Observation: Small modular reactors

- Subsidies go to SMRs if nuclear production increases
- Allow implementation for decades to come to reduce emissions

C1) Military stuff

- Small Modular reactors being deployed with military
- Military people have to find fuel
- Prevent fuel related deaths

C2) Building a Better r America

Kutak Rock, Department of Energy, "New DOE Report Examines How Incentives Used for Renewables Could Benefit Small Modular Reactors | Department of Energy", 11/13/2018, https://www.energy.gov/ne/articles/new-doe-report-examines-how-incentives-used-renewables-could-benefit-small-modular

According to a new report by the U.S. Department of Energy (DOE), the federal government provided more than $51 billion in incentives over the last decade to help deploy renewable technologies. The study also projects that if the same types of tax incentives and mandates were applied to small modular reactors (SMRs), **the government could see a return on investment that is three times less expensive per kilowatt-hour (KWh) than historical investments in wind and solar.** Renewables accounted for nearly half of the installed capacity in 2017 and are expected to be the fastest-growing energy source through 2040. As higher penetrations of renewables come online, new opportunities will emerge to help bring resilience and reliability to the grid—xsomething SMRs could meet as a flexible and carbon-free energy source. Download the full report The growth of renewables The new report—Examination of Federal Financial Assistance in the Renewable Energy Market— examines the financial support from the state, local and federal government that was used to spur the development of wind and solar. According to the study, the two technologies received $51.2 billion from 2005-2015 in the form of mandates, tax incentives, loans and research grants. Roughly 90% of that came in the form of subsidies, which included investment and production tax credits. As a result, solar capacity grew by nearly 78 megawatts over that time frame, with wind capacity adding more than 446,000 megawatts. Today, the two technologies currently produce about 8% of America's electricity and have created thousands of jobs for the economy. According to the U.S. Department of Labor, solar installers and wind technicians are expected to be the two fastest growing occupations in the United States through 2026. A future path for SMRs? **If these same incentives were applied to SMRs, the federal government could see another attractive return on its potential investment. SMRs are smaller and cheaper to build than traditional nuclear power plants, and can flexibly support renewables in meeting additional power demands on the grid. They are expected to come online within the decade but will need support as a new technology to help lower the cost of deployment. To make a meaningful impact, the new DOE report estimates about $10 billion in incentives would be needed to deploy 6 gigawatts of SMR capacity by 2035.** While both are attractive federal investments, in terms of spending per unit of power produced, the study projects that the investment per KWh delivered by SMRs would be three times less expensive given the same historical support for wind and solar.

Lieutenant General Dan Christman, War on the Rocks, "Mobile Nuclear Power Will Enable a Logistics Revolution for the Army - War on the Rocks", 11/15/2019, https://warontherocks.com/2019/11/mobile-nuclear-power-will-enable-a-logistics-revolution-for-the-army/

In today's wars, the United States has again learned that a long logistical "tail" creates vulnerabilities that its adversaries are able to exploit. Insurgents in Iraq perfected the art of the improvised explosive device attack against American and allied forces. Future adversaries will certainly also concentrate their attacks on fuel supplies as they know that America's military needs energy to fight effectively. And this energy demand will only grow. The Army of the future will require far more power even than today's Army. Directed-energy weapons, electromagnetic rail guns, electric vehicles, drones, and soldiers connected into a secure communications network will all require electric power. As an earlier War on the Rocks article showed, modern ground attack jets use more aviation fuel than propeller planes to do the same mission. There's even talk that the successor vehicles to the Army's tanks could be battery-electric powered. These weapons platforms promise an enhanced ability to protect the force and take the fight to the enemy even as they require more power. **On the battlefield, energy and technology act as "force multipliers" that allow American soldiers to be more lethal and less vulnerable. While weapons systems and information technology have revolutionized the battlefield, the military relies on the same petroleum-based liquid fuel system, delivered by pipelines, trucks, and ships, that Eisenhower was forced to rely on in 1944.** These limitations on the military were most notably recognized by Gen. Mattis after his 2003 run to Baghdad, when he declared, "unleash us from the tether of fuel." It is time for a change. **Energy needs of the future force will be mostly electrical, so the Army has a choice about how to power the force. It can generate that electrical power through the internal combustion engine — today's diesel generators — or it can generate power with advanced energy sources. Already, soldiers are recharging batteries with solar power, and advances in battery technology allow for lighter, more resilient energy storage. The Army needs more and better batteries. But to meet the higher energy needs of the next generation of weapons systems, the Army needs a generator that can dramatically increase the amount of tactical energy.** Only nuclear power can provide the energy density necessary to have both a small footprint and a low logistical tail. I**t is not an exaggeration to say that the deployment of mobile, micro nuclear power plants would revolutionize military logistics for the 21st century.** These new micro nuclear power plants would provide clean, safe, and secure power to the fighting force. In 2016, the Defense Science Board found that mobile, micro reactors would "fundamentally change the logistics of forward operating bases." **In 2018, the Army deputy chief of staff's report on mobile nuclear power plants for ground operations called these "a classic example of disruptive innovation." The number of fuel convoys would be drastically reduced, and possibly eliminated, if the Army's experiments with an all-electric brigade come to fruition.** The new designs for micro nuclear reactors are largely built on innovations first designed for space exploration, where having any form of backup diesel power is simply impossible. Instead of the traditional nuclear power plant requiring backup diesel power to ensure cooling in the case of an accident, these reactors are designed to be passively safe, cooled by the ambient environment. For example, Westinghouse's micro reactor design relies on heat pipes to eliminate the need for coolant pumps. Moreover, the reactors will be built already fueled. Once the fuel is spent, the mobile nature of the power plant means that the entire plant will be moved to a secure facility for long-term storage. The innovative new designs ensure that the Army would not have to rely on fuel shipped in from vulnerable convoys snaking across mountain passes.

Matthew Baker, American Security Project, "Small Modular Reactors: A Serious Solution or Another Nuclear Fantasy? American Security Project", 6/22/2012, https://www.americansecurityproject.org/do-small-modular-reactors-present-a-serious-option-for-the-militarys-energy-needs/

MRs differ from conventional nuclear reactors, which are capable of producing upward of 1,000MW, is that they are much smaller and cheaper. That makes them more capable of catering to our modern energy needs. **SMRs are able to be constructed in factories, with manufacturing capabilities already available in the United States. Their smaller size means that they require less construction time and can be deployed in areas that cannot accommodate conventional reactors.** Although still in the design stage, SMRs could support small townships and military bases once manufactured. The flexibility of the new technology is particularly important to the DESC audience because SMRs can support remote military bases. **The speakers at the DESC briefing suggested a surge is needed in SMR production to combat a major vulnerability in America's national security: possible attacks to the power grid. Such attacks could cause blackouts for over a year according to Congressman Bartlett, leading to blackouts never before experienced in the United States. In such an event the U.S. military would still need to function 24/7. Current predictions made by the DESC suggest that up to 90% of the US military's energy needs could be supplied by SMRs.** Congressman Bartlett also pointed out that current military bases such as **Guam – which is fueled by the transport of diesel – are extremely vulnerable should the energy transport system be disrupted. Fuel supplies are even more unstable in Afghanistan, where one out of every twenty-four convoys results in a casualty.** According to Congressman Bartlett, SMRs could make such bases energy self-sufficient.

Mark Thompson, Center for Defense Information, "A New Kind of Nuclear War", 4/16/2019, https://www.pogo.org/analysis/2019/04/a-new-kind-of-nuclear-war/

In the post-9/11 wars, the number of U.S. service members killed in action has been relatively low compared to earlier conflicts. But the Pentagon has been swapping blood for oil. "The increasing number of convoys required to transport an ever-increasing requirement for fossil fuels is itself a root cause of casualties, both wounded and killed in action," said a 2009 study by the consulting firm Deloitte. **"The use of IEDs and roadside bombs has been an especially effective means to disable friendly fighting forces by disrupting their supply of energy**." Backers of battlefield nuclear reactors are leveraging this fact to bolster their case that investing billions to develop and deploy reactors is worth it. And the Pentagon is trying to build support for the plan by noting that mini-nukes have heart-warming peaceful uses, too. "A small mobile nuclear reactor would enable a more rapid response during Humanitarian Assistance and Disaster Relief (HADR) operations," it said earlier this year in a "request for information" seeking outside help to develop portable atomic reactors for war zones. But, as they say on late-night TV, "But wait, there's more!" Think of it as atomic alchemy. "It is not just about basing, but warfighting capability enabled by the assured supply of energy," the 2016 report by the Pentagon's Defense Science Board said. According to the report, a battlefield polka-dotted with portable nuclear reactors could pretty much sustain itself. "Supplying liquid fuel and water to military forces is a significant sustainment challenge, as the two commodities typically comprise the majority of mass transported to deployed locations," the study said. "Yet both fuel and water—and potentially other supplies (e.g., munitions and spare parts)—could be produced close to where it is needed with the necessary industrial technologies that could be powered by nuclear energy." That makes military planners salivate. The Pentagon has been talking for decades about lasers and similar weapons that

would require mass quantities of electricity. Nuclear power could be the best choice to fuel such futuristic weapons, assuming they're ever produced. Getting fuel to remote bases is costly—as much as $50 per gallon when delivered by truck and $400 a gallon when delivered by air—which could render battlefield lasers even less likely than physics already does. "Energy intensive capabilities are under development for which there is no parallel development for power sources," that Defense Science Board report noted ominously. Smart taxpayers might wonder why. Prodded to act by that 2016 Defense Science Board study, the Pentagon launched "Project Dilithium" in January. (Dilithium is a molecule made up of a pair of lithium atoms, although it is perhaps more commonly known as a key element in a fictitious Star Trek superfuel that propels spaceships via a warp drive—faster than light.) The Pentagon wants a reactor capable of generating between 1 and 10 megawatts (enough for a base housing at least 1,000 troops for three years without refueling. Weighing no more than 40 tons, it must be "sized for transportability by truck, ship, and C-17 aircraft." And to avoid the problems posed by water-cooled reactors, it needs to be cooled by "ambient air," just like the original VW Beetle and its distinctive putt-putt engine. Such reactors would "fundamentally change the logistics of forward operating bases, both by making more energy available and by drastically simplifying the complex fuel logistical lines which currently support existing power generators operating mostly on diesel fuel," the Pentagon's Strategic Capabilities Office said in that January request seeking outside help. The unit will be "semiautonomous—Not requiring manned control by operators to ensure safe operation," the Pentagon says. Starting it up should take less than three days, and shutting it down should take no more than a week. Their basic design is as simple as nuclear power gets: as the reactor fuel decays, it generates heat that is then turned into electricity. The Pentagon plans on funding up to three designs before tapping a winner from among them. Other nations—Canada, China, and the United Kingdom—are also exploring such small reactors. Last fall, the Army climbed aboard the Pentagon's atomic bandwagon with a report that began with an unusual, standalone quote that sat like a hood ornament atop an M-1 tank. "Unleash us from the tether of fuel," the study began, quoting one "Gen. James Mattis, former commander of the 1st Marine Division, during the drive to Baghdad, March 2003"—and, coincidentally, you can bet, the sitting defense secretary when the Army published its report (although that, of course, the report did not mention). The Army report mainlined hype. "The return of nuclear power to the Army and DOD will have a significant impact on the Army, our allies, the international community, commercial power industry, and the nation," the report said. (Added bonus: militarized nuclear power would lead to "decreasing carbon dioxide emissions.") Then the Army overdid it. "A movement towards increased reliance on nuclear power from MNPP [mobile nuclear power plant] development, could spur worldwide jobs in high tech, electric utility, specialized manufacturing, and uranium mining industries," it said. "Additionally, the academic disciplines relating to nuclear power would be revitalized and once again become a source of professionals for the rest of the world. In sum, the social aspects of nuclear technology development would be deep and wide, and would enhance the economic prosperity of the nation." Whew! The panel learned firsthand how sensitive fossil-fuel casualties are inside the Pentagon. "Although the Task Force was discouraged from referencing convoy casualty factors which have been estimated in several reports, it is well-known that a significant number of casualties in Iraq and Afghanistan were associated with resupply logistics—much of which was attributed to fuel and water," the 2016 report noted. That was a deft use of the passive voice so the panel didn't have to say just who did the discouraging. **More than half the U.S. casualties between 2001 and 2010 in Afghanistan and Iraq happened during convoy operations (18,700 of 36,000, or 52 percent, according to a 2015 RAND**

Corporation report). An Army Environmental Policy Institute assessment estimated that there was nearly one U.S. casualty for every 24 fuel resupply missions. "Every 55,702 barrels of fuel burned in Afghanistan by the U.S. military forces corresponded to one casualty," according to an Army Technology analysis of the study's findings. The U.S. military, and those responsible for powering it, say it needs to stop bleeding for oil. "If a better way could be found to generate electricity at remote bases—that's what most of the fuel is used for—it could greatly reduce the risks to our military," Andy Erickson of the Los Alamos National Laboratory, home of the world's first nuclear bombs, noted last fall. He argued that a new kind of "micro-nuclear reactor" under development by Los Alamos and Westinghouse could help reduce the carnage. "The reactor core itself is about the size of the garbage can that you roll down to your curb each week," he said, offering a new vision of nuclear waste. "By working with an experienced nuclear vendor like Westinghouse to design, build, and test these units, a near-term solution to remote power for the military can be quickly realized."

Brad Plumer, Vox, "Nuclear power is dying. Can radical innovation save it? - Vox", 3/27/2017, https://www.vox.com/energy-and-environment/2017/3/27/15043522/nuclear-power-future-innovation

We can learn from the Koreans," writes Michael Shellenberger in a long recent essay on Toshiba/Westinghouse's woes. **To revive nuclear, countries and industry would need to likewise settle on a proven light-water reactor design and build it again and again to drive down costs — as opposed to the current situation, where countries like the United Kingdom are pursuing a welter of new designs.** Only once a global supply chain is reestablished will it be time to experiment with incremental new models. "Nations must work together to develop a long-term plan for new nuclear plant construction to achieve economies of scale," Shellenberger writes. "Such a plan would allow for certainty, learning-by-doing, cost declines and lower financing costs." It's a forceful call to action. Yet it's also clear that this would require sweeping policy and political shifts in many countries**. The US, for example, doesn't have a single state-owned utility like South Korea does — it has balkanized state electricity markets and deregulated utilities, which has made standardization and coordination on nuclear power far more difficult. This vision would also likely require significant government investment in nuclear, at least early on.** France's nuclear build-out, remember, was guided by the heavy hand of the state. Just as importantly, such a build-out would likely require changing public opinion about nuclear power in the United States, Europe, Japan, and elsewhere — overcoming long-standing (but often unfounded) concerns around radiation and waste. It would require persuading regulators that existing light-water reactor technology is already safe enough and shouldn't be bogged down by shifting requirements that drive up costs. It'd take too long to delve into all those issues here, and I won't hazard a guess as to whether these changes are feasible. But they're certainly daunting, which is why many nuclear advocates now think radical innovation is a better way forward…

- Reid Frazier, NPR, "As nuclear power loses ground to natural gas, environmentalists are torn: Are the risks worth saving it for climate's sake? | StateImpact Pennsylvania", 4/27/2018, https://stateimpact.npr.org/pennsylvania/2018/04/27/as-nuclear-power-loses-ground-to-natural-gas-environmentalists-are-torn-are-the-risks-worth-saving-it-for-climates-sake/
- n Pennsylvania and Ohio, four nuclear plants have said they are shutting down, years ahead of their scheduled retirement dates, unless they receive state aid. Those include Three Mile Island,

near Harrisburg, and Beaver Valley, in Shippingport, Pa., as well as the Davis-Besse and Perry plants in Ohio. If those plants close, that's bad news for climate hawks. "If your concern is about climate change and you view it as an urgent and perhaps even existential threat to human society, then you should be very concerned about the closure of nuclear power plants," said Jesse Jenkins, a Ph.D. candidate at MIT studying the electric grid**. That's because the power currently generated by soon-to-close nuclear plants will likely be replaced mainly by natural gas, which produces about half the carbon dioxide as coal. If nuclear plants close, emissions likely to rise Together, the four plants provide enough electricity to power 4 million homes. A recent industry-funded group found tshe plants provide more electricity than all the wind and solar in the PJM Interconnection, the electric grid that serves 65 million people in the mid-Atlantic region. The report estimates that replacing the four plants would produce the same amount of carbon pollution as 4.5 million more cars on the road.** "Each one of those nuclear power plants is a significant source of low carbon, emissions-free electricity, and losing each one is a significant step back at a time we should be making rapid progress towards a zero carbon energy system," Jenkins said. o stay in business, the owners of nuclear plants are turning to states and the federal government for help. FirstEnergy has asked the federal government to declare a grid emergency to keep its coal and nuclear plants running.But keeping these plants online might be difficult in an electricity market flooded by cheap natural gas. **Jenkins' research found that low natural gas prices were the main reason for the struggles of the nuclear industry.** New York and Illinois are subsidizing struggling nuclear plants through 'zero emissions credits' — subsidies that pay plants based on the amount of carbon pollution they save. Matt Wald, a spokesman with the Nuclear Energy Institute, an industry trade group, says the subsidies are necessary. "We are seeking to have the market recognize the things that we provide to the system," Wald said. "It doesn't do that now."

James Conca, Forbes , "U.S. CO2 Emissions Rise As Nuclear Power Plants Close", 1/16/2019, https://www.forbes.com/sites/jamesconca/2019/01/16/u-s-co2-emissions-rise-as-nuclear-power-plants-close/#39f81e8f7034

The politics are understandable, if misguided. But the costs are strange. Renewables are more costly than both gas and nuclear, but their 2.5 cent/kWh tax credit, plus state mandates and federal construction subsidies, seem warranted given the fears of climate change. Nuclear plants are only about a cent/kWh higher than gas so a subsidy, much smaller than that for renewables, is certainly warranted, and has been borne out by reality. The nuclear plants that have already closed in recent years include Crystal River, SONGS, Kewaunee, Vermont Yankee, Fort Calhoun and Oyster Creek**. These were replaced mainly by natural gas and imports to those states, adding about 25 million tons of CO2 annually. U.S. carbon emissions rose in 2018 by over 60 million tons of CO2. Closing those nuclear plants, building new gas plants, increasing manufacturing and construction, and increasing gasoline/diesel/jet fuel demand are the reasons for this rise. Increased renewables have not been able to keep up with any one of these effects. But what we are facing is bigger than this.** The additional 12 units that have been announced for closure presently avoid 55.5 million metric tons. This is why the state policies to recognize the value of nuclear plants matter – they can make a difference. The policies enacted in New York, Illinois, Connecticut and New Jersey are already saving 60 million metric tons per year (see figure below).

Peter Maloney, American Public Power Assoc. , "Small modular nuclear reactors cut costs for a diverse portfolio | American Public Power Association", 1/9/2019, https://www.publicpower.org/periodical/article/small-modular-nuclear-reactors-cut-costs-diverse-portfolio

NuScale Power is working with Utah Associated Municipal Power Systems (UAMPS) on the nation's first commercial small modular reactor project. Twelve small modular reactors will be installed in Idaho, each capable of delivering 60 megawatts of zero-emission energy. UAMPS plans to have the plant in operation by 2026. UAMPS is a public power joint action agency that provides wholesale electricity to more than 40 community-owned electric utilities in the Intermountain West. UAMPS in 2016 took a step forward in the development of its Carbon Free Power Project by identifying a preferred site within the boundary of the Department of Energy's Idaho National Laboratory near Idaho Falls. The site selection process was conducted in collaboration with the DOE. Another public power entity, Energy Northwest, has the option to operate the SMR plant. UAMPS says the Carbon Free Power Project helps it achieve two goal**s. It is cost effective and has zero emissions, so it will provide the flexibility to ramp up and down to support greater penetration of renewable resources while providing a hedge against higher natural gas prices.** Other elements of the Carbon Free Power Project include energy efficiency and distributed generation. UAMPS already has wind, hydro and distributed solar on its system, as well as aging coal plants that will need to be replaced. "They are looking for nuclear to be the foundation for that portfolio," Chris Colbert, chief strategy officer at NuScale, said. One of the problems with wind and solar power is that the power generated cannot be shifted effectively to be used when it is needed. The electrical output could be captured in batteries and discharged when needed, but "the MIT Report shows you would end up over building pretty dramatically," Colbert said. **Similarly, the intermittency of wind and solar power means that those facilities have to be sized to exceed expected demand. In terms of meeting load, a 1,000 MW nuclear plant is roughly equivalent to a 3,000 MW wind or solar plant, Colbert said. "If you don't have nuclear in your portfolio, the cost of decarbonization increases dramatically, by a factor of three or four times," he said citing the MIT Report. "Having some slice of nuclear makes renewables much more effective." Including nuclear power in a low carbon generation portfolio conforms with the findings of recent studies by researchers at Harvard University and MIT.** In a paper, "Climatic Impacts of Wind Power," published in the scientific journal Joule, authors Lee Miller and David Keith of Harvard found that while wind power reduces emissions overall, it also raises temperatures, particularly at night, because the turbine blades redistribute heat in the layers of the atmosphere. So, while wind power's overall environmental impact is less than fossil energy, it is not zero, the researchers concluded. In another paper, "Observation-based solar and wind power capacity factors and power densities," the same Harvard researchers found that other studies have underestimated the impact wind and solar power have on land use. Measuring the output of wind and solar plants, Miller and Keith found the current rate of electricity consumption would require 12% of the continental United States to be covered with wind turbines. Solar power, they found, has a higher power density, but it would still require 1% of the continental U.S. to be covered with solar panels. Nuclear power, on the other hand, is the densest form of power generation. In the MIT study, the authors found that nuclear power plays an important role in decarbonization. "The least-cost portfolios include an important share for nuclear, the magnitude of which significantly grows as the cost of nuclear drops," they wrote. They also acknowledged that uncontained costs have made the prospects of traditional nuclear power "decidedly dim in many parts of the world." The greatest promise for reducing capital

costs lies in advances in plant design, the MIT study's authors say. Among the recommendations they make are changes in how nuclear plant construction is handled, such as a shift away from field construction and a shift toward passive safety features. That is the approach taken by NuScale. NuScale's SMR design uses a passive safety feature that "vastly simplified the design," Colbert says. "It eliminates two-thirds of the systems and components in a typical large reactor." NuScale also has moved a lot of the work for its SMRs from the field to the factory. Steam supply and containment are all done in a factory. In all, Colbert said about 80% of the work on NuScale's SMR will be done in a factory. He said a rule of thumb in construction is "what takes one hour in a factory, takes three hours on site and eight hours in the hole," and less construction leads to lower prices. "People want clean energy, but first they want affordable energy," Colbert said. Under its arrangement with NuScale, UAMPS set a price to beat of $65 per MWh on a levelized cost of electricity basis. If the price goes above that, UAMPS can exit its contract with NuScale. For comparison, a new gas-fired, combined-cycle costs about $55 per MWh. Douglas Hunter, CEO & general manager of UAMPS, said NuScale's technology "is ideal for public power utilities given its small footprint and other favorable siting features, scalability, compatibility with other energy resources, and its competitive cost. Joint action agencies should consider development of a 12-module installation. It will allow their members that desire a clean portfolio to bring on 60 MW modules as needed for load. SMRs are also a great replacement for retiring coal plants.**" Like a gas plant, Colbert says NuScale's SMR design can provide the flexibility to ramp up and down to support the variability of wind power, but the nuclear plant also provides a hedge against the volatility of gas prices and fuel security by having a two-year supply of fuel on site.** The quest for secure, reliable and clean baseload power is still on. NuScale is working on providing that through SMRs.

- Jessica Lovering, World Nuclear News, "Viewpoint: Why the USA should partner with Africa to deploy advanced reactors : Perspectives - World Nuclear News", 1/11/2019, https://world-nuclear-news.org/Articles/Viewpoint-Why-the-USA-should-partner-with-Africa-t
- A small number of US and European companies are also working on extremely small modular reactors, or microreactors, which have capacities of 20 MWe or less and can operate for up to 10 years without refueling. The owners and operators of these reactors, sometimes dubbed "nuclear batteries," do not have to handle fueling or maintenance, thus making them suitable for African countries that lack a technical workforce with training in nuclear technology. Microreactors could also be a good option for off-grid industrial and mining operations, which are often the largest energy consumers in developing countries. Using already proven reactor technology, several companies are developing floating and stationary offshore nuclear plant designs, using either SMRs or traditional large LWRs mounted on vessels or offshore platforms. These nuclear plants have easier access to cooling water, and their location away from land makes them not subject to damage from hazards such as tsunamis and earthquakes, which could make them easier to license from a safety perspective. Yet another advanced design under development is the high-temperature gas reactor (HTGR). Because these reactors use gas rather than water as their primary coolant, they operate at much higher temperatures and thus much higher efficiencies, making them smaller and vastly reducing water demand. They also use a ceramic fuel that can withstand significantly higher temperatures, making a meltdown extremely unlikely. **African countries have expressed great interest in the potential use of such advanced reactor designs, but in interviews with representatives from state utilities and atomic energy agencies, they insist that they need proven technology. With no desire to be**

the world's guinea pig for untested nuclear technologies, these countries want the new reactors to be first built and operated successfully in their country of origin. Mutually beneficial partnerships Although advanced reactors hold great promise, the countries that dominate the African nuclear export market - overwhelmingly Russia and China - are offering only traditional LWRs. The world's other nuclear exporters - including the USA, Canada, and France, which dominated global exports historically - have minimal roles in Africa, if any. The USA's retreat from fostering nuclear power in Africa, or anywhere really, has been magnified of late with the bankruptcy of Westinghouse, which was the main US nuclear vendor bidding for projects abroad.

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- US nuclear suffering
- Benjamin Hulac, Roll Call, "Carbon-free nuclear power in a crisis just when it's most needed - Roll Call", 2/26/2020, https://www.rollcall.com/2020/02/26/carbon-free-nuclear-power-in-a-crisis-just-when-its-most-needed/
- But critics, including some investment analysts, say the outlook for growth in the industry is bleak. "We are definitely the most bearish on nuclear," says John Larsen, director at Rhodium Group, a research firm. Ten reactors are scheduled to power down by 2025 due to financial **pressures, deals with state governments, labor and environmental groups or a combination. Rhodium projected in a September note that as much as 75 percent of the U.S. fleet's capacity could be gone by 2030. Th**e nuclear industry does have its backers in Congress, notably Republicans Greg Walden of Oregon in the House and Lisa Murkowski of Alaska in the Senate, chairwoman of the Energy and Natural Resources Committee. She is sponsoring legislation (S 903) that would direct federal agencies to buy electricity from new reactors. "We once led the world in nuclear energy, but have surrendered that position to Russia and China," Murkowski says. "It is imperative that we reverse that trend and develop advanced nuclear technologies domestically." Walden, past chairman and current ranking member of the House Energy and Commerce Committee, recalls when he first won his congressional seat in 1998, nuclear was a politically toxic issue. Not anymore, he says. "Now you realize you better embrace it and help it along because it is going to be key to a sustainable supply of electricity, which, by the way, the world wants," Walden says. "There's a worldwide call to make sure that as you electrify you do it in the least polluting way possible," he says. "So there's a huge market out there." Still, Walden thinks the next 15 years or so are pivotal for the industry. "It's make or break," he says. The challenges are especially great in the U.S., where other clean energy sources are growing faster and becoming more cost-competitive than nuclear, says Devin Hartman of the R Street Institute, a conservative think tank. "This decade won't necessarily seal the fate of nuclear technology, but given cost declines and aggressive policy support for nuclear's competition, it will be an uphill battle in the domestic market to say the least," Hartman says.
- Lester Brown, Earth Polic Institute, "The Great Transition: Shifting from Fossil Fuels to Solar and Wind Energy", 2015, http://www.earth-policy.org/images/uploads/book_images/EPI_TGT-ch04.pdf
- Nuclear power, once lauded as an energy source that would be "too cheap to meter," is becoming too costly to use. For the world as a whole, nuclear power generation peaked in 2006 and dropped by more than 10 percent by 2013. In the United States—the country with the most reactors—nuclear generation peaked in 2010, then dropped by nearly 3 percent by 2014. In second-place France, nuclear output has dropped nearly 7 percent since peaking in 2005. Similar

declines can be seen in several other leading countries. These trends are likely to continue and even to accelerate as the world nuclear fleet ages and as solar- and wind-generated electricity comes online at a much lower cost than electricity from new nuclear plants. **The idea of using nuclear technology for peaceful purposes was brought to the fore with U.S. President Dwight D. Eisenhower's "Atoms for Peace" speech to the U.N. General Assembly in 1953. The 1960s and 1970s saw a boom in nuclear plant construction. Then new construction starts dropped sharply, and the worldwide growth in nuclear power generation slowed in the mid1980s. A**s a share of global electricity generation, nuclear 54 THE GREAT TRANSITION power reached nearly 18 percent in 1996. But by 2013, it accounted for less than 11 percent. Industry analysts Mycle Schneider and Antony Froggatt write in their annual World Nuclear Industry Status Report that the number of operating reactors worldwide peaked at 438 in 2002. By July 2014, the total had dropped to 388 reactors operating in 31 countries—with most of the decline coming from the massive closure of plants in Japan following the 2011 Fukushima accident. Of the world's remaining reactors, exactly 100 were in the United States. France came next, with 58 nuclear reactors, followed by Russia with 33 and South Korea, China, India, and Canada each with around 20. The other countries rounding out the top 10 were the United Kingdom, Ukraine, and Sweden.

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To keep some control of the spread of nuclear technology, President Eisenhower's 1953 program Atoms for Peace offered U.S. help to countries with interest in the civilian uses of nuclear energy. Under the program, reactors using highly enriched uranium were donated to a number of countries for research purposes and for industrial and medical applications. The rationale for such a move – stimulated by well-intentioned leading scientists in the United States, such as I. I. Rabi – was that the spread of nuclear technology was inevitable, so efforts should be made to restrict it to peaceful uses. **The United States, which then controlled the worldwide production of enriched uranium (besides the Soviet Union), established tight export control of sensitive nuclear materials. Of course, the program also had commercial motivations: it promised to create a market for nuclear equipment produced in the United States. Over the years, the United States and the Soviet Union exported hundreds of research reactors using highly enriched uranium to many developing countries.** Some of the spent fuel from the reactors was returned to the United States and the Soviet Union, and new shipments of fuel and other materials were closely monitored.

Tom DiChristopher, CNBC, "Trump aims to beat China and Russia in nuclear energy export race", 3/21/2019, https://www.cnbc.com/2019/03/21/trump-aims-to-beat-china-and-russia-in-nuclear-energy-export-race.html

o be sure, the Energy and Commerce departments actively facilitate U.S. nuclear cooperation with their foreign counterparts. But the State Department now intends to push the issue in talks at the highest levels of government, making it clear that Washington believes cooperation in the nuclear realm is central to its strategic relationships. **But even with the State Department lending its diplomatic heft, winning nuclear energy contracts won't be easy. Russia and China are aggressively pursuing those deals at a time when the U.S. has struggled to build reactors at home and no longer enriches uranium to fuel those facilities. "We have lost tremendous ground. We were once 90 percent of the market**

globally. We're down to 20 [percent] if we're lucky," Ed McGinnis, the Department of Energy's principal deputy assistant secretary for nuclear energy, said in an interview. "T**he majority of the big 80- to 100-year nuclear power deals being made overseas are Russian and Chinese and other state-owned corporations," said McGinnis, who has worked in government on nuclear energy and nonproliferation issues for 27 years. Rise of Russia and China The U.S. dominated nuclear energy exports decades ago, but faces stiff competition today, including from allies like France and South Korea. But it's the growing dominance of adversaries in Beijing and Moscow that worries the Trump administration and nonproliferation experts. China is building more reactors at home than any other country, and its state-owned nuclear companies are beginning to enter the international market in Pakistan, Argentina and the UK. Russia's Rosatom, already an established exporter, is providing reactors for plants in Eastern Europe, India, Bangladesh and Turkey. Russia is also changing the rules of the game by offering generous financing that makes nuclear energy affordable to more nations. Moscow is targeting non-nuclear states in the Middle East and Africa with a model to build, own and operate the plants.** The State Department intends to actively dissuade its partners from working with China and Russia, according to Christopher Ford, assistant secretary for international security and nonproliferation. Ford previewed that message last month at the Hudson Institute in Washington DC: "Russia and China also use reactor sales by their heavily state-supported nuclear industries as a geopolitical tool to deepen political relationships with partner countries, to foster energy dependence by foreign partners, and sometimes even to use predatory financing to lure foreign political leaderships into 'debt traps' that give Beijing or Moscow leverage that it can exploit later for geopolitical advantage."

Jose Goldemberg, AMERICAN ACADEMY OF ARTS & SCIENCES, "Nuclear energy in developing countries | American Academy of Arts and Sciences", 2009, https://www.amacad.org/publication/nuclear-energy-developing-countries

Despite the U.S. government's efforts to revive nuclear energy, the prospects for nuclear are not considered very bright in those countries that are part of the Organisation for Economic Co-operation and Development (OECD): the worldwide projections for 2030 by the International Atomic Energy Agency (IAEA) predict, essentially, zero growth in nuclear power generated in the period 2003–2030 from OECD countries.3 The hopes of a nuclear industry renaissance, therefore, lie almost exclusively in the non OECD countries, where the installed power is expected to grow from 57 to 132 gigawatts (a net addition of some 75 large nuclear reactors). The French company AREVA, with the active support of the French government, has been engaged in lobbying to sell reactors to a large number of developing countries around the world, at least 13 of which are in the Middle East. Presently only 7.5 percent of existing reactors are in non-OECD countries (mainly in China and India), and since most of them are small, the power generated by them represents only 4.3 percent of total nuclear-generated electricity. According to IAEA projections, this fraction will grow to 15 percent by 2030. **Recently, 50 developing countries4 that do not have nuclear reactors for electricity production expressed to the IAEA interest in acquiring their first nuclear power plant.** Such countries have a gross domestic product (GDP) ranging from US$6 billion (Haiti) to US$657 billion (Turkey) and electric grids ranging from 0.1 gigawatt (Haiti) to 31 gigawatts (Turkey).

James Hansen, Columbia U, "Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power", 2013, https://pubs.acs.org/doi/pdf/10.1021/es3051197

GHG Emissions. We calculate that world nuclear power generation prevented an average of 64 gigatonnes of CO2- equivalent (GtCO2-eq), or 17 GtC-eq, cumulative emissions from 1971 to 2009 (Figure 3a; see full range therein), with an average of 2.6 GtCO2-eq/year prevented annual emissions from 2000 to 2009 (range 2.4−2.8 GtCO2/year). Regional results are also shown in Figure 3a. Our global results are 7−14% lower than previous estimates8,9 that, among other differences, assumed all historical nuclear power would have been replaced only by coal, and 34% higher than in another study10 in which the methodology is not explained clearly enough to infer the basis for the differences. Given that cumulative and annual global fossil fuel CO2 emissions during the above periods were 840 GtCO2 and 27 GtCO2/year, respectively,11 our mean estimate for cumulative prevented emissions may not appear substantial; however, it is instructive to look at other quantitative comparisons. For instance, 64 GtCO2-eq amounts to the cumulative CO2 emissions from coal burning over approximately the past 35 years in the United States, 17 years in China, or 7 years in the top five CO2 emitters.11 Also, since a 500 MW coal-fired power plant typically emits 3 MtCO2/year,26 64 GtCO2-eq is equivalent to the cumulative lifetime emissions from almost 430 such plants, assuming an average plant lifetime of 50 years. It is therefore evident that, without global nuclear power generation in recent decades, near-term mitigation of anthropogenic climate change would pose a much greater challenge. **For the projection period 2010−2050, in the all coal case, an average of 150 and 240 GtCO2-eq cumulative global emissions are prevented by nuclear power for the low-end and high-end projections of IAEA,6 respectively. In the all gas case, an average of 80 and 130 GtCO2-eq emissions are prevented (see Figure 3b,c for full ranges).** Regional results are also shown in Figure 3b,c. These results also differ substantially from previous studies,9,10 largely due to differences in nuclear power projections (see the Supporting Information).

SOE US Nuclear Capacity Low in Squo

Todd Allen, Issues in Science and Technology, "How to Reinvigorate US Commercial Nuclear Energy | Issues in Science and Technology", 2018, https://issues.org/how-to-reinvigorate-us-commercial-nuclear-energy/

The global civil nuclear energy supply chain is a mature industrial enterprise servicing not only existing but a growing number of new markets. With an estimated value of $2.6 trillion over the coming 20 years, this supply chain includes new reactor development and construction, myriad fuel cycle services for existing reactors, power generation equipment, professional services, training, reactor life extension, and decommissioning services. Where once the market action was taking place mostly in the United States, now the markets are principally based elsewhere, with 440 commercial power reactors operating in 31 countries. **State-owned enterprises in Russia, China, and Korea provide the majority of new reactors,** with India gaining strength through its own domestic market. Flagship US technology providers are subsidiaries of foreign industrial giants or operate as closely aligned strategic partners. **Where once US industry held the vast majority of nuclear-qualified manufacturing (so called N-stamp certification**, issued by the American Society of Mechanical Engineers to indicate a level of quality assurance appropriate for nuclear applications, or similar quality certification), **it lost its majority in 2010**... The advanced reactors envisioned by today's US-based private-sector innovators are targeted to overcome many of the operational challenges of existing systems through the use of such features as passively safe designs, simpler system architectures, advanced monitoring and controls, and more robust nuclear fuels. They are also being designed to provide both baseload power to the electrical grid and zero greenhouse-gas process energy and electricity for growing industrial energy needs in the manufacture of

steel, fertilizer, bulk commodity chemicals, and other energy-intensive applications. These integrated systems are being designed to operate within a dynamic energy grid alongside fossil and renewable energy systems, and could provide new approaches to providing increasingly valuable grid stabilization services to help overcome intermittency challenges of wind and solar energy. For entrepreneurs, these new integrated systems provide avenues to dramatically expand global markets for nuclear energy. Our colleagues at Idaho National Laboratory have estimated the global market potential for nuclear could grow from a total of $2.6 trillion over 20 years to over $4 trillion if reactors were integrated as clean energy sources into industrial processes. **US innovators may hold a key competitive advantage in developing these integrated nuclear systems if research continues to mature in areas such as advanced catalysts**, high-temperature nuclear reactors, and other technologies that enable a more efficient use of nuclear-grade process heat for a variety of manufacturing industries. Such systems may provide the **differentiator that makes the next generation of US advanced reactors and services more desirable than the stand-alone electricity producing reactors that dominate production in the global market.**

Int. Financing Organizations don't finance nuclear power

PHYS, "World Bank says no money for nuclear power", 2013,
https://phys.org/news/2013-11-world-bank-money-nuclear-power.html

The World Bank and United Nations on Wednesday appealed for billions of dollars to provide electricity for the poorest nations but said there would be no investment in nuclear power. "We don't do nuclear energy," said World Bank president Jim Yong Kim as he and UN leader Ban Ki-moon outlined efforts to make sure all people have access to electricity by 2030.

Jessica Lovering, Carnegie Mellon, "Why the United States Should Partner With Africa to Deploy Advanced Reactors | Issues in Science and Technology", Winter 2019,
https://issues.org/why-the-united-states-should-partner-with-africa-to-deploy-advanced-reactors/?utm_

Yet the **United States still has an opportunity to help interested African nations overcome the obstacles to realizing their energy ambitions. Whereas Russia and China have large government investments in a few advanced nuclear technologies, the United States has a robust and thriving private sector for advanced nuclear development, drawing on both decades of public research and development and a high-tech investment ecosystem. From large national laboratories to small venture-backed start-ups, the United States has over 50 firms working on a diverse portfolio of advanced nuclear designs, many targeting smaller or niche markets. The US government should pave the way for advanced nuclear companies to market their products in Africa.** This means signing bilateral agreements much earlier with African nations sincerely interested in nuclear power, without which US nuclear companies will have trouble getting approval to collaborate, share information, or export nuclear technology with these nations. Unfortunately, the United States has tended to wait until a country wants to import a particular nuclear technology to sign bilateral agreements. Finally, the government should tackle one of the largest barriers to the development of nuclear power in newcomer countries: opposition from international financing institutions, including the World Bank, which have long-standing, explicit policies against funding nuclear power projects. The US government should lobby these institutions to change such policies in light of new technologies and business models. Small and advanced nuclear designs could actually be a better fit for sustainable development than many projects

that the institutions fund today. The United States has significant power in these organizations and should use it to effect change.

Hannah Thoburn, Reuters, "Russia building nuclear reactors - and influence - around the globe - Reuters", 5/1/2015, https://www.reuters.com/article/us-thoburn-nuclear/russia-building-nuclear-reactors-and-influence-around-the-globe-idUSKBN0NM36Z20150501

For all these reasons, competing against Russia and Rosatom has become increasingly difficult for Western corporations, which are steadily falling behind. France's Areva, for example, is in serious financial straits and must address recent revelations of technological problems with one of its reactor designs. **Westinghouse is hamstrung by Americans' reluctance to build new reactors. Foreign buyers often want to see how the reactor models they decide to build are running in a company's base, and Westinghouse has nothing to show them.** Japanese companies have been adversely affected by the 2011 meltdowns at the Fukushima power plant. Meanwhile, Rosatom, backed by the full power of the Putin government, is expanding its international reach and, in doing so, widening the scope of Russian power. As it has begun to do in other arenas - media and finance, for example - Europe and the United States must identify and counter Russian influence in the energy sphere. Sooner or later, Washington's and Brussels' instinct to ignore these challenges will not only seriously undermine Western businesses, it will also cede to Russia the international influence it so ardently seeks to purchase. Hannah Thoburn

L Holgate, The Washington Quarterly, "Sci-Hub | America Must Lead on Nuclear Energy to Maintain National Security. The Washington Quarterly, 41(2), 7–25 | 10.1080/0163660x.2018.1484223", 2018, https://sci-hub.tw/https://doi.org/10.1080/0163660X.2018.1484223

Unfortunately, nuclear energy's resurgence coincides with the United States' decline in the market. In 1953, President Dwight D. Eisenhower gave his "Atoms for Peace" speech to the United Nations, in which he advocated for an international agency to both control and promote the deployment of nuclear power for peaceful use. Shortly after, the International Atomic Energy Agency (IAEA) was founded, and Congress passed the Atomic Energy Act of 1954 declassifying U.S. reactor technology. From then until the 1990s, the United States benefited immensely as the world's leading nuclear technology supplier.13 First, domestic nuclear deployment provided long-term, high-paying jobs and helped the nation diversify away from fossil fuels, particularly after the 1973-1974 oil embargo. In addition, exporting nuclear reactors helped the United States develop critical diplomatic and economic links throughout Europe and the Asia-Pacific. **Westinghouse, then America's most successful nuclear company, built reactors in countries like Japan and South Korea, nations that later became self-reliant because of technology transfers.**

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In addition to domestic export controls, the United States has also been a strong advocate for nuclear security and nonproliferation in international fora. The U.S. strategy centers on limiting the commercial use of weapons-usable materials and preventing countries from misusing dual-use technologies. The United States helped create the Nuclear Suppliers Group (NSG), which coordinates national export policies regarding nuclear technology and materials and has been a strong supporter of the IAEA's nuclear security and safeguards roles. Non-nuclear-weapons states party to the Nuclear

Non-Proliferation Treaty (NPT) are required to regularly file detailed reports and allow international inspectors to visit nuclear facilities for verification that materials and facilities are not being used for weapons purposes. The Obama administration also initiated four Nuclear Security Summits (NSS), aimed at focusing leaders' attention on securing nuclear materials and preventing nuclear terrorism. The forum proved effective, inspiring hundreds of national pledges and dozens of group commitments describing specific steps to implement physical security upgrades, invite peer review of nuclear security, install nuclear detection equipment, and other critical security improvements. Nevertheless, exports underpin this multipronged approach—123 Agreements are only effective if countries import from the United States. **Even in international fora, it is unlikely that other countries will continue taking cues from the United States if it does not participate in global markets. U.S. nuclear influence is likely to continue to decline commensurate with exports.** Today, American companies account for only 13 percent of new reactor builds globally even including domestic reactor construction. **After Westinghouse completes two behind-schedule reactors in China, the U.S. share of the global nuclear exports will drop to zero. T**hose reactors aside, an American company has not completed a reactor abroad since the 1990s as seen in Figure 1. 14 Two factors led to the U.S. decline—ever-increasing regulatory requirements and a changing domestic energy landscape. As a result, nuclear construction costs skyrocketed in the United States while they stayed relatively the same or fell in other countries.15 These dynamics made it difficult to construct new reactors domestically, a precondition to exporting those same model

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Rosatom's dominance is also explained by its business model. The firm offers a Build, Own, and Operate (BOO) scheme, which means it will offer reactors to developing countries even if they cannot afford them. Under this model, **Rosatom would own the plant and provide the full range of services needed for nuclear power from construction and financing to maintenance and fuel removal. Although BOO schemes lower upfront costs and knowledge barriers, the process results in little transfer of technology or expertise to host nations and sets up significant regulatory challenges. Instead, the result is that import-countries are reliant on Russia for a substantial part of their energy needs including fuel, reactor operation, and spent fuel storage.** Rosatom's financing terms—so far, 49 percent to 90 percent of the total project cost— are generous, but also dangerous if countries are unable to repay.

Nabil Fahmy, Cairo Review of Global Affairs, "A Nuclear Curse and a Nuclear Blessing – The Cairo Review of Global Affairs", Fall 2019, https://www.thecairoreview.com/essays/a-nuclear-curse-and-a-nuclear-blessing/

The Russian reactors are not newer, cheaper, more advanced, or more efficient than their Western competitors. Indeed, buying from Russia's nuclear energy sector is not a better alternative, but arguably a worse one. The country's economy is hurting from international sanctions and low oil prices. Its operators have a terrible record of corruption and malfeasance. Also, its production capacity is overstretched. **Unable to produce more than one reactor per year, the Russians have nevertheless committed to nineteen reactors in fourteen nations. Even if Moscow remains committed to its nuclear projects, its customers are in for a rough ride. So far, Russia's reactors have taken twice as long to build, and cost double what was promised.**

Why, then, are countries playing this game with Russian nuclear companies, knowing full well that some projects will inevitably be delayed or terminated and even those that are not, will take more money and time than initially anticipated? The answer lies in the changing structure of the international system

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During the Cold War period, both the United States and the Soviets exported primarily to their allies. In some cases, they sold reactors to client states that did not even have the capacity to complete their construction—as happened when the United States built the Bataan plant in the Philippines and when the Soviets built the Juragua plant in Cuba. For countries whose loyalties were not perfectly clear, the crucial variable was whether they could afford buying from both sides. This was the case in a few states like India and Finland, who commissioned, in 1956 and 1977 respectively, reactors from both the United States and the Soviets. For those lacking the means to do so—Turkey and Egypt being two examples—nuclear power remained an elusive dream for decades.

The end of the Cold War brought about the United States' unipolar moment— and the **American nuclear industry's slow march to irrelevance as a confluence of factors from an oil-centric energy policy, to stringent regulation, to the shale gas revolution, and the falling cost of renewable technologies—made nuclear energy in the United States an ignored sector of the economy.**

In the past twenty years, by contrast, both Russia and China have come to consider nuclear energy and reactors a national priority. Chinese and Russian companies are directly controlled by the state and benefit from lavish spending on domestic projects, especially in the case of China whose insatiable hunger for energy has fueled a rapidly growing nuclear power industry. **The competitive disadvantage of the West, however, is only one side of the coin. The other side is that not only are Russia and China better positioned to sell their reactors but countries that had less interest in buying from the two nations are now actively courting them.** This is what political scientist Patricia Weitsman describes as "hedging". **As American power declines, weaker allies are stepping up their engagement with the United States' adversaries like Russia and China to gain strategic flexibility.**

Jennifer Gordon, Atlantic Council, "International co-financing of nuclear reactors between the United States and its allies - Atlantic Council", 1/9/2020,

https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/international-co-financing-of-nuclear-reactors-between-the-united-states-and-its-allies/

The World Nuclear Association has identified thirty countries as emerging markets for nuclear energy technologies, and most of the countries in question are not members of the OECD. The regions focused on acquiring civil nuclear capabilities include: Eastern Europe; the Middle East and North Africa; Western, Central, and Southern Africa; Central and South America; and East and Southeast Asia.52 Russia and China have identified these new markets as opportunities to expand their spheres of influence by forging diplomatic and economic relationships. However, nuclear commitments between Russia or China and third-party countries may lack the safety guarantees and nonproliferation standards that are integral to nuclear-export agreements made by the United States or its allies. Russia is playing an increasingly dominant role in exporting nuclear technologies around the world. In the early fall of 2019, Russia announced that it would build nuclear reactors in India and Rwanda, and a second reactor in Turkey.53 Russia's ability to finance new nuclear projects through its state-owned enterprises allows it to offer attractive financial terms to countries that are newcomers to the civil nuclear energy sector. **However, many purchasing countries choose their civil nuclear vendors based on geopolitical considerations, economics, and preferences for a particular nuclear technology. While financing from Russia and China may be more advantageous now, many countries still wish to build diplomatic ties with the United States, and would opt for nuclear partnerships with the United States and its allies.**5

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The United States has a number of federal institutions that are intended to provide financial support to new international nuclear exports, and which will need to be strengthened in order to cooperate fully with US allies on co-financing schemes. These include the Export-Import Bank, the Overseas Private Investment Corporation (OPIC)—now reorganized into the US International Development Finance Corporation (USDFC)—and a whole-of-government approach that has been termed "Team USA**." However, many of these institutions have suffered in recent years, and whether the United States can become a competitive exporter of nuclear technologies depends, in large part, on whether these institutions can be empowered and made more effective. Furthermore, domestic nuclear technology—even if encouraged through legislation like the Nuclear Energy Innovation and Modernization Act (NEIMA), the Nuclear Energy Innovation Capabilities Act (NEICA), and the Nuclear Energy Leadership Act (NELA)—will be stymied on the international stage without support from financial institutions like the US Export-Import Bank.62 There are strong links between domestic progress in nuclear energy technologies and the ability of the United States to conduct a robust nuclear energy export program.** The importance of streamlining domestic policy toward nuclear innovation and foreign policy toward nuclear exports cannot be overstated.

Solve EP [Ramtanu **Maitra**, currently South Asian Analyst at EIR News Services Inc, Associate Editor at 21st Century Science and Technology, intelligence analyst at EIR News Service, BE in civil engineering from Bengal Engineering and Science University, MS in engineering from Cooper Union for the Advancement of Science and Arts, "Expand Nuclear Power for the World's Survival", July 25 ,2014, http://www.larouchepub.com/other/2014/4129expand_nuclear.html] // t-haas **Over 1.2 billion**

people—20% of the world's population—are today without access to electricity, and almost all of them live in developing countries. This includes about 550 million in Africa and over 400 million in India. **It is incumbent upon all the world leaders to bring this number to zero at the earliest possible date, and thus provide these people with a future to look forward to within a span of 25 years**. Can this be done with fossil fuels, wind, and solar power? The answer is a resounding "No!" **The only way world can meet the power requirements of one and all is by fully exploiting the highest energy-flux density power generation achieved through nuclear fission now**, and by starting to move to an even higher level by using hydrogen as fuel in generating power through nuclear fusion.

Jason Burke, The Guardian, "Russia pushing 'unsuitable' nuclear power in Africa, critics claim | World news | The Guardian", 8/28/2019, https://www.theguardian.com/world/2019/aug/28/russia-pushing-unsuitable-nuclear-power-in-africa-critics-claim

Experts pointed out that no nuclear projects have been finished and only two contracts – in Egypt and Nigeria – are in place. "These projects are far into the future, but Russia and Rosatom have been actively wooing African states," said Schepers. "It is very profitable for them [because it] creates jobs at home and a decades-long relationships." Advertisement Selling nuclear technology is part of an effort by Russia to build influence, power and trade across Africa, with growing involvement in nations across the continent. The involvement of Russian mercenaries in the Central African Republic and Sudan has attracted significant attention, as has an apparent effort to influence elections in South Africa in May. Many of the African countries that have signed commercial agreements of the kind being pursued by Rosatom are run by movements or individuals who have long-standing relationships with Russia or – more often – the USSR. In early April João Lourenço, the president of Angola, visited Moscow for talks with Vladimir Putin and top officials, to discuss arms sales, diamond mining, and gas and oil production. Russia delivered six Su-30K fighter jets to Angola this year and two more are expected in the second part of a billion-dollar deal.

Morgana Wingard, ShareAmerica, "How U.S. aid avoids 'debt-trap diplomacy'", 3/12/2019, https://www.eenews.net/assets/2019/05/28/document_ew_01.pdf

id isn't really aid if it's used to hire donor-country workers. One example: Nearly three-quarters of the laborers who constructed Angola's Ombaka National Stadium were imported from China. In Cameroon, half the workers on a major port reconstruction hailed from China. Locals were not trained in engineering and other skills for high-value positions on the project. Even less-skilled positions such as truck drivers were filled by Chinese workers**. By contrast, consider how the U.S. structured the Power Africa program. Power Africa is a true partnership, working to add 60 million new home and business connections to Africa's power grid. U.S. and private firms provide the financing to build the new electricity projects, but local workers are hired to do the work.** Osike Kenneth of Uganda said working on a solar plant helped his family through a 2016 famine. "Because I was working in the solar project, I was able to feed my family," the 24-year-old said. Two Power Africa projects bringing reliable electricity to Senegal should create more than 68,000 jobs and grow the economy by $400 million, according to recent studies. Administrator Green celebrated Power Africa's multidimensional partnerships in a March event, highlighting an electricity project in Ghana. General Electric and Endeavor Energy are building the plant, which will supply about a fifth of the country's power. U.S. government agencies are providing technical assistance and finance. The result? "Citizens being employed, communities being connected and Ghana charging ahead in its journey to self-reliance and prosperity," Green said. Transparency Without anticorruption measures, aid can create economic distortion, according to James

Roberts of the Heritage Foundation. “It reinforces instead of fixing the problems that undermine sustainable development — including corruption.” That’s why U.S. aid programs include safeguards that allow people anywhere to follow the money. The U.S. government makes public all of its program data since 1946 through the Foreign Aid Explorer. This “dashboard” of U.S. assistance presents decades of accurate data in understandable terms. The U.S. government also provides detailed foreign-assistance transaction data from 2006 to the present at Foreignassistance.gov. Geoffrey Chongo of Zambia said transparency was crucial in starting up a $30 million electricity project in a community of 100,000. Four years after obtaining assistance, the government hadn’t started work. Community leaders spoke out. “They became passionate, to just find out where their money had gone. Government had to respond,” Chongo said. Transparency also lets countries coordinate efforts to make development assistance more effective. Green said that each sector — the public sector and the private sector — playing by the rules and doing what it does best, is key to prosperity for all. “This is Africa’s time, but only if all of us here work together.”

James Osborne, Houston Chronicle, "With rise of Russian and Chinese reactors, Perry fights to keep U.S. nuclear sector alive", 3/21/2018, https://outline.com/75Syzb

Competing with Russia and China would mean reviving a U.S. nuclear power industry that remains a shell of what it was in the 1970s. Following a partial meltdown at the Three Mile Island nuclear power plant in 1979, the Nuclear Regulatory Commission did not approve the construction of another reactor until 2012. And with the flood of cheap natural gas and vastly improved wind and solar energy technology, the outlook here for building massive 2,500 megawatt nuclear plants, which can now cost more than $20 billion to build, is bleak. Westinghouse declared bankruptcy last year after construction on plants in Georgia and South Carolina went wildly over budget. Construction on the South Carolina plant was shut down by the state-owned public utility last year. But the Trump administration remains bullish on nuclear power, extending the terms of a federal loans to keep the Georgia project going and helping preserve a tax break for the development of next generation nuclear technology. Trump is eager to make the United States a leader in a business that is expected to grow quickly in the decades ahead, as countries like China and India try to clean up air pollution by shifting away from coal and climate change regulation spreads around the globe, analysts said. **In the United States, the focus is turning to smaller, mass-produced reactors that can be assembled on site and theoretically allow nuclear power plants to get built more quickly and cheaply than traditional projects. N**uscale Power, whose largest investor is the Texas industrial giant Fluor, is testing a 50-megawatt reactor that is only 15-feet in diameter and requires no outside water or power supply, theoretically making it able to avoid meltdowns such as the one experienced by the Fukushima nuclear power plant in Japan following a tsunami in 2011. While the company hopes to one day build in the United States, it is focused on winning work in Saudi Arabia and other countries, where interest in a new generation of nuclear plants is growing.

James Conca, Forbes, "The Global Nuclear Landscape Is Changing And America Better Get On Board", 5/19/2017, https://www.forbes.com/sites/jamesconca/2017/05/19/the-global-nuclear-landscape-is-changing-and-america-better-get-on-board/#53bc99e973d4

The global market for nuclear reactors is at least $75 billion per year, even more if you include lucrative fuel and maintenance contracts (see figure). American products use to dominate this sector, but Russia,

Korea, and China have passed us. **The U.S. could easily compete for these billion-dollar contracts using advanced reactors. This would employ tens of thousands of American engineers, manufacturers, and tradesmen, and open up entirely new markets for the United States. But only if we move fast to finish development and construction of these new designs.** Advanced reactors are key to this effort because they simultaneously solve the problems of safety, security and cost. We have led the development of international non-proliferation standards but as our global market share dwindles, so too does our ability to influence agreements that effect national and international security. The U.S. must reprioritize American nuclear exports as a key element of its domestic and foreign policy. We need to re-establish leadership in civilian nuclear power in Washington D.C., provide new financing tools for civilian nuclear exports, and invest in innovative nuclear technologies.

Russian Ties w/State Makes Countries Hesitent

The Economist, "Atoms for peace - The world relies on Russia to build its nuclear power plants | Europe | The Economist", 2018, https://www.economist.com/europe/2018/08/02/the-world-relies-on-russia-to-build-its-nuclear-power-plants

Once completed, the plants offer an obvious diplomatic lever in the form of sway over a large portion of a country's electricity-generation capacity. In theory Russia might threaten to raise the price of uranium, or simply to close a reactor operated by Rosatom. The relationship between exporter and customer is particularly close in a nuclear plant's early years, when local employees are still being trained and the exporting country is directly involved in the plant's operation. The threat is especially potent in countries where a new nuclear plant represents a significant share of the electricity supply. Rooppur, the Russian-built nuclear-power station in Bangladesh, for instance, will provide 2,400 megawatts, accounting for 15% of total generation capacity. Vulnerable countries have long grown accustomed to Russia's habit of wielding energy as a geopolitical weapon. **Ultimatums over gas supplies were once a regular feature of eastern European winters, but lately the threat has grown more sophisticated. In 2015 Russia launched a cyber-assault on Ukraine's electrical transmission system. Last week America's department of homeland security said that Russia's military intelligence agency had hacked into the control rooms of American power plants.** Cautious hosts might be forgiven for wondering whether their new Russian nuclear plants come with back doors that would enable similar attacks. Still, Agneta Rising, director general of the World Nuclear Association, says that geopolitics tends not to complicate Rosatom's export plans. Any influence the Kremlin can exert through its plants is limited by the supervision of the International Atomic Energy Agency. Rosatom's influence weakens over time, because customers typically insist that it trains local engineers to run their plants. Customers can source their nuclear fuel elsewhere. **And Russian potential mischief-making would spook buyers in other countries.** Yet **concerns persist**. **In 2017 a South African court blocked a $76bn deal with Rosatom that had been secretly brokered between Presidents Jacob Zuma and Vladimir Putin. Closer to home, this year Rosatom started building a reactor in Hungary months after Mr Putin was warmly received in Budapest by Viktor Orban, Hungary's prime minister. The**

deal is financed by a €10bn ($11.6bn) loan from Russia, and Rosatom will operate the plant and supply its fuel. That prompts fears that Russia could use the plant as diplomatic leverage.

Christopher Helman, Forbes, "For U.S. Military, More Oil Means More Death", 11/12/2009, https://www.forbes.com/2009/11/12/fuel-military-afghanistan-iraq-business-energy-military.html#72431e0f4562

If President Obama decides to send another 20,000 soldiers to Afghanistan, the Department of Defense will also have to figure out how to send along another half-million gallons of fuel a day to support them. Since the end of World War II, the use of petroleum-based fuels has risen 175% to 22 gallons per solider per day. In 2008 U.S. forces in Iraq and Afghanistan burned through 25 million barrels of oil. It's more than a conservation issue. More fuel consumption correlates directly to more deaths. So asserts a new report by Deloitte Consulting on the military's energy security. "The biggest game changer for reducing casualties is reduction in convoys," says retired Air Force General Charles Wald, the lead author of the report. Fuel convoys are easy targets for roadside bombs, which have accounted for nearly half of American deaths in Iraq and almost 40% of deaths in Afghanistan. Even though convoys are the big culprit, the Deloitte report calls for a concerted effort to reduce petroleum consumption and adopt renewable and green energy alternatives across the entire military. Though this recommendation may be in line with green politics, it doesn't seem quite right.