, close to the last one, to prevent the **worst of climate change's** future **harms**, a top United Nations panel of scientists said Monday. But doing so requires **quickly slashing carbon pollution and fossil fuel use** by nearly two-thirds by 2035, the Intergovernmental Panel on Climate Change said. The United Nations chief said it more bluntly, calling for an end to new fossil fuel exploration and rich countries quitting coal, oil and gas by 2040. "Humanity is on thin ice — and that ice is melting fast," United Nations Secretary-General Antonio Guterres said. "Our world **needs climate action** on all fronts — everything, everywhere, all at once." Stepping up his pleas for action on fossil fuels, Guterres not only called for "no new coal" but also for eliminating its use in rich countries by 2030 and poor countries by 2040. He urged **carbon-free electricity generation** in the developed world by 2035, meaning no gas-fired power plants too. That date is key because nations soon have to come up with goals for pollution reduction by 2035, according to the Paris climate agreement. After contentious debate, the U.N. science panel calculated and reported that to stay under the warming limit set in Paris the world needs to cut 60% of its greenhouse gas emissions by 2035, compared with 2019, adding a new target not previously mentioned in the six reports issued since 2018. "The choices and actions implemented in this **decade** will have impacts for **thousands of years**," the report, said calling climate change "a threat to **human well-being** and planetary health." "We are not on the right track but it's not too late," said report co-author and water scientist Aditi Mukherji. "Our intention is really a message of hope, and not that of doomsday." With the world only a few tenths of a degree away from the globally accepted goal of limiting warming to 1.5 degrees Celsius (2.7 degrees Fahrenheit) since pre-industrial times, scientists stressed a sense of urgency. The goal was adopted as part of the 2015 Paris climate agreement and the world has already warmed 1.1 degrees Celsius (2 degrees Fahrenheit). This is likely the last warning the Nobel Peace Prize-winning collection of scientists will be able to make about the 1.5 mark because their next set of reports will likely come after Earth has either breached the mark or locked into exceeding it soon, several scientists, including report authors, told The Associated Press. After 1.5 degrees "the **risks are starting to pile on,**" said report co-author Francis X. Johnson, a climate, land and policy scientist at the Stockholm Environment Institute. The report mentions "https://apnews.com/article/science-climate-and-environment-10b36a73b486ed5c0bde05db4151ccb0">tipping points" around that temperature of species extinction, including coral reefs, irreversible melting of ice sheets and sea level rise on the order of several meters (several yards). "The window is closing if emissions are not reduced as quickly as possible," Johnson said in an interview. "Scientists are rather alarmed." "1.5 is a critical **critical limit**, particularly for small islands and mountain (communities) which depend on glaciers," said Mukherji, who's also the climate change impact platform director at the research institute CGIAR. Many scientists, including at least three co-authors, said hitting 1.5 degrees is inevitable. "We are pretty much locked into 1.5," said report co-author Malte Meinshausen, a climate scientist at the University of Melbourne in Australia. "There's very little way we will be able to avoid crossing 1.5 C sometime in the 2030s " but the big issue is whether the temperature keeps rising from there or stabilizes. Guterres insisted "the 1.5-degree limit is achievable." Science panel chief Hoesung Lee said so far the world is far off course. "This report confirms that if the current trends, current patterns of consumption and production continues, then … the global average 1.5 degrees temperature increase will be seen sometime in this decade," Lee said. Scientists emphasize that the world, civilization or humanity won't end if and when Earth hits and passes the 1.5 degree mark. Mukherji said "it's not as if it's a cliff that we all fall off." But an earlier IPCC report detailed how the harms – from coral reef extinction to Arctic sea ice absent summers to even nastier extreme weather – are much worse beyond 1.5 degrees of warming. "It is certainly prudent to be planning for a future that's warmer than 1.5 degrees," said IPCC report review editor Steven Rose, an economist at the Electric Power Research Institute in the United States. If the world continues to use all the **fossil fuel**-powered infrastructure either existing now or proposed Earth will warm **at least 2 degrees Celsius** since pre-industrial times, blowing past the 1.5 mark, the report said. Because the report is based on data from a few years ago, the calculations about fossil fuel projects already in the pipeline do not include the increase in coal and natural gas use after Russia's invasion of Ukraine, said report co-author Dipak Dasgupta, a climate economist at The Energy and Resources Institute in India. The report comes a week after the Biden Administration in the United States approved the huge Willow oil-drilling project in Alaska, which could produce up to 180,000 barrels of oil a day. The report and the underlying discussions also touch on the disparity between rich nations, which caused much of the problem because carbon dioxide emissions from industrialization stay in the air for more than a century, and poorer countries that get hit harder by extreme weather. If the world is to achieve its climate goals, poorer countries need a "many-fold" increase in financial help to adapt to a warmer world and switch to non-polluting energy. Countries have made financial pledges and promises of a damage compensation fund. If rich countries don't cut emissions quicker and better help victim nations adapt to future harms, "the world is relegating the least developed countries to poverty," said Madeline Diouf Sarr, chair of a coalition of the poorest nations. The report offers hope if action is taken, using the word "opportunity" nine times in a 27-page summary. Though opportunity is overshadowed by 94 uses of the word "risk." The head of the IPCC said the report contains "a message of hope in addition to those various scientific findings about the tremendous damages and also the losses that climate change has imposed on us and on the planet." "There is a pathway that we can resolve these problems, and this report provides a comprehensive overview of what actions we can take to lead us into a much better, livable future," Lee told The Associated Press. Lee was at pains to stress that it's not the panel's job to tell countries what they should or shouldn't do to cap global temperature rise at 1.5 Celsius. "It's up to each government to find the best solution," he said, adding that scientists hope those solutions will stabilize the globe's temperature around 1.5 degrees. Asked whether this would be the last report to describe ways in which 1.5 C can be achieved, Lee said it was impossible to predict what advances might be made that could keep that target alive. "The possibility is still there," he said. "It depends upon, again I want to emphasize that, the political will to achieve that goal." Activists also found grains of hope in the reports.

Every degree matters: warming is anthropogenic, fast, underestimated, and carbon alone triggers acidification.

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Every degree of warming up to 2°C **will add** at least 1.3 meters to sea levels from accelerated ice flow into the ocean and melting from the Antarctic Ice Sheet, while **warming** between 2°C and 6°C is predicted to add 2.4 meters per degree (Garbe, Albrecht, Levermann, Donges and Winkelmann, 2020). While the IPCC Working Group III reports frequently refer to 'cost-effectiveness', the cost against which the effectiveness is being assessed never includes the cost that would arise from exceeding a climate tipping point. It should also be noted that there are no credible technological solutions for many climate change impacts: for example, the Arctic and boreal permafrost contain 1460 to 1600 Gt of organic carbon, almost twice the carbon in the atmosphere (WMO, 2020), and if gigatonnes of methane are released from melting permafrost and warming oceans, the process cannot be reversed. Fact 3.2: The deadly impacts and costs of increasingly acidifying oceans are also greatly underestimated. When **carbon** dioxide combines with seawater it forms carbonic acid, which **makes the ocean more acidic**. Since around 1850, the oceans have absorbed between a third and a half of the CO_2 emitted to the atmosphere. As a result, the average pH of ocean surface waters has fallen from 8.2 to 8.1 units. This corresponds to a 30% increase in ocean acidity, a rate of change roughly 10 times faster than any time in the last 55 million years (CoastAdapt, 2017; Jiang et al., 2023). If GHG emissions continue at the current rate (the RCP8.5 trajectory), by the end of the century average pH is projected to decrease by 0.3–0.4 units (~100%–150% increase in acidity) (Kwiatkowski et al., 2020). Increasing acidity will make it difficult for marine organisms such as corals, clams, mussels, crabs, and some plankton, to form calcium carbonate, the material used to build shells and skeletal material. The **survival** of many microscopic **marine species** will also be **threatened** (Bird, 2023). In addition, ocean acidification will disrupt pelagic **food webs** via the proliferation of toxic algal blooms (Doney et al., 2020). The increasing degradation of marine food chains will seriously damage fishing industries and tourism. **Ocean systems are not able to adapt** to these **rapid** changes in **acidity**—a process that **naturally** occurs over **millennia**. Declining ocean pH levels will persist as long as concentrations of atmospheric CO_2 continue to rise. The stress on marine organisms will be exacerbated by rising temperatures and exposure to multiple biogeochemical changes. To avoid significant harm to critical marine ecosystems and the food security of **billions** of people, atmospheric concentrations of atmospheric **CO_2** must be rapidly **reduced** to at least 320-350 ppm or less (IUCN, 2017). Fact 3.3: Virtually irreversible tipping points are already being passed. Acceleration of the rate of **climate** change is a real and **existential** risk. Climate tipping points (CTPs) are irrevocable changes in the climate, such as the melting of ice sheets, or the dieback of rainforests. These are points of **no return**: once glaciers and ecosystems like coral reefs have disappeared, they cannot be restored. For example, warming oceans make the collapse of the West Antarctic Ice Sheet unavoidable (Naughten, Holland and De Rydt, 2023). Evidence is all around us that we are nearing or have already crossed CTPs associated with critical parts of the Earth system—we see catastrophic fires in rainforests, spreading deserts, degrading ecosystems, and shrinking sea ice (e.g., Walsh, 2016; Bochow and Boers, 2023; Kim et al., 2023). Another example is rainfall in Greenland, which has increased by 33% since 1991, with flooding rain darkening and melting the ice sheet and baring rocks (Box et al., 2023). However, the accelerating rate of melt and the positive feedbacks of increasing rainfall and reducing albedo are not represented in IPCC models. Armstrong McKay and colleagues (2022) identify six **tipping points** that are **likely** to be crossed within the Paris Agreement targets of 1.5°C - 2°C of warming. **These are:** Greenland Ice Sheet collapse West Antarctic Ice Sheet collapse **Coral** reef die off at low latitudes Sudden **thawing** of permafrost in northern regions Abrupt sea **ice loss** in the Barents Sea Collapse of ocean **circulation** in the high-latitude North **Atlantic** They point out that crossing these climate tipping points can generate positive feedbacks that will increase the likelihood of crossing other CTPs. For example, Arctic permafrost may permanently thaw even if warming stays between 1.1 °C and 1.5°C. Above 1.5°C of warming, losing the permafrost becomes "likely," and we are currently on track for 2.7°C of warming in this century. If all the permafrost thawed, emissions would be equivalent to **51 times** all GHG **emissions** in 2019. Alarmingly, the ESCIMO climate model indicates that a self-sustaining process of permafrost thaw has already begun, which suggests that the world is already past a point-of-no-return for global warming. This cycle consists of decreasing surface albedo, increasing water vapour feedback and increasing thawing of the permafrost, which releases both methane and carbon dioxide, resulting in even further temperature rises, and so on. Even after no more man-made GHG are emitted, this cycle will continue on its own until all carbon is released from permafrost and all ice is melted (Randers and Goluke, 2020). The likelihood of passing additional CTPs becomes non-negligible at ~2°C and increases greatly at ~3°C. Above 2°C the Arctic would very likely become summer ice-free, and land carbon sink-tosource transitions would become widespread. Scientists are detecting warning signs for many CTPs. For example, researchers have found an almost complete loss of stability of the Atlantic meridional overturning circulation (AMOC). These currents are already at their slowest point in at least 1,600 years, and new analysis indicates that the AMOC could collapse between 2025 and 2095, with a central estimate of 2050, if global carbon emissions are not reduced (Ditlevsen and Ditlevsen, 2023). This would have catastrophic consequences, severely disrupting the rains that billions of people depend on for food in India, South America and West Africa; increasing storms and lowering temperatures in Europe; and raising sea levels in the eastern North America (Boers, 2021) The IPCC's highest-end GHG concentration pathway, RCP 8.5, remains close to observations in many regions and may eventuate if negative feedback loops are activated, such as emissions from melting permafrost and forest die-backs (Schwalm, Glendon and Duffy, 2020). Both of the high-emission pathways considered in the IPCC's most recent Working Group I report contain 4°C increases in the "very likely" range for 2081 through 2100, temperatures that many scientists believe would pose a significant threat to civilization (Steel, DesRoches, Mintz-Woo, 2022). Tipping elements have been identified in all earth systems including cryosphere, ocean circulation systems and the biosphere, and a growing risk is that even if the Paris Agreement targets are met, a **cascade** of positive feedbacks could **push** the Earth System irreversibly onto a "**Hothouse** **Earth**" pathway (Steffen et al. 2018; Klose, Karle, Winkelmann and Donges, 2020). During the last glacial period abrupt climate changes sometimes occurred within decades, with temperatures over the Greenland ice-sheet warming by 8°C to 16°C at each event (Corrick et al., 2020). The IPCC has been cautious in its evaluation of climate tipping points. For example, its latest report stated that there was a chance of a tipping point in the Amazon by the year 2100. However, while most studies only focus on one driver of destruction, such as climate change or deforestation, in reality ecosystems are simultaneously impacted by multiple interacting threats, e.g., water stress, degradation and pollution. Because tipping points can amplify and **accelerate** one **another**, more than a fifth of ecosystems worldwide, including the Amazon rainforest, are at **risk** of a catastrophic **breakdown** within a single **human life**time (Willcock et al., 2023). Record drought in Amazonia in 2023 suggests we are **much closer** to these thresholds than models **predict**. Fact 3.4: It is **impossible** to adapt to irreversible, catastrophic impacts like species extinction, the loss of glaciers, rising sea levels, and the release of methane from permafrost and oceans.