C1 is Leadership.

American adversaries dominate nuclear energy

Cohen 24(Dr. Ariel Cohen, Ph.D. is a Senior Fellow at the Atlantic Council and the Founding Principal of International Market Analysis, a Washington, D.C.-based global risk advisory boutique. He is also Managing Director of the Energy, Growth, and Security Program (EGS) and a Senior Fellow with the International Tax and Investment Center (ITIC). 7 June 2024, "China And Russia Now Dominate The Global Nuclear Trade" Forbes, https://www.forbes.com/sites/arielcohen/2024/06/07/china-and-russia-now-dominate-the-global-nuclear-trade/, DOA: 3/5/25) LLO

Russia is not alone in surpassing the US. **China is also far ahead of the US in the nuclear energy industry. China's nuclear power industry has retained its domestic focus, with twenty-three power plants under construction in China as of July 2023.** This is due to increasing energy demand, as China continues to develop its economy. The United States is constructing a single nuclear power plant. **While China has refined its nuclear power production process, the last plant built in the US arrived 7 years late and 17 billion dollars over budget, as a testament to America's byzantine permitting and environmental review system. China has built upon this expertise also to begin supplying reactors abroad. The China National Nuclear Corporation and China General Nuclear Power Group have developed a third-generation reactor called Hualong One.** This new reactor began operations in 2021 in Fuqing**. In 2023, China began construction on the Chashma-5 nuclear power plant in Pakistan, which will use Hualong One reactors. Such actions contribute to China's capacity to construct infrastructure abroad and expand its influence.** The American nuclear power industry was once the world's envy, peaking with 112 operational reactors in 1990, with America on a path to carbon neutrality much earlier than current predictions. **34 years later, the United States has lost nearly a third of its operational nuclear reactors, has built almost no new ones, and its average reactor age is decades old. If nothing is done to rectify this, in the next 10-15 years, scores of nuclear reactors will have to be retired as their operational lifecycles end, and as a result, America will have to contend with nearly 20% of its electricity capacity evaporating.**

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Through Rosatom, Russia remains the global leader in nuclear reactor construction. According to the World Nuclear Strategy Report, **as of July 2023, Russia had twenty-four. Nuclear reactors under construction in seven countries: China, India, Turkey, Egypt, Bangladesh, Iran, and Slovakia. For comparison, the US was constructing zero. Russia dominates the nuclear industry in more areas than just reactors. They also have the largest uranium conversion and enrichment industries in the world, at 38% and 46% of international capacity**, respectively, in 2020. **This makes it a major fuel exporter as well. Russia exported over $1 billion worth of nuclear energy-related products from February 2022-2024. Two of the countries in which Russia is constructing nuclear power plants, Turkey and Slovakia, are NATO members.** They are not alone amongst the collective West in enabling Russia's nuclear dominance while ostensibly being committed to containing the Kremlin. As my colleague Wesley A. Hill wrote, Russian-enabled geopolitical turmoil in Africa, which Russia is using to try to acquire formerly French uranium assets, helped force Europe to double its import of Russian uranium in 2023. The US was no better, remaining dependent on Russian nuclear exports even after the war in Ukraine restarted in 2022. The US imported Russian nuclear fuel until May 14th, 2024, over two years after Russia's invasion of Ukraine began, from the same entities that the White House sanctioned.

And, America is losing influence

Policy Circle 24 (Policy Circle is a digital platform that offers in-depth coverage of public policy issues in governance, environment, and society. It was launched in 2020 by a group of policy experts who share a vision of promoting evidence-based policymaking and constructive policy dialogue. It also organises summits, roundtables, and online discussions to bring together policymakers, researchers, corporate executives, professionals, and other stakeholders to deliberate on policy issues. December 27, 2024 "End of American hegemony: Can the superpower reinvent power for the 21st century" Policy Circle, https://www.policycircle.org/world/end-of-american-hegemony/, DOA: 3/28/25) LLO

In 2010, a historian predicted that the American hegemony might end by 2025 — not with a bang but with a whimper — as domestic divisions deepened and rival powers rose to challenge its authority. Today, that prediction appears prophetic as America faces increasing pressures from within and outside. Even as the US retains military dominance and an economy capable of immense influence, **the structural underpinnings of its global power are eroding. This decline, though not necessarily terminal, signals a transition away from the so-called American Century. Historically, the US leveraged its unmatched economic strength, technological innovation, and cultural influence to dominate the post-World War II global order. However, the foundations of the American hegemony are crumbling. The US share of global GDP has steadily declined,** falling from 50% in the mid-20th century to approximately 15% today when adjusted for purchasing power parity. **The globalisation, initially championed by the US, has redistributed industrial power, with China emerging as a key beneficiary. China's rise has reoriented global economic networks, particularly in the Global South.** In contrast to America's interventionist foreign policy, **China has cultivated influence through infrastructure investments, soft power campaigns**, and state-sponsored media. The United States, while still a major player, has failed to present an alternative vision that resonates with developing nations, where perceptions of Chinese leadership are increasingly favourable.

Affirming enables exports

Bowen et al 20 (Matt Bowen is a research scholar at the Center on Global Energy Policy at Columbia University School of International Public Affairs and a senior fellow at the Atlantic Council Global Energy Center. Jackie (Kempfer) Siebens is a senior policy adviser for the energy and climate program at Third Way and a senior fellow at the Atlantic Council Global Energy Center. Jennifer T. Gordon is the managing editor and senior fellow for nuclear energy at the Atlantic Council Global Energy Center. 10/7/20, "Strengthening cooperation with allies could help the United States lead in exporting carbon-free nuclear energy", The Atlantic Council, https://www.atlanticcouncil.org/blogs/energysource/strengthening-cooperation-with-allies-could-help-the-united-states-lead-in-exporting-carbon-free-nuclear-energy/ //. DOA: 3/3/25)JDE

First, **the federal government should establish a more comprehensive and coordinated interagency system focused on the development and deployment of civilian nuclear technologies**, which would **support bringing advanced nuclear power to the global market.** This would involve establishing a collaborative network of nuclear-specific staff positions embedded in the collection of government agencies that **play a meaningful role in safely and securely developing**, deploying, and exporting US energy **technologies**. Similar to the "Team USA" whole-of-government approach first initiated under the Obama Administration, a network of nuclear-specific staff positions could be located across different US agencies including: the Department of Energy, Department of State, Nuclear Regulatory Commission (NRC), White House Office of Science and Technology Policy, National Security Council (NSC), Department of Commerce, and any future Climate Office. While the Obama Administration created an NSC role to coordinate interagency nuclear policy, and the DOE report released earlier this year, Restoring America's Competitive Nuclear Advantage, recommended reinstating that role, there is currently no high-level mechanism for interagency coordination on US nuclear exports. And, **since it is difficult to export a product that lacks a domestic market, continued policy support for constructing advanced reactors here in the United States is imperative.**

Exports secure positive global relationships

Graham 19 (Thomas Graham is a retired diplomat who helped negotiate every international arms control and nonproliferation agreement from 1970 to 1977, co-chair of the Nuclear Energy and National Security Coalition, 5/29/19, "National security stakes of US nuclear energy" The Hill, https://thehill.com/opinion/national-security/445550-national-security-stakes-of-us-nuclear-energy/, DOA: 3/4/25) ST

We have dedicated our careers to controlling the destructive potential of nuclear weapons. But since the Atoms for Peace era, **U.S. leadership in supplying peaceful nuclear energy technology, equipment, and fuel to the world has been important for world development and therefore critical for the United States to establish and enforce standards for nuclear safety, security and nonproliferation**. But in recent decades, the U.S. share of international commercial nuclear energy markets has diminished, and so with it has the United States' ability to influence global standards in peaceful nuclear energy. The critical moment for U.S. leadership in nuclear energy is when a country is developing nuclear energy for the first time. **The supplier country and the developing country typically forge a relationship that endures for the 80- to 100-year** life of the nuclear program. Unlike a coal or gas plant**, nuclear reactors need specialized fuel and maintenance. Once established, the bilateral commercial relationship is not easily dislodged by a rival nation, providing the supplier profound and lasting influence on the partner's nuclear policies and practices. Russia and China have identified nuclear energy as a strategic export, to be leveraged for geopolitical influence as well as for economic gain.** According to a recent analysis, **Russia is the supplier of more nuclear technology than the next four largest suppliers combined, and China is quickly emerging as a rival. If the United States fails to compete in commercial markets, it will cede leadership to these countries on nuclear safety, security and nonproliferation, as well as foreign policy influence.** As the competition intensifies to deliver **the next generation of nuclear power technologies**, U.S. nuclear leadership is approaching a watershed opportunity. Simpler, scalable, and less expensive, small and advanced reactors **are commercially attractive to an expanded range of markets** — particularly in Africa, Asia and the Middle East. The United States has the world's best training and development programs, unmatched regulatory experience, and multiple small and advanced reactor designs; we should be the easy choice for the next generation of nuclear technology. But early U.S. engagement in these important geopolitical regions is critical. Without it, **Russia and China will lock up future nuclear markets through MOUs and other bilateral agreements.** And for addressing the national security risks of climate change, nuclear energy is not just an option but a necessity. Developing nations that are planning to meet power and water needs for large and growing populations must have reliable, demonstrated, zero-emission nuclear power in order to meet global climate goals as well. Advanced reactors are integral to these goals. In the United States, nuclear energy is responsible for a fifth of the United States' total electricity and more than 55 percent of our emissions-free energy, but the pace of domestic construction of new natural gas plants far exceeds the few nuclear plants under development, and the existing fleet is retiring prematurely at an alarming rate. Which brings us back to the domestic nuclear industry**. U.S. global competitiveness and leadership are inextricably linked to a strong domestic nuclear program. Without a healthy domestic fleet of plants, the U.S. supply chain will weaken against international rivals. Russia has brought six new plants online in the past five years and has six more plants currently under construction. In the same period, China has brought 28 new plants online and has 11 others under construction. These domestic projects provide Russia and China with a robust supply chain, an experienced workforce, and economies of scale that make them more competitive in bidding on international projects. Unless we continue to innovate and build new plants, we will cease to be relevant elsewhere.** Even our own domestic energy security is supported by nuclear power. The nuclear plants operating today are the most robust elements of U.S. critical infrastructure, offering a level of protection against natural and adversarial threats that is unmatched by other plants. Because the nation's grid supplies power to 99 percent of U.S. military installations, large scale disruptions affect the nation's ability to defend itself. **We can regain U.S. leadership in nuclear energy. The key steps are to maintain the domestic reactor fleet, with its reservoir of know-how, and to assist American entrepreneurs in developing the next generation of the technology**.

Countries prefer US reactors.

Gattie 19 [David Gattie; Associate Professor of Engineering at the University of Georgia's College of Engineering, Senior Fellow @ UGA's Center for International Trade and Security; 05-22-2019; "Will the US lead? Or let China and Russia dominate nuclear energy"; The Hill; https://thehill.com/opinion/energy-environment/444944-will-the-us-lead-or-let-china-and-russia-dominate-nuclear-energy/; accessed 03-07-2025] tristan + leon

Moreover, **with the UK, South Korea, Japan and France having shown signs of political uncertainty in their respective commitments to nuclear power, the global nuclear ecosystem is potentially vulnerable to domination by a country pursuing a role of top predator**.

Meanwhile, the world is seeking U.S., Allied leadership in nuclear power — a clarion call that must be heard. At a minimum, **there must be a *viable* non-authoritarian nuclear partner alternative committed to the rule of law, individual liberty, cooperative security, multilateral alliances and fair trade**. However, while other countries waver, two countries show no signs of retreating from an aggressive nuclear power future — China and Russia. In fact, they are doubling down.

Investment drives innovation. Holtzman 23

Benjamin **Holtzman**, Nuclear Energy Institute. "Opportunities for Industries," **2023**. https://www.nei.org/advanced-nuclear-energy/opportunities-for-industries. [Ben is the Director of New Nuclear at the Nuclear Energy Institute. He is an accomplished and results-driven nuclear professional with over 15 years of experience in a variety of regulatory, technical, and business arenas. He currently is focused on developing a more efficient risk-informed regulatory framework, accelerating industry deployment readiness, and engaging with investors and new end-users to understand new nuclear opportunities. Ben has a B.S. in nuclear engineering, a M.S. in nuclear, plasma, & radiological engineering, and an executive M.B.A.] //MH

Industries across the economy are recognizing nuclear's ability to reduce—or erase—their carbon footprints. **Existing nuclear, small modular reactors, and other advanced nuclear technologies also offer significant opportunities for industry innovation and growth beyond electricity.** Explore Nuclear & Your Industry Aerospace - Nuclear has successfully powered space... ...exploration for decades. Now, the industry is developing new nuclear energy technologies to power the next phase of space travel: early unmanned missions, earth satellites, permanent lunar bases and missions to Mars. Companies such as Zeno Power, X-energy and Ultra Safe Nuclear Corporation are creating next-generation radioisotope power systems to send spacecraft and probes even farther into space. NASA is exploring nuclear thermal propulsion to reduce flight time, enabling human missions to Mars and beyond. As part of the historic Artemis space program, NASA also awarded contracts for a small nuclear power system that could run a permanent base for surface power on the Moon for upwards of 10 years. **Agriculture - Nuclear technologies can reduce the carbon... ...footprint of this industry's energy intensive processes.** Nuclear can make hydrogen for zero-carbon ammonia production and can also directly provide the process heat required to produce synthetic fertilizers. **Nuclear technology can be used to improve crop yield and develop plant varieties that need less water and are more resistant to the impacts of climate change.** Nuclear's desalination capabilities can enable irrigation in arid regions and combat water disputes between agricultural, commercial, and residential interests. Nuclear can also help fight against pests, avoiding the need to use harmful pesticides. Irradiating food also kills E. coli, listeria and salmonella, so fresh foods can last longer. **Data Centers and Information Technology - Google and other companies... ...like Microsoft are turning to nuclear energy for a dependable, carbon-free source of power to power their data centers continuously. In the future, data centers may have dedicated, standalone, small modular reactors (SMRs) or microreactors to power their operations "behind the meter."** SMRs can provide backup power for data centers on the grid and also operate independently of a grid. Some designs for new nuclear facilities also allow for data centers to be co-located on the same site, creating even more efficiencies. Finance, Blockchain, and Cryptocurrency - To address the substantial energy consumption... ...linked to cryptocurrency mining and transactions, businesses are looking towards eco-friendly energy alternatives. Nuclear energy can deliver consistent carbon-free power for continuous mining and transaction processing. Oklo entered a 20-year agreement with Compass Mining to offer 100 percent carbon-free electricity for crypto mining. Energy Harbor signed an agreement with Standard Power to deliver nuclear-generated, carbon-free, electricity to its bitcoin blockchain mining center in Ohio.

Additionally, Talen Energy intends to establish a nuclear-powered cryptocurrency mining and data facility adjacent to the Susquehanna nuclear power plant. **Manufacturing - Advanced reactors can provide heat for... ...industrial processes such as chemical production and metal refining, enabling these industries to reduce their carbon footprint. Dow Chemical partnered with X-energy to develop SMR technology, while Nucor has invested in NuScale Power Corporation to support the development of small modular reactor nuclear plants which can meet their needs for reliable carbon-free electricity to power steel production.** Nucor was also the first major industrial company to join the United Nations 24/7 Carbon-Free Energy Global Compact, which is aimed at accelerating the decarbonization of the world's electricity systems to mitigate climate change and ensure access to clean and affordable energy. **Medicine and Health - Nuclear power plants play a crucial role in public health... ...by producing a life-saving resource, Cobalt-60.** This isotope sterilized billions of pieces of medical equipment in hospitals during the height of the COVID -19 pandemic. **Radioisotopes, which are naturally formed during the process of producing reliable, carbon-free electricity, have significant lifesaving applications such as diagnosis and treatments for cancers.** Bruce Power and Ontario Power Generation (OPG) are among the companies that collect these medical isotopes and process them for worldwide distribution. Demand for radioisotopes is continuously increasing. Nuclear radiation is also used to treat food, kill bacteria, and eradicate insects and parasites that cause illness. Lastly, microreactors offer the potential to provide hospitals with clean energy 24/7/365, either independently or as part of a microgrid, without relying on a larger power grid. These compact reactors can be transported by land, air, or sea to remote areas, allowing hospitals in communities with inadequate access to health care or that have been affected by disasters to be powered with reliable energy. Textiles - The textile industry can remove chemicals and... ...pollutants, such as dyes, starches, acids, salts and detergents, from its water by using nuclear electron beam technology. Electron beams can break apart the chemical bonds of clothing dyes and remove pollutants, allowing textile manufacturers to recycle wastewater for reuse. One textile factory in Southern China uses the technique to save up to 4.5 million cubic meters of fresh water annually, which is equivalent to the water consumed by about 100,000 people. The fashion industry, which accounts for nearly 10 percent of global emissions, is also turning to nuclear energy to decarbonize. Transportation - Some of today's nuclear reactors are demonstrating... ...the capability for carbon-free production of large quantities of hydrogen, which can be used as fuel to power various forms of transportation, including aviation, shipping, heavy transport, fuel-cell trains, and vehicles. Advanced nuclear reactors can produce hydrogen. Nuclear energy is also a highly feasible option for providing steady and reliable carbon-free electricity to EV charging stations 24/7/365.

C2

Meltdown is inevitable — it's only a matter of time. Fox 24

Fox, Audrey. "Is Nuclear Power Bad for the Environment?" Friends of the Earth, August 19, **2024**. https://foe.org/blog/is-nuclear-power-bad-for-the-environment/. [Audrey Fox is the digital communications manager at Friends of the Earth. She manages the organization's websites, produces social content for the organization, tracks and analyzes metrics, and coordinates between the communications and campaign teams. She additionally assists with the production of multimedia content. Previously, she served as the organization's communications intern, assisting the team with media outreach, social media, copy editing, and rapid response. Audrey holds a B.A. in Political Science and Communications with a specialization in Environmental Science from the University of California, San Diego. Outside of work, she enjoys skiing, hiking, biking, and watching Giants baseball.] //MH

Nuclear Hazards – Safety and Health Nuclear disasters serve as prescient reminders of the unimaginable dangers of nuclear power. They may be caused by human error, mechanical failures, and/or natural disasters. The Chernobyl disaster in Ukraine in 1986 remains the worst nuclear accident in history. It will take at least 3,000 years for the area surrounding the nuclear power plant to be habitable. The second worst nuclear accident occurred in 2011 after an earthquake and tsunami struck the Fukushima Daiichi Nuclear Power Station in Japan, causing all three operating reactors to melt down. The Three Mile Island Generating Station in Pennsylvania experienced a partial meltdown in 1979, leading to increases in cancer and other diseases.

The worst radiation disaster in U.S. history is the Church Rock uranium spill, which occurred on the Navajo Nation a few months after Three Mile Island. Nuclear accidents pose extreme threats to life and have forced abandonment of wide swaths of land. Health impacts include increased risk of different types of cancer, immune deficiencies, infant mortality and birth defects, acute radiation syndrome (radiation poisoning), and harms to mental health. Those who mine and mill uranium and who work at nuclear power plants also face higher risk of diseases such as cancer. **The U.S. nuclear fleet is old, with an average age of 42 years. Aging infrastructure is more prone to cracks, corrosion, and other compromises in safety. Nuclear power stations are also vulnerable to military strikes and threats of terrorism.** Further, the technologies required to make nuclear energy are also the technologies required to make nuclear weapons, raising the risk of nuclear proliferation.

Affirming solves through upgrades. Tariq 24

Tariq, Ehtesham. "Costs and Benefits of Extending Aging Nuclear Power Plants | Certrec." Certrec | Regulatory & Technology Solutions for the Energy Industry, December 2, **2024**. https://www.certrec.com/blog/costs-and-benefits-of-extending-aging-nuclear-power-plants/. [Certrec is a leading provider of regulatory compliance and digital integration solutions for the energy industry, with the mission of helping ensure a stable, reliable, bulk electric supply. Since 1988, Certrec's innovation combined with industry expertise has helped hundreds of power-generating facilities manage their regulatory compliance with both the Nuclear Regulatory Commission (NRC) and North American Electric Reliability Corporation (NERC) and reduce their risks.] //MH

For several decades, nuclear power plants worked as a cornerstone of global energy strategies, providing reliable and carbon-free electricity to millions in the U.S. However, as many nuclear reactors approach the end of their initial design lives, questions arise about whether to decommission them or extend their operational lifespan. Aging nuclear power plants, though still a vital asset in many energy grids, face mounting challenges that require careful consideration. Extending the life of aging nuclear power plants involves a complex evaluation of costs, safety considerations, technological advancements, and socio-economic benefits. This decision-making process carries immense implications for energy security, climate goals, and financial investments. The Economic Rationale for Life Extension Projects The economics of extending the operational life of aging nuclear reactors is one of the primary drivers behind life extension projects. **Constructing new nuclear plants is a capital-intensive endeavor, often requiring billions of dollars and spanning a decade or more. In contrast, extending the life of an existing plant through life management programs, such as refurbishment and equipment upgrades, generally costs significantly less.** According to the International Atomic Energy Agency (IAEA), life extension projects can cost 25–50% of the expenses of building a new plant, making them a cost-effective solution for maintaining energy supply. Operational costs are another favorable factor. Aging nuclear plants often operate at lower marginal costs than alternative energy sources, especially fossil fuels. **With upgrades in key systems, such as steam generators, turbines, and safety measures, older plants can achieve higher efficiencies, further driving down costs.** However, these financial benefits come with upfront investments in safety assessments, regulatory compliance, and infrastructure modernization to meet evolving industry standards. Safety Upgrades and Regulatory Challenges Safety is paramount in any discussion about extending the lifespan of nuclear power plants. **Aging infrastructure poses increased risks, necessitating comprehensive safety evaluations and enhancements. Life extension projects typically involve extensive inspections, including assessments of reactor pressure vessels, containment systems, and cooling mechanisms to identify potential vulnerabilities.** Advanced nondestructive testing methods are often employed to detect micro-cracks, corrosion, and material degradation that might compromise safety during extended operations. Meeting regulatory requirements from the Nuclear Regulatory Commission (NRC) presents additional challenges. Governments and nuclear safety agencies like the NRC require rigorous assessments to ensure that extended operations do not compromise public health or the environment. This involves implementing post-Fukushima safety measures, such as improved flood protection, enhanced seismic resilience, and backup power systems. These safety upgrades, while necessary, can significantly increase the costs and time required for life extension projects. Social and Energy Security Implications The socio-economic and energy security implications of extending the life of nuclear plants are profound. **These plants provide thousands of high-paying jobs, from engineers and technicians to plant operators and support staff.** Life extension projects, which require extensive maintenance and upgrades, often create additional employment opportunities in the local community. On the energy security front, extending nuclear plant operations reduces dependence on imported fossil fuels and mitigates price volatility in energy markets. Countries with aging nuclear fleets, such as the United States, France, and Canada, view life extension as a strategic move to maintain energy independence and secure supply chains. Conclusion The decision to extend the life of aging nuclear power

plants is a multifaceted challenge involving economic, technical, environmental, and social considerations. While life extension offers significant benefits, including cost savings, enhanced energy security, and climate mitigation, it also demands substantial investments in safety upgrades, regulatory compliance, and public trust. By balancing these factors and leveraging advancements in nuclear technology, nations can ensure the safe and sustainable operation of nuclear power plants, paving the way for a cleaner and more secure energy future.

Two Subpoints - A) Accidents.

Accident risk peaks now. Dinneen 24

James **Dinneen**. "Can Aging U.S. Nuclear Power Plants Withstand More Extreme Weather?" Yale E360, **2024**. https://e360.yale.edu/digest/u.s.-nuclear-power-climate-change. [Yale Environment 360 is an online magazine offering opinion, analysis, reporting, and debate on global environmental issues. We feature original articles by scientists, journalists, environmentalists, academics, policymakers, and business people, as well as multimedia and a daily digest of major environmental news.] //MH

To reach its climate goals, the Biden administration aims to extend the lives of U.S. nuclear reactors. But a new report finds regulators have not studied whether increasingly extreme weather could threaten the safety or viability of power plants largely built in the 1970s and 1980s. On August 10, 2020 a powerful derecho windstorm blasted the Duane Arnold nuclear power plant in Iowa. Up to 130 mile-per-hour winds caused a power outage and knocked over the 50-year-old plant's wooden cooling towers, which triggered an automatic shutdown of the reactor and a switch to backup generators to power its cooling system. The U.S. Nuclear Regulatory Commission (NRC) concluded the plant's multiple layers of defense had avoided any risk of releasing radioactive material, but the reactor was never restarted. The plant had been slated to close, and its owner decided not to repair the damage. "A weather-related event prematurely and permanently shut down the Duane Arnold," says Jeff Mitman, a nuclear risk consultant and a former NRC engineer now involved in a campaign to highlight safety risks at aging nuclear plants. He points to Duane Arnold as an example of how such plants can be vulnerable to extreme natural hazards that may be exacerbated by climate change. The country's 54 nuclear power plants still in operation were designed to be resilient to numerous outside threats, including the most extreme weather-related events deemed feasible based on the historical record, and even beyond. **But most plants were built more than 40 years ago, and a new investigation finds these plants may yet be vulnerable to unprecedented hazards fueled by climate change, at a time when many experts say nuclear power is needed to keep emissions from fossil fuels in check. According to the report released earlier this month by the U.S. Government Accountability Office (GAO), the investigative arm of Congress, every nuclear plant in the country is located in an area where climate change is set to worsen flooding, heat, storms, wildfires, extreme cold, or some combination. However, it found that the NRC — which is responsible for U.S. nuclear safety — has not conducted the analyses necessary to know whether nuclear power plants are prepared for those changing conditions.** The report did not demonstrate that any plants are necessarily vulnerable to these hazards, which would require a plant-by-plant analysis. But it found the NRC has not adequately addressed whether more extreme weather could force plants to shut down or lower power output more frequently, or pose a safety risk.

Investment means improvement — solves the neg and outweighs on timeframe and scope. Rehm 23

Rehm 23 [Thomas E Rehm, American Institute of Chemical Engineers, 3-xx-2023, Advanced nuclear energy: the safest and most renewable clean energy, No Publication, https://www.sciencedirect.com/science/article/abs/pii/S2211339822000880, accessed 3-10-2025.] //aayush

Although legacy nuclear energy has been the safest form of electricity generation, it has been demonized as unsafe since the 1960s. The three well-known **nuclear accidents**, Three Mile Island, Chernobyl, and Fukushima, **were legacy nuclear designs**. **Even with the best safety record of all types of electricity generation, it is time to move away from legacy nuclear to reap the benefits of a truly renewable source of safe clean energy, advanced nuclear**. Solar and wind cannot hold a renewable candle to the vast renewable potential of advanced nuclear energy. **The transition to carbon-neutral energy can best be made with advanced nuclear, in safety,**

waste minimization, true renewability for thousands of years, process heat for manufacturing, and a viable means of replacing our chemical manufacturing dependence on fossil fuels. Some of my colleagues tell me, “There are few opportunities for chemical engineers in nuclear”. I disagree. **Opportunities include design and operation of high-temperature (550–750 °C) plants involving molten salts, liquid metal, and helium; application of this high-temperature capability for industrial process heating; recycling legacy nuclear ‘waste’ to provide fuel for advanced reactors; integration of the hydrogen economy into nuclear plant design and operation; improvement in moving pebble-bed advanced reactor technology; mining improvements for uranium and thorium, including mining uranium from seawater; molten salt storage systems for improving load following functionality and to provide process heat functionality; resolving corrosion challenges in molten salt reactors; and retrofitting existing oil-and-gas-based refineries to operate as nuclear biorefineries**.