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OPINION – Hossein Mousavian

Iran Didn't Ask for this Crisis, but it Won't Stand for Trump's Bullying

In May 2018, the Trump administration unilaterally withdrew from the JCPOA, which was designed to prevent Iran from acquiring a nuclear weapon and had been agreed on after 12 years of exhaustive negotiations.

The US began to impose new economic and political sanctions, targeting not just various sectors of the Iranian economy, but the state's most influential entities and actors. The imposition of these sanctions has virtually killed off the possibility of diplomatic efforts to resolve the crisis and will have political consequences for not just Iran and the US, but the whole region. The current situation is extremely fraught, with Iran responding to aggressive actions by increasing its level of uranium enrichment. The re-emergence of hostility between Iran and the US – after a period of detente under Barack Obama – is one of the most urgent challenges to peace and security in the Middle East. And yet Trump's belligerent policies have all but blocked conventional channels of diplomacy.

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The re-emergence of hostility between Iran and the US – after a period of detente under Barack Obama – is one of the most urgent challenges to peace and security in the Middle East. And yet Trump's belligerent policies have all but blocked conventional channels of diplomacy. For one thing, cooperation requires dialogue between the countries' respective military establishments in the region.

establishments in the region. US Central Command (Centcom) and Iran's revolutionary guard corps' Quds force are both responsible for their countries' extraterritorial operations. The IRGC's designation as a terrorist organisation – and Iran's reciprocation against Centcom – has ended the possibility of negotiation between these two extremely influential state entities.

Next, in an unprecedentedly aggressive action, the Trump administration has imposed sanctions on Iran's ultimate source of authority according to its constitution, namely the supreme leader Ayatollah Ali Khamenei. Just as in the US

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the president has the authority to determine the general trajectory of foreign policy, the supreme leader in Iran is the one who sets the foreign policy of that country. Let's not forget it was the supreme leader who allowed direct negotiation with the US over the nuclear issue in the first place. By sanctioning Ali Khamenei, Trump has effectively killed off any chance of diplomatic rapprochement so long as he is in office. And it is not only the political leadership of Ali Khamenei that is relevant here; he is also a religious scholar with millions of Shia Muslim followers – not just in Iran, but Iraq, Pakistan, Afghanistan, India, Bahrain and elsewhere.

In addition, last week, the treasury secretary Steven Mnuchin said the Trump administration was looking to levy penalties against Iran's foreign minister, Javad Zarif, who trained in the US and is one of the most distinguished career diplomats in Iran's recent history. Zarif has been compared to the popular prime minister Mohammad Mossadegh, who nationalised Iran's oil industry and was deposed in 1953 in a coup organised by Britain and the US. Sanctioning Zarif is a mistake if the US ever wants to reengage with Iran, because he is in charge of the diplomatic channels that would be necessary to resolve this crisis. As Wendy Sherman, who led the US negotiating team in the talks that led to the 2015 accord, put it: "I can't think of anything that makes less sense than sanctioning a key person who might actually be helpful if there is ever a dialogue with the US."

The Iran nuclear deal is the most comprehensive agreement in the history of non-proliferation. As part of it, Iran accepted the most intrusive transparency measures and stringent limits on a nuclear programme ever demanded of a non-proliferation treaty member. What is more, the IAEA recently judged that Iran was in full compliance with the terms and conditions of the JCPOA.

But where Iran has kept its end of the bargain, it has been rewarded with sanctions and additional pressure, and the benefits Iran was supposed to receive have been suddenly snatched away. The Trump administration made a decision to undermine the diplomatic legacy of Obama, but it may not have fully understood that in doing so it would also be obliterating any possibility of brokering its own diplomatic solution.

Trump has consistently offered to talk to Iranian officials, but his actions have been by far the most belligerent since the 1979 revolution. Deploying these phony, rhetorical offers of talks at the same time as imposing devastating sanctions is not a strategy that will make Iran yield. Iran warned world powers in advance that if the other parties failed to meet their commitments, it would begin to reduce its obligations under the

It will enrich uranium above the 3.67% limit specified by the deal. In addition, the Iranian president, Hassan Rouhani, has told his cabinet that the Arak reactor will be restored to its original design which, it was claimed, would be able to produce plutonium. It is crucial to note that this is the first time Iran has contravened the JCPOA.

JCPOA. As a first step, over the past few days, it exceeded the 300kg limit on its uranium stockpiles. It has now also announced it will enrich uranium above the 3.67% limit specified by the deal. In addition, the Iranian president, Hassan Rouhani, has told his cabinet that the Arak reactor will be restored to its original design which, it was claimed, would be able to produce plutonium. It is crucial to note that this is the first time Iran has contravened the JCPOA. Ever since the Trump administration withdrew last year, Iran has been patiently waiting for the other parties involved in the nuclear agreement to honour their commitments, but the only outcome was the intensifying of pressures and sanctions. Iran cannot be expected to fully comply with the deal when others are failing to meet their obligations.

Trump single-handedly undid 12 years of intensive negotiations between Iran and world powers by withdrawing from the nuclear deal. He chose the dangerous path of hostile policies and actions and has increased the likelihood of yet another disastrous conflict in the Middle East. He

does appear to recognise that a military confrontation with Iran would be catastrophic in every possible way. But he should also realise the fact that Iran will never give in to bullying. If Trump genuinely wants to resolve this unnecessary, self-imposed crisis, he needs to make a swift strategic turnaround, one that would allow both countries to save face. Only then would credible diplomacy become possible once more.

Source: <https://www.theguardian.com/>, 07 July 2019.

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OPINION – World Nuclear News

Building a Belief in Nuclear, Financially and Emotionally

There are two misleading narratives about nuclear energy: one, that it is the sole answer to tomorrow's energy and climate challenges; the other, that it could - and perhaps even should - disappear entirely. The truth is of course somewhere between the two - but what's certain is that nuclear, like every sector of the energy industry, must earn its place in the energy mix of the future, writes Rob Whittleston, VP of Insight at the UK's National Nuclear Laboratory. If we are to achieve our global decarbonisation targets by 2050, we need the resilient and sustainable source of low-carbon electricity that nuclear provides. While everyone should welcome the strides in efficiency and competitiveness made by the renewables sector, wind and solar remain intermittent sources of energy - and storage technologies still have a long way to develop.

The IPCC recently highlighted that in order to achieve the 1.5°C target by 2050, nuclear's share of electricity generation would very likely need to increase in almost any scenario. Public perception of nuclear does not always tally with the important role it needs to play, however. Nuclear technology remains emotive and controversial in some countries, and public pressure can ultimately move policy, as has been seen in Germany, which is abandoning nuclear generation entirely.

Nuclear energy is the most prevalent source of electricity generation in the EU - it contributes a quarter of the EU power mix, followed by coal (21%) and gas (20%). It's also by far the largest low-carbon provider of power ahead of wind (11%), hydro (10%) and solar (4%). Overall, nuclear accounts for half of the low-carbon electricity generated in the EU. Without nuclear we would be forced to rely on higher-carbon and less sustainable alternatives. This would make it much harder to

honour the Paris Agreement on climate change and keep the increase in global average temperature to well below 2°C above pre-industrial levels. In fact, the IPCC recently highlighted that in order to achieve the 1.5°C target by 2050, nuclear's share of electricity generation would very likely need to increase in almost any scenario. Public perception of nuclear does not always tally with the important role it needs to play, however. Nuclear technology remains emotive and controversial in some countries, and public pressure can ultimately move policy, as has been seen in Germany, which is abandoning nuclear generation entirely, despite the impact this has on its ability to meet CO2 reduction targets.

Delivering Projects, on Time and to Budget:

The nuclear industry is also susceptible to wavering investor confidence, as has been evident recently in the UK. Nuclear plants are exceptionally large and long-term investments, so private-sector investors set the bar very high when it comes to incentives and the reassurances they need before making final investment decisions. When Hitachi suspended work on its Wylfa

Newydd project, it cited the size of the financial burden as one of the main factors, while the high cost of Hinkley Point has, in part, been explained by the fact that EDF could only borrow capital funding at high interest rates. That's because this project is deemed 'risky', and well over half the cost was attributed to raising the money over the lifetime of the project.

Following the publication of the UK National Infrastructure Assessment last year, these high borrowing costs for nuclear have come into even sharper focus. This report recommended that the Government restrict support to "one more nuclear plant before 2025" as the costs of renewable technologies were "far more likely to fall, and at a faster rate". Delays and cost increases don't help public perception. It only takes a glance at the transport sector to see that when large infrastructure projects run late or over budget, criticism can be directed at government as well as at industry players. It would be a painful irony - just as the urgent need to tackle climate change is finally being recognised by the public and by parliaments - if a vital part of any action plan aimed at seriously addressing the challenge is ruled out because of a lack of will to overcome procedural obstacles. It's our responsibility as an industry to work together to change perceptions and provide stakeholders with the confidence that nuclear projects will be delivered on time and to cost, and to set out the evidence that demonstrates why nuclear energy must form part of the future energy mix. If we can't do this then the trust simply won't be there, and neither will the investment.

Collaboration and a Commercial Focus: Collaboration will be key to proving the value of nuclear investment. The industry, regulators and researchers must work together to become more astute on everything from technology, supply chain and financial management to culture and leadership - providing more compelling and commercially minded projections that will inspire investor confidence.

That collaboration is happening, but it needs to happen quicker - and globally. That's why we're working alongside other leading industry bodies

including Korea Hydro and Nuclear Power, the Electric Power Research Institute, the International Atomic Energy Agency and the Organisation for Economic Co-operation and Development's Nuclear Energy Agency to deliver events like the Innovation for the Future of Nuclear Energy - A Global Forum, which took place in Korea last month....

Present a More Positive Future: There are many exciting possibilities for nuclear, from innovation in waste management and recycling to the emergence of small modular reactors. But, in order to realise this future, the industry has some short-term hurdles that it must overcome. And in particular we must drive efficiencies into existing programmes and onto existing plants.... But can we work together to drive transformative change and help persuade all those who will need to invest in its future, both emotionally and financially, to believe in it too?

Source: <http://world-nuclear-news.org>, 08 July 2019.

PRESS STATEMENT: Micheal R Pompeo

US Calls on Iran to Halt All Uranium Enrichment

The Iranian regime has taken new steps to advance its nuclear ambitions. The world's leading state sponsor of terrorism continues to use its nuclear program to extort the international community and threaten regional security. No nuclear deal should ever allow the Iranian regime to enrich uranium at any level. Starting in 2006, the United Nations Security Council passed six resolutions requiring the regime to suspend all enrichment and reprocessing activity. It was the right standard then; it is the right standard now. The Trump Administration calls on the international community to restore the longstanding nonproliferation standard of no enrichment for Iran's nuclear program. Iran has the uncontested ability to pursue peaceful nuclear energy without domestic enrichment.

The Iranian regime, armed with nuclear weapons, would pose an even greater danger to the region and to the world. The United States is committed

to negotiating a new and comprehensive deal with the Iranian regime to resolve its threats to international peace and security. As long as Iran continues to reject diplomacy and expand its nuclear program, the economic pressure and diplomatic isolation will intensify.

Source: <https://www.state.gov>, 01 July 2019.

NUCLEAR STRATEGY

USA

The Pentagon Revealed its Nuclear War Strategy and its Terrifying

'The United States has always sought to use its nuclear weapons for more than deterrence despite protestations to the contrary.' The Pentagon published the "Doctrine for Joint Nuclear Operations" on the Joint Chiefs of Staff's website last week, then pulled the document. The 60 page paper is a look at how the Pentagon views nuclear weapons, the circumstances under which it might use them, and how it might fight after a nuclear detonation. The "Doctrine for Joint Nuclear Operations" vanished from the Joint Chiefs website, but not before the Federation of American Scientists (FAS)—a non-profit that uses science to study national and international security threats—archived it.

Nuclear war policy is terrifying. These weapons have the power to destroy all life on Earth, but the Pentagon has thought long and hard about how to deploy these weapons in smaller engagements. The leaked document is just further proof of that. "There is plenty of goofy shit in there, but I should note that it's the same goofy shit that has underpinned nuclear strategy for decades, just without the good sense to gloss over certain

things," Jeffrey Lewis, Director of the East Asia Nonproliferation Project at the Middlebury Institute of International Studies, said in an email. "This Administration insists on saying the quiet part out loud."

"Integration of nuclear weapons employment with conventional and special operations forces is essential to the success of any mission or operation," the document said. The United States doesn't have a "no first use" policy when it comes to nuclear weapons and—according to the "Doctrine for Joint Nuclear Operations"—the

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US is prepared to use nukes in ways typically reserved for conventional munitions. A section of the document titled "Nuclear Operations" detailed what war might look like in a post-nuclear detonation world. "The spectrum of nuclear warfare may range from tactical application, to limited regional use, to global employment by friendly forces and/or enemies," the document said. "Employment of nuclear weapons can radically alter or accelerate the course of a campaign. A nuclear weapon could be brought into the campaign as a result of perceived failure in a conventional campaign, potential loss of control or regime, or to escalate the conflict to sue for peace on more-favorable terms."

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Continuing the theme of turning nuclear weapons into everyday-use weapons, the document also suggests that commanders in the field could suggest nuclear targets. "The [military commanders] can nominate potential targets to consider for nuclear options that would support [military commander's] objectives in ongoing operations," the document said. "The United States has always sought to use its nuclear weapons for more than deterrence despite

protestations to the contrary," Martin Pfeiffer, a PhD candidate at the University of New Mexico who studies the culture of nuclear weapons, told me over Twitter. "[The document is] a continuation of long-standing beliefs in United States's thinking about the nigh-magical fungibility and compellent power of nuclear weapons."

"The United States plans to use nuclear weapons in a broad range of scenarios and against a broad range of targets even when conventional weapons would work as well or better," Lewis said. "The [document] makes clear that remains the case, referencing 'a broad range of targets' for nuclear forces and talking about the importance of using nuclear weapons for war termination."

"What leapt out at me is the frank discussion of nuclear warfighting—which is in fact the meaning of 'Nuclear Operations,'" Steven Aftergood, director of the FAS Project on Government Secrecy—told me in an email. "It begins with the presumption that deterrence will have failed." Aftergood said we shouldn't overstate the document's importance. "The document is not radically different from similar doctrinal publications," he said. "Nor does it represent a new policy departure by the Department of Defense...but in today's context of proposals for new nuclear weapons, expiring arms control treaties, and erratic political leadership, the new doctrine takes on an alarming cast."

The world feels closer to a nuclear conflict today than at any time in living memory. Both the United States and Russia are committed to modernizing its nuclear arsenal. Russia has made headlines showing off hypersonic missiles, nuclear powered torpedos, and nuclear powered cruise missiles. Both the US and Russia have pulled out of the INF, a Cold War-era agreement that prohibited certain types of intercontinental ballistic missiles. New START, another treaty which

limits the amount of nuclear warheads each country can have, will expire in February 5, 2021 unless the US and Russia agree to extend it until 2026. They might not. "The traditional view is that preparing for war is the best way to avert it," Aftergood said. "But this would be more credible if the government were also pursuing reductions in nuclear arsenals and other peace building initiatives."

Source: Matthew Gault, <https://www.vice.com/>, 21 Jun 2019.

AUSTRALIA

Australia to Debate Developing Nuclear Weapons Amid China Tensions

With a volatile ally in the US and a steadily increasing rivalry with China, the Australian government is reportedly debating whether to produce their own nuclear deterrent. Former prime ministerial adviser Hugh White claims that Australia is no longer protected from an attack, and suggests Canberra needs to think about their defensive capabilities. His new book – 'How to Defend Australia' – claims that, without nuclear weapons, China would continue to rampage through the South China Sea to establish dominance. Australia have historically maintained good relations with both Washington and Beijing – diplomatic with the former, economic with the latter. However, China's recent incursions into the South China Sea – including an ongoing skirmish with the Philippines – has put Canberra on high alert.

The premise of the debate rested on one question: "What about nuclear weapons?" Mr White suggested that without Washington's support, it will be impossible for Australia to defend itself against Chinese aggression. He added: "It's made perfect sense for Australia not to contemplate nuclear weapons for the last 40 years because

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Australia recently planned to build a new port in Darwin intended for the use of American troops. Prime Minister Scott Morrison has also pledged millions of dollars of funding to various islands in the region, in order to counter current Chinese influence. However, more drastic action is needed, according to Mr White. He wrote: "It is no longer clear that nuclear weapons would never make sense. "The strategic costs of forgoing nuclear weapons in the new Asia could be much greater than they have been until now." He added that conventional weapons will not be enough to defend the country from Chinese invasion. There is no way Australia can take that risk, especially with limited support from the Trump administration.

China stepped up their quest for control over the South China Sea last month as Philippine President Rodrigo Duterte gave Chinese fishermen access to their previously exclusive waters. Yesterday Mr Duterte dared the US to send the entire 7th fleet into the region to confront Chinese forces if it was serious about defending the Philippines. The maverick leader said: "I have a proposal – If America wants China to leave, and I can't make them, I want the whole 7th Fleet of the armed

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forces of the United States of America there. "When they enter the South China Sea, I will enter. I will ride with the American who goes there first. Then I will tell the Americans, 'Okay, let's bomb everything.'" It is the latest in a series of disputes in the South China Sea between a US ally and China – but Washington is reluctant to get involved in a military confrontation.

Source: Kumail Jaffer, <https://www.express.co.uk>, 09 July 2019.

BALLISTIC MISSILE DEFENCE

CHINA

China Tests Latest Submarine-Launched Ballistic Missile: Report

China has successfully tested its latest submarine-launched ballistic missile, the JL-3, official media here reported. The scheduled test was normal, China's Ministry of National Defence said on

Thursday, when asked about the alleged test launch of a JL-3 SLBM on June 2, state-run Global Times reported. Asked about reports of shining UFO in the sky cited in many provinces and whether it he can confirm it was related to test launch of JL-3 submarine-launched ballistic missile, Defence Ministry spokesperson Ren Guoqiang said "it is normal

for China to conduct scientific research and tests according to plan".

"These tests are not targeted against any country or specific entity. China follows a defence policy which is defensive in nature and an active defence military strategy, and our development of weapons

and equipment is to meet the basic demand of protecting China's national security," he said. Military experts told the daily that the JL-3 is China's latest SLBM under development that is expected to reach targets farther away with higher accuracy and capable of carrying more warheads than China's current SLBMs. The SLBM might have a range of up to 14,000 kms and be equipped with 10 independent guided nuclear warheads, the daily quoted Russia Today as saying.

Source: *Economic Times*, 28 June 2019.

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RUSSIA

Russian Aerospace Defense Forces Successfully Test New Anti-Ballistic Missile

Russian Aerospace Defense Forces have tested a new anti-ballistic missile at the Sary-Shagan training range in Kazakhstan, the Russian Defense Ministry said on 2 July. "The new anti-ballistic missile, after several trials, has reliably confirmed its characteristics and successfully fulfilled the task by striking an assigned target with precision," the defense ministry cited Colonel Pavel Kuzmin as saying. Anti-ballistic missiles are used to counter ballistic missiles.

Source: <https://tass.com/>, 02 July 2019.

NUCLEAR ENERGY

CZECH REPUBLIC

Czech Government Approves Framework Plan for New Nuclear Plant

The Czech government has given preliminary approval for a plan by a subsidiary of electricity producer CEZ to build a nuclear power station with the government providing guarantees to help it secure cheaper financing. CEZ is 70 percent state-owned and has previously declined to invest in nuclear alone given high costs and unclear returns. A decision on construction of a unit at the Dukovany site is still years away with suppliers expected to be chosen by 2024. The plan

presented by Industry and Trade Minister Karel Havlicek does not specify how to handle economic viability.

While the government is keen to build new nuclear power stations, it does not want to pick up the bill, while CEZ has insisted that any investment makes a return for its owners, including minority interests.

Havlicek said the government was ready to take responsibility for any future changes in legal and regulatory environments, and help secure cheap financing. But it does not want to guarantee returns on investment, as the British government did with guarantees on future power

prices sold by the planned Hinkley Point power plant. "We will not go the British way of 'contract for difference', however we want to provide state guarantees. What they will cover is a matter of detailed discussions," Havlicek told a news conference. "We expect that CEZ will be the investor and CEZ will go into it with its business risk." CEZ said negotiations were only beginning. "CEZ will of course proceed in a way that the result is beneficial for all shareholders," it said in an emailed reply to a question from Reuters.

The investment into the initial unit with about 1,200 MW output is expected to be billions of dollars. It should replace capacity at Dukovany whose four 500-megawatt units will start decommissioning in 2037, and help energy needs as coal-fired capacity is gradually retired. The decision is partially geopolitical, with firms from Russia, the United States, South Korea, France and China potentially interested.

Source: <https://af.reuters.com/>, 08 July 2019.

GENERAL

How Each Country Contributed to the Explosion in Energy Consumption

The world has almost doubled its energy consumption since 1980. While renewable energy resources such as solar and wind power are getting cheaper to build, much of that demand growth has

come from the use of fossil fuels. In fact, half of all carbon emissions from fossil-fuel operations in modern history have come in just the last three decades, putting the Earth on a climate precipice.

The rise in energy demand is essentially a story of economic and population growth. Primary energy consumption—which encompasses virtually all demand, right down to the losses of energy as it travels across transmission and distribution lines—has boomed in developing parts of the world, even as it leveled off, or even fell, in industrialized countries.

As a result, the global balance of energy demand has shifted dramatically since 1980. Back then, the U.S. consumed over a quarter of the world's energy—more than any other country. Today, it's China that uses the most. (The U.S. is still a close second.) Other large, emerging economies like India and Indonesia are consuming four, five, and in some cases, even six times the primary energy they did in 1980—most of it coming from fossil fuels spewing the carbon-dioxide emissions now threatening

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the earth's climate. In other parts of the world, clean energy sources are taking off. Renewable, nuclear and other non-fossil-fuel sources made up more than 14% of the globe's primary energy consumption in 2016. They make up an even larger share of its "final" energy use—demand after transformation and distribution losses—because fossil fuels lose more. The rise of cheap solar and wind power is helping slow the growth of carbon emissions globally—so is the decline in overall energy demand in developed nations.

A recent McKinsey report projected that energy demand would plateau around 2030—thanks in large part to wealthy nations such as the U.S., Germany and Japan. Meanwhile, the number of countries that solely consume fossil fuels including

coal and oil has dropped by about half to 17 since 1980, according to U.S. Energy Information Administration (EIA) data. The shift away from fossil fuels, however, has faced setbacks. Nuclear power plants, despite the zero-emissions electricity they produce, have fallen out of favor in some parts because of Japan's Fukushima disaster in 2011. And while the use of renewables is growing, their adoption may not prove quick enough to ward off the worst effects of global warming. Even if the nearly 200 countries that signed the Paris climate accord were on track to meet their own emission goals, global temperatures would still climb more than 2 degrees Celsius (3.6 degrees Fahrenheit)—a rise that scientists expect will be catastrophic to life on earth.

Every country has a different energy story: While energy consumption in most advanced economies has either stabilized or fallen in the past couple of decades, demand in many emerging markets has soared. The U.S. and China, the world's two largest consumers of energy, are a case in point.

China overtook the U.S. as the world's largest energy consumer a decade ago. Cheap and dirty coal plants proliferated there, spewing so much soot that the sun was clouded out and cities were choking by the early 1990s. Within the past decade, the country has been working on a plan to curb its fossil-fuel pollution. One major part of that plan, the \$36 billion Three Gorges dam, was completed in 2012, becoming the largest hydroelectric plant in the world at 22.5 gigawatts. And yet, China is still the largest consumer of coal. The country has begun to shutter some older power plants, and Bloomberg NEF expects consumption of the fuel to peak in about seven years. But coal may very well remain a massive source of China's energy for years to come. The U.S., meanwhile, has seen its energy demand

plateau. That's even as its reliance on natural gas has grown rapidly thanks to a domestic fracking boom. U.S. monthly electricity generation from renewables surpassed coal for the first time in April 2019, according to the EIA.

In Europe, the U.K. and France are actually decreasing energy consumption. France became one of the smallest users of fossil fuels after the Arab oil embargo in the 1970s led to a rapid expansion of nuclear power. French utility EDF gets more of its electricity from emissions-free nuclear power than any other source and has committed to extending the life for most

of its reactors even as others pull back in the wake of the Fukushima disaster. The consumption of once-dominant coal in the U.K. shrank to nearly zero in 2016, as the country plans to close all coal plants by 2025. The U.K. closed its last three deep mines in 2015, which led to a sharp drop in coal consumption for the country that launched the Industrial Revolution on the fossil fuel. The country has instead invested heavily in offshore wind farms. Energy demand in both Japan and Germany also peaked more than a decade ago. Japan's consumption began falling around the turn of the century as efficiency gains and a shrinking population reduced the country's needs, while Germany's decline has been slower. Both countries were early proponents of nuclear power but are dismantling reactors because of safety concerns after a tsunami overwhelmed Japan's Fukushima Daiichi plant in 2011. That led to a scramble to replace the output. Japan responded by turning to gas and oil to fill the gap. Its share of fossil fuels soared.

Energy demand in both Japan and Germany also peaked more than a decade ago. Japan's consumption began falling around the turn of the century as efficiency gains and a shrinking population reduced the country's needs, while Germany's decline has been slower. Both countries were early proponents of nuclear power but are dismantling reactors because of safety concerns.

Take Iceland, which taps heat from the volcanoes that built the island nation and gets the rest of its electricity from hydroelectric dams. Others like Brazil, Paraguay, Bhutan and Norway are also geographically blessed with enormous hydroelectric and renewable energy potential. That's not so for arid regions such as the Middle East—Saudi Arabia generates most of its electricity from oil. The shift toward renewables has proven easier for some countries than others, but the economics of wind and solar are tipping the scales globally.

Germany, an early investor in clean energy, turned to renewables. Unlike Japan, Germany hasn't seen a major increase in its share of fossil fuels as it shuts down its nuclear fleet ahead of Chancellor Angela Merkel's 2022 deadline. But phasing out nuclear energy means that Germany's carbon emissions have stayed steady, even as the country rapidly turns to renewables. Like China, India has seen breakneck development since 1980 and the accompanying surge in energy consumption that comes as tens of millions of its citizens join the country's middle class. But unlike China, India has not invested as much in renewable energy as it's developed. While a greater share of India's total energy consumption came from non-fossil fuel sources in 1980 than its larger neighbor did, that share has actually dropped since 1980.

Meanwhile, China's share coming from nuclear and renewables has nearly quadrupled. South Korea's energy use also has grown rapidly. Because it must import most of its fuel supplies and has little land available for giant wind or solar farms, South Korea has embraced hydrogen fuel cell technologies to become the largest producer of fuel cell equipment. Energy mix and carbon footprint reveal a lot about a country's natural resources. Take Iceland, which taps heat from the volcanoes that built the island nation and gets the rest of its electricity from hydroelectric dams. Others like Brazil, Paraguay, Bhutan and Norway are also geographically blessed with enormous hydroelectric and renewable energy potential. That's not so for arid regions such as the Middle East—Saudi Arabia

generates most of its electricity from oil. The shift toward renewables has proven easier for some countries than others, but the economics of wind and solar are tipping the scales globally. The two resources are now the cheapest forms of energy in two-thirds of the world, according to BloombergNEF. The cost of solar has declined by 85% since 2010. As clean power sources get even cheaper, countries will have a greater incentive to transition and cut carbon emissions. Whether that comes in time to prevent the worst effects of climate change remains to be seen.

Source: Lauren Leatherby, Chris Martin, <https://www.bloomberg.com/>, 09 July 2019.

UAE

15 Emiratis Ready to Operate UAE Nuclear Reactor

The Federal Authority for Nuclear Regulation (FANR) announced On July 08, 2019 it has officially certified the first group of 15 UAE National Senior Reactor Operators (SROs) and Reactor Operators (ROs) at Nawah Energy Company, the operations and maintenance subsidiary of the Emirates Nuclear Energy Corporation (ENEC). The certification is part of complying with FANR's Regulation 17 that dictates requirements for the training and qualification of SROs ROs, and ensures their competence to operate the nuclear energy plant.

In addition, the certification of SROs and ROs is a key requirement for future receipt of the Operating License.

A reactor operator is responsible for operating and managing the main control room (MCR) of a nuclear energy plant during regular operations and emergencies including starting up a nuclear reactor, shutting down a nuclear reactor, and monitoring reactor parameters. The SROs manage the control room and supervise the ROs and field operators to ensure adherence to high standards

of nuclear safety. "This is a major milestone for the UAE peaceful nuclear energy programme. Investing in building Emirati nuclear expertise is pivotal for the sustainability of the UAE peaceful nuclear energy programme to attain the nation's ambitious goals," said Christer Viktorsson, Director-General of the Federal Authority for Nuclear Regulation (FANR), commenting on the latest milestone.

"FANR has played a critical role to certify the reactor operators and verifying their competence and readiness to operate the Barakah Nuclear Energy Plant in accordance with the highest standards of safety to ensure the protection of the public and the environment," he added, highlighting the competence of the 15 nuclear reactor operators. Eng. Mohammad Al Hammadi,

chief executive officer at ENEC also commented positively on the development, calling it a step forward for the country's nuclear energy industry. "The certification of Nawah's first group of UAE National Senior Reactor Operators and Reactor Operators represents a significant

step forward in the nation's efforts to build capacity, skills and talent for the future of the UAE's nuclear energy industry. "The UAE peaceful nuclear energy programme is creating new, high value job opportunities that will play a significant role in diversifying the UAE's economy and supporting sustainable economic development for decades to come," he added.

Rigorous Training Programme: The first group took part in a three-year training programme developed by ENEC and Nawah, according to the regulations set out by FANR. The training programmed combined hands-on experience from some of the industry's leading engineering and nuclear energy experts with a discipline-focused curriculum. The first group of SROs and ROs had the opportunity to train in the Republic of Korea, the USA, South Africa, and the UAE. Throughout

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the programme, FANR verified and inspected the training programme, from curriculum content through to training implementation and exam administration, ensuring that it met regulatory requirements. After obtaining the certification, FANR will verify Nawah's refresher training programme every two years, which will include provisions for periodic confirmation of an operator's competency in line with the regulatory requirements for the safe and secure operation of the nuclear energy plant and protection of the public and the environment.

ENEC is developing four identical nuclear energy units at Barakah, in the Al Dhafra region of Abu Dhabi. The overall construction of the four units is more than 93 percent completed. Unit 4 is more than 82 percent complete, Unit 3 is more than 91 percent and Unit 2 is more than 95 percent completed. Unit 1 construction is complete and the unit is currently undergoing commissioning and testing as it enters the final stages of its operating license.

Source: <https://gulfnews.com/>, 08 July 2019.

America currently receives uranium from a number of sources, including Russia, China, Kazakhstan and Uzbekistan, while figures from the Commerce Department estimate that in 2017 Canada and Australia provided uranium for more than half of the US's consumption. A quota of even 10% equates between 4-5 Mlbs of uranium, and to meet the proposed tariff requirements the US would have to produce around 12Mlbs of uranium each year.

sources, seeking quotas under Section 232 of the 1962 trade law, which deals with national security. A response from the White House is expected in July, when the Commerce Department is also set to investigate the request, considering it under the same law used to impose tariffs on steel and aluminium imports in 2018.

Can the US Meet Demand?: America currently receives uranium from a number of

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Report speculates that even if uranium prices rose sufficiently, America could cover only 10% of reactor requirements by 2021. With such a challenge faced by an already struggling industry, it's no surprise some are questioning the benefits of such a move. However, the petitioners say it is a necessary one.

uranium sector. Industry members are sceptical as to whether imposing quotas will stimulate production, with a report from Eight Capital saying tariffs would not motivate a boost until the rest of the world were unable to fill the supply gap, reading; "It would...make that foreign

material more readily available to the global market, and global prices might react negatively." The report speculates that even if uranium prices rose sufficiently, America could cover only 10% of reactor requirements by 2021.

With such a challenge faced by an already struggling industry, it's no surprise some are questioning the benefits of such a move. However, the petitioners say it is a necessary one. Why impose tariffs? "We believe import limitations on uranium are absolutely crucial for US national security and energy security," says Curtis Moore,

URANIUM PRODUCTION

USA

Uranium in the US: A Domestic Market on the Rise or an Industry in Trouble?

Two US-based uranium companies – Energy Fuels and Ur-Energy – have launched a petition to limit uranium imports in the name of energy security. The firms are calling for US utilities to source at least 25% of the radioactive fuel from domestic

V.P. marketing and corporate development for Energy Fuels. "We believe the US needs to maintain some form of a viable nuclear fuel industry, including uranium mining, to make sure we have an industry able to respond when we need more fuel and nuclear material."

According to Moore, the US receives a third of its nuclear fuel from 'geopolitical adversaries' such as Russia. He argues such reliance could potentially endanger both the energy market and the military – where uranium is used for weapons, submarines and aircraft carriers. Due to the flexibility of Section 232, it would be possible for quotas to be targeted toward certain countries while bypassing allies such as Canada and Australia, however due to the unstable nature of the global uranium industry there is no guarantee even friendly markets can provide consistent supply. "Russia currently controls about 7% of the US electrical grid," Moore says. "The situation is likely to grow far worse in the coming years. Of course, uranium mining in the US is dropping, but it is also dropping in our allies like Canada and Australia."

Indeed, uranium companies worldwide have been facing closures, for example Australia's Ranger mine – one of the largest free market uranium mines in the world – is expected to halt production in either 2020 or 2021. "It is not an exaggeration to state that the entire 'free-market' for uranium may be collapsing around the world right now," Moore says, "with the vacuum being filled by state-owned entities in nations like Russia, China and their allies." He adds; "Do we want to be in a position where Russia, China and their allies exert almost complete control over the global nuclear industry? This would be highly

dangerous, and it would likely lead to an enormous increase in the proliferation of nuclear weapons across the world."

Similarly, writing for Forbes, Hudson Institute senior fellow Thomas J. Duesterberg said allowing Russian and Chinese dominance of the uranium market would be 'a mistake', urging "a serious look at maintaining our uranium suppliers by accepting the Section 232 petition for review." However, despite the confidence of the quota proponents, not everyone is convinced.

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"Most industry people say imposing import quotas will not benefit the nuclear industry, though it would likely benefit a few select miners," says Bloomberg analyst Chris Gadowski. "Common sense suggests that imposing uranium quotas will not move forward on a purely economic basis, but in the current political environment, it is hard to predict how political twists can turn the page." Others, such as nuclear proliferation expert at the Union of Concerned Scientists Edwin Lyman, dismiss the request entirely. "We think the assertion that US national security is being harmed by its reliance on uranium imports is without merit,"

Lyman says. "The US imports much of its uranium from staunch allies such as Australia, and I would consider that supply at low risk of being cut off. The claim is being raised by small, high-cost domestic uranium producers who hope that the Trump administration's protectionist trade policies can give a boost to their uneconomic enterprises."

An Economic Choice?: Moore predicts the quotas will have 'almost no effect' on the US economy, costing between \$200m- \$300m. However, other industry members set the figure significantly higher. A 2018 Nuclear Energy Institute study said

Moore predicts the quotas will have 'almost no effect' on the US economy, costing between \$200m- \$300m. However, other industry members set the figure significantly higher. A 2018 Nuclear Energy Institute study said research behind the proposed figure was 'deeply flawed', as it is apparently based on a data sample of US production levels "well below the level...needed to support the proposed quota.

research behind the proposed figure was 'deeply flawed', as it is apparently based on a data sample of US production levels "well below the level...needed to support the proposed quota". The study concludes that such limitations would in fact only exacerbate economic pressure on the US nuclear industry, with expensive domestic uranium replacing cheaper imported fuel. The study sets the additional costs on the industry at between \$500m-\$800m per year, a figure that could potentially be higher in the policy's early years if implemented without a phase-in or other protections against price spikes.

"We sympathise with the plight of uranium suppliers," NEI President Maria Korsnick said in a statement. "However, NEI does not support the implementation of quotas as described in the petition. Potential remedies could put even more generating units at risk for premature closure, which would further soften the market for uranium." Similarly, a report from Australian resources development company Vimy says a universal import tariff on uranium "would need to be so high to incentivise new US production, that it would inevitably damage the competitive position of the US nuclear utilities."

Source: *Scarlett Evans*, <https://www.mining-technology.com/>, 08 July 2019.

NUCLEAR COOPERATION

POLAND–USA

Poland and the US Sign MoU Concerning Strategic Civil Nuclear Cooperation – What Can We Expect?

Poland and the US signed the MoU on strategic civil nuclear cooperation on June 12. The MoU emphasizes the desire to establish a deeper bilateral strategic relationship aiming at energy security and meeting Poland's clean energy needs. These aims are to be achieved by: Collaboration for developing Polish infrastructure for the responsible use of nuclear energy and technologies; Adoption of best practices in nuclear safety, security and independent regulatory oversight; Exploration of cooperation

across the breadth of existing and future US reactor technologies, fuel, equipment and services; Identifying a pathway to Poland's development of a civil nuclear program, including addressing commercial challenges such as financing and workforce development.

In a prior post (*Poland's New Energy Policy Until 2040 Goes Nuclear*), we described the development of nuclear energy as one of the key elements of the new Polish Energy Policy until 2040. This plan focused on the planned 6,000-9,000MW of generation by NPPs. Although we are still waiting for the final version of this Energy Policy until 2040, with the signing of the MoU, Poland appears to be taking further steps to follow the Polish Energy Policy 2040 goals....

Source: <https://www.natlawreview.com/>, 05 July 2019.

TURKEY–CHINA

Ankara Boosts Energy Cooperation with Beijing

Turkey and China are increasing their energy cooperation through a range of projects, Turkey's Energy and Natural Resources Minister Fatih Dönmez told Anadolu Agency (AA) on July 08, 2019. Dönmez explained that in recent years Turkey and China made important energy investments, with one of the major projects being a nuclear power plant that has seen the undertaking of detailed studies and feasibility reports for almost a year with China's National Nuclear Corporation.

In November 2014, Turkey's state-owned electricity generation company EÜA^a, China's State Nuclear Power Technology Corporation Limited (SNPTC), and U.S.-based Westinghouse Electric Company announced a multiparty agreement to enter exclusive negotiations to develop and construct Turkey's third nuclear power plant. This was followed in June 2016 with the signing of a MoU for the development of nuclear technology between Turkey and China. In June 2018, President Recep Tayyip Erdoğan said Turkey would likely build its third nuclear power plant with China. More recently, in January 2019, the Energy Ministry announced that 32 students would be sent to Russia and China in a bid to provide a professional, skilled workforce for planned nuclear power plants

in Turkey.

Smart Grids Necessary for Efficient Electricity

Network: Another area of collaboration is in smart grid technology, Dönmez said, adding the State Grid

Corporation of China and Turkey’s Electrical Installations and Engineering Services, which already has a cooperation agreement, has reviewed this agreement and updated the roadmap. “We are holding meetings with high level officials at the State Grid Corporation of China,” he said. “The discussion will include additional measures to secure networks that can become vulnerable to external threats, especially at the point of software.” “Smart grids are necessary for increasing the operational efficiency of the electricity network while benefiting consumers who can use energy more efficiently,” he added. He argued that China and Turkey have commonalities in that both have far distances between resources and energy-intensive regions.

“They [China] have considerable experience in controlling transmission lines, managing electricity loads remotely and taking the necessary precautions [for efficient electricity distribution], we will benefit from them,” Dönmez underlined. He stressed that it will take time to update the network to become smart. “Nowhere in the world is this application made suddenly,” he said.

Source: <https://www.dailysabah.com/>, 09 July 2019.

TURKEY–BELARUS

Turkey, Belarus Nuclear Energy Agreement Open to Abuse: Abdullah Bozkurt

A nuclear power agreement between Turkey and Belarus has been criticized for including open-ended terms that are subject to broad interpretation and abuse of power, Nordic Monitor has learned. According to the terms of the agreement, a copy of

which was obtained by Nordic Monitor, a sweeping mandate to expand the agreement at will was included in the deal at the request of the government of President Recep Tayyip Erdoğan.

The controversial clause was added to section L of Article 3, which lists “other fields of cooperation as may be mutually agreed upon by the Parties” when enumerating the specific areas of nuclear cooperation between Turkey and Belarus. The Turkish opposition challenged the clause on the

grounds that the wording is vague and gives a broader mandate to the government to expand nuclear cooperation schemes beyond the intent and the scope of the agreement. It also allows the government to bypass legislative review to make changes to the agreement as it sees fit after it is ratified by parliament. A similar loophole was also inserted

in Article 4, which describes the various forms of cooperation. Section G of the article states that the government can add “other forms of cooperation as may be agreed upon by the Parties.”

Furthermore, the way the agreement, officially titled “Cooperation in the

Area of the Use of Nuclear Energy for Peaceful Purposes,” was signed in Minsk on November 11, 2016 was unusual as well. The person signing for Turkey was Orhan Erdem, the deputy minister of education whose portfolio had nothing to do with nuclear energy. When the agreement was signed in Minsk, a huge delegation including ministers and senior government officials led by Erdoğan met with their Belarusian counterparts. Under normal circumstances, such an agreement should have signed by an official from the Ministry of Energy, In the event no such official is present during the signing ceremony, standard

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operating procedure requires that an official from the Foreign Ministry on behalf of the Energy Ministry should sign. In this nuclear deal, none of these procedures were followed. Furthermore, when Erdoğan submitted the agreement to parliament on March 15, 2019, the deal was taken up by the Foreign Affairs Commission on May 22, 2019 as opposed to the Commission for Industry, Trade, Energy, Natural Resources, Information and Technology, which has more competence to review the terms of the agreement. The Turkish president wanted to fast track the agreement without much hassle through the Foreign Affairs Commission chaired by his confidant, Volkan Bozkır. It took only a few minutes to debate the deal before it was passed by the commission.

Both Turkey and Belarus have committed themselves to cooperate in the research and development of nuclear energy and advanced nuclear reactors, radioactive waste management, production of isotopes, training and education. The two sides will establish joint working groups to study nuclear energy-related issues, exchange scientific and technical personnel and cooperate in the transfer of nuclear materials. Another indication the agreement was rushed emerged after the deal was signed by the Turkish and Belarusian officials. The mistakes that were made in the text had to be corrected through an exchange of diplomatic notes between the Turkish Embassy and the Belarus Foreign Ministry. It turned out Leonid Shenets, first deputy minister of the Belarus energy ministry, signed the English version of the agreement on behalf of Turkey. The wrong country designation next to the Belarus official's signature was later corrected after an exchange of letters. In all versions of the text, the subsections of Article 1 were incorrectly labeled, also subsequently corrected at the request of the Belarusian Foreign Ministry. The agreement is valid for 10 years with an automatic extension of five years.

On the whole, international cooperation on nuclear issues—both on the Korean Peninsula and writ large—has been spotty in recent years. Luminaries of the Council of Councils (CoC), a network of twenty-eight leading think tanks worldwide, awarded a C to the world's efforts in "Preventing Nuclear Proliferation" in 2018, a significant improvement from 2017's.

Source: <https://www.nordicmonitor.com>, 07 July 2019.

NUCLEAR NON-PROLIFERATION

GENERAL

The Fissile State of International Nuclear Cooperation

After a several-month hiatus, U.S. President Donald J. Trump and North Korean leader Kim Jong-un resumed bilateral meetings. The two met along the North-South Korea border to build on their blossoming pen-pal relationship and talk shop on nuclear issues. Analysts pronounced the tête-à-tête in the demilitarized zone, which saw Trump cross into North Korean territory, a less-than-shining example of effective diplomacy (the phrase "photo-op" found more than its fair share of use). Nevertheless, this and previous meetings have marked an improvement from the "fire and fury" Twitter escapades that defined the two leaders' early exchanges.

On the whole, international cooperation on nuclear issues—both on the Korean Peninsula and writ large—has been spotty in recent years. Luminaries of the Council of Councils (CoC), a network of twenty-eight leading think tanks worldwide, awarded a C to the world's efforts in "Preventing Nuclear Proliferation" in 2018, a significant improvement from 2017's. With the advantage of greater hindsight, however, this increase appears to have been more an anomalous uptick than indicative of any broadly positive trend. Recent developments in disparate regions of the globe signal a resumed descent into the atomistic politics of nuclear arms racing and deterrence.

Efforts in 2018: Nominally, preventing nuclear proliferation remains near the top of the global

agenda. The issue area ranked third out of ten global challenges on the 2018-2019 Report Card on International Cooperation in terms of importance. CoC member institute heads recognized the need to address a number of “serious challenges to the nuclear governance regime,” as Elizabeth Sidiropoulos of the South African Institute of International Affairs put it. “Nuclear concerns came from both great powers and misfits,” according to Michael Fullilove of the Lowy Institute (Australia), who pointed to the United States and North Korea as sources of anxiety. The historically contentious relationship between the two powers saw some degree of conciliation in 2018. Yul Sohn of the East Asia Institute (South Korea) cited “a string of successful meetings with North Korean leader Kim Jong-un and South Korean President Moon Jae-in and a ground-breaking tête-à-tête with U.S. President Donald J. Trump” as indicative of “noteworthy progress.”

Memduh Karakullukçu of the Global Relations Forum (Turkey) averred that “de-escalation of the North Korean crisis needs to be registered as an encouraging development in 2018.” “The U.S.-North Korean Singapore Summit achieved a moratorium on testing,” a positive outcome in light of past frustrations, as Riccardo Alcaro of the Institute of International Affairs (Italy) noted, though “there has not been any reduction in North Korean nuclear warheads.”....North Korea, though a conspicuous source of headlines, was not alone in the noteworthiness of its developments. Trump’s decision to exit the United States from the Iran Nuclear Deal elicited an array of reactions from representatives to the CoC. Mariana Campero of the Mexican Council on Foreign Relations remarked that “the U.S. withdrawal from the JCPOA . . . dealt a big blow to political and diplomatic efforts.”....The United States also came to loggerheads with Russia over nuclear issues. The INF Treaty was a major point of contention, as

The INF Treaty, at risk in late 2018, is now little more than tattered paper. The broader nuclear context—one in which policymakers are embracing geopolitical competition, modernizing nuclear arsenals, and questioning the value of arms control—offers little reassurance to those who fear catastrophe.

U.S. and Russian officials forwarded claims that the other country was in violation of the agreement. Sergey Kulik of the Institute of Contemporary Development (Russia) saw the prospect of the treaty’s demise as “particularly fraught with weakening nuclear security and safety.”

Prospects in 2019: Unfortunately, recent developments have done little to assuage atomic anxieties. Talks between the United States and North Korea continue, though to unknown ends....Other relationships, however, have edged more clearly toward the nuclear brink. In South Asia, India and Pakistan have teetered between hostility and conflict, and the two have tested antisatellite and ballistic missiles. Likewise, “the United States’ decision to withdraw

from the JCPOA and impose sanctions added fuel to the fire of Iranian discontent,” according to Sohn. The effects of the agreement’s evisceration have become clear:

Iran has exceeded previously agreed-upon limits in its stockpiling of enriched uranium. And the INF Treaty, at risk in late 2018,

is now little more than tattered paper. The broader nuclear context—one in which policymakers are embracing geopolitical competition, modernizing nuclear arsenals, and questioning the value of arms control—offers little reassurance to those who fear catastrophe. As Sunjoy Joshi and Samir Saran of the Observer Research Foundation (India) note, “larger powers such as the United States, China, and Russia are upgrading, not downgrading, their nuclear weapons systems.” At the same time, the potential demise of the New Strategic Arms Reduction Treaty (New START), up for renewal in 2021, “marks an end to a whole era of arms control,” in Lukyanov’s words.

Recommendations: The current, fissile state of international nuclear cooperation leaves the world in considerable peril. The Bulletin of the Atomic

Scientists announced this January that their Doomsday Clock would remain at two minutes to midnight, in large part due to nuclear concerns. A catastrophic nuclear exchange remains a remote prospect to be sure, but the probability is non-zero. And nuclear proliferation and arms-racing heighten the potential for conventional conflict between current and would-be nuclear powers....For now, the world's nuclear powers seem recalcitrant to measures that would limit their freedom of action. The dismaying reality may be, in the words of Kudo, that "the situation surrounding nuclear disarmament is currently at its worst, and no improvement can be expected without the leaders of the major nuclear powers making the decision to disarm."

About the CoC Report Card:

The Council of Councils (CoC) Report Card on International Cooperation evaluates multilateral efforts to address ten of the world's most pressing global challenges, from countering transnational terrorism to advancing global health.... To help policymakers around the world prioritize among these challenges, the CoC Report Card on International Cooperation surveyed the Council of Councils, a network of twenty-eight foreign policy institutes around the world between December 2018 and January 2019.

Source: Stewart M. Patrick, <https://www.cfr.org>, 03 July 2019.

NUCLEAR PROLIFERATION

IRAN

Iran Says it is Breaking Nuclear Enrichment Limits

Iran's nuclear energy agency says the country has broken limits set in its 2015 nuclear deal with

world powers. The agency reported on Monday that Iran began enriching uranium to 4.5 percent, passing the 3.67 percent limit set under the deal. The international agreement was meant to restrain the country's nuclear activities. The higher level of uranium enrichment is the second time Iran has violated the agreement. Iran said it had produced more than 300 kilograms of low-enriched uranium and announced plans to continue making more. Uranium enriched to 5 percent is reported to be enough to produce fuel for a nuclear energy center. However, it is far

below the purity needed to make a nuclear weapon. For such weapons, a purity level of about 90 percent is required.

In recent weeks, Iran said several times that it would surpass limits set by the Joint Comprehensive Plan of Action. Iran's government is trying to pressure other countries, especially those in Europe which signed the agreement, to do more to help Iran economically. The United States, China and

Russia also signed the 2015 Iran nuclear deal. Iranian President Hassan Rouhani said that Iran was prepared to enrich "any amount that we want" beyond the 3.67 level. He also announced that Iran would restart construction at the Arak heavy water reactor. That nuclear center was closed as part of the 2015 nuclear deal. A spokesman for Iran's nuclear agency suggested that Iran may consider enriching uranium to 20 percent. The Associated Press reported his comments. The official also suggested that Iran might add to its current number of centrifuges — the devices used to increase the purity of uranium.

US President again Warns Iran: U.S. President Donald Trump warned Iran to "be careful" about its activities. Trump spoke soon after Secretary of State Mike Pompeo wrote that: "Nations should restore the longstanding standard of no

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enrichment for Iran's nuclear program." Pompeo's comments appeared on the social networking service Twitter. He went on to say that, if Iran had nuclear weapons, it would be an even bigger threat to the world.

The United States withdrew from the nuclear deal with Iran last year. At the time, Trump said that the deal was doing little to stop Iran from developing nuclear weapons. The Trump administration then placed additional restrictions on Iran. France, Britain and Germany have been trying to save the deal by creating a system by which Iran can carry out limited trade. However, Iran's recent activities make even that attempt unlikely to succeed. Earlier this month, an Iranian oil tanker carrying over 2 million barrels of oil was seized in waters near the British port of Gibraltar. Reports say the oil was meant to go to Syria, which is under European Union sanctions.

Source: <https://learningenglish.voanews.com>, 08 July 2019.

Iran's Slow-Burn Nuclear Strategy: Wait out Trump and Get New Deal from his Successor

Iran's second pledge to breach the terms of the landmark nuclear deal was light on detail, but heavier in consequence. And it pretty much encapsulated the mood music of the Persian Gulf right now: a move that permits great, inflammatory rhetoric, but changes little in practice.

Tehran declared that it would enrich uranium past the limit of 3.67% set by the deal. In the past few months Iran had suggested that this might mean 3.7%, while on Saturday they mentioned as much as 5%. But it conspicuously left out any number from the announcement. It was the sequel to last week's declaration that they would enrich more low-grade uranium past the stockpile limit of

300kg (660 pounds) set out by the deal. That earlier move was purely symbolic: there's little you can do with tons of 3.67% enriched uranium bar power an older pressurized water reactor for a little while, and it has no use for a bomb at all. Enriching uranium to 3.7% is equally as useless, and 5% isn't much help either. Iranian officials hinted strongly, however, that they would not enrich uranium for the use of the Tehran research reactor, which requires 20% enrichment. (It was, curiously, supplied by the US to the then-Shah of Iran in 1967. How times can change).

This is an alarm-bell figure: 20% enables swift enrichment to the 90% needed for a nuclear weapon. Yet only 5% enrichment is required for the Bushehr civilian power reactor, for which Russia originally supplied the fuel. Iran has subsequently strongly suggested that they would go for 5%. So why not just announce 5%? Firstly, it would burden the Iranian government with this figure in the future. It both makes

the threat sound hollow as it is only 1.3% above the current limit, and it specifies a more clear violation of the deal.

Much better for the hardliners to let the new levels of enrichment seem vague: they can seem more strident in their defiance, while also avoiding doing anything in public that the European signatories can complain about. Much of this posturing is about pressuring the three European nations into helping alleviate the sanctions reimposed by the US after President Donald Trump withdrew from the JCPOA, the 2015 nuclear accord intended to limit Iran's civilian nuclear program and prevent it from developing nuclear weapons.

Iran wants to force the European nations into creating a mechanism by which they can ease the impact of the US blockade, even though it's highly unlikely Europe can do this. European firms don't want to risk losing business in the US by doing a

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deal with Iran and in turn violating US sanctions. But Iran's vagueness comes at a cost. It permits the nation's critics to speculate wildly. Within minutes of the Iranian announcement, Israel's Prime Minister Benjamin Netanyahu declared the enrichment was for the pursuit of "atomic bombs." There's no evidence to that effect, and Iran has always insisted its nuclear program is peaceful. But the absence of a public declaration of the level to which the Iranians will purify means the void can be filled with suspicion. You can anticipate further negative assessments from Washington. So where do we go from here?

Iran has turned up the volume briefly on the mood music and then pressed the pause button. It says its next step will come in 60 days. That means this escalation is staggeringly slow, and makes clear that Tehran is really hoping to wait out Trump's presidency and patch the deal back together with his successor. The European figurehead, French President Emmanuel Macron, said following a long phone call with his Iranian counterpart Hassan Rouhani the day before, that Iran must return to the text of the deal. This won't happen and the US will refuse to alleviate sanctions, while the Europeans will be unable to provide any relief either.

But that leaves us with all parties in the same deadlock, as if stuck in an elevator in which all they can do is shout over loud, heavy metal music, while the temperature slowly rises. It's clear that neither the US nor Iran seek a war, but both are influenced by hardliners who could easily stumble into one. Sunday's violation is just another symptom of that. While the region needs calm, all it gets is puffed-out chests.

Source: Nick Paton Walsh, <https://www.wral.com/>, 07 July 2019.

Media Falsely Portrays Iran's Nuclear Deal Breach as Dash to Bomb

The IAEA—the U.N. nuclear watchdog tasked with vigorously monitoring Iran's nuclear program under the 2015 accord—confirmed this week that Iran exceeded the limit on its supply of LEU. Unfortunately, with a few notable exceptions, reporting from many in the media on this development wasn't great. Reporters and commentators portrayed Iran, not Donald Trump, as the primary provocateur, with many going so far as to claim, without any evidence whatsoever, that Iran is now racing to build a nuclear weapon.

One goal of the Iran nuclear deal (JCPOA) was to stretch the timeline to one year in terms of how long it would take Iran to enrich enough uranium for one bomb. To achieve that outcome, the United States, the U.K., France, Germany, China, Russia, and Iran agreed that Tehran could continue enriching uranium for civilian energy purposes but also to cap the amount of LEU it could have on hand at any one time to about 660 pounds. Before the agreement, and ostensibly under the untenable George W. Bush-era policy of "zero enrichment," Iran had amassed around 10,000 pounds of LEU, which if further refined, could be

transformed into fuel for nuclear weapons. After the JCPOA's implementation, Iran shipped out 98 percent of its LEU stockpile and verifiably maintained, until this week, the 660-pound cap, even after Trump last year unilaterally reimposed sanctions that were lifted as part of the deal. And the reason Iran surpassed the cap?

Back in May, as part of its unprovoked "maximum pressure" campaign against Iran, the Trump

It's clear that neither the US nor Iran seek a war, but both are influenced by hardliners who could easily stumble into one. Sunday's violation is just another symptom of that. While the region needs calm, all it gets is puffed-out chests.

One goal of the Iran nuclear deal (JCPOA) was to stretch the timeline to one year in terms of how long it would take Iran to enrich enough uranium for one bomb. To achieve that outcome, the United States, the U.K., France, Germany, China, Russia, and Iran agreed that Tehran could continue enriching uranium for civilian energy purposes but also to cap the amount of LEU it could have on hand at any one time to about 660 pounds.

administration revoked sanctions waivers allowing Iran to ship out any excess LEU it produces beyond the 660-pound cap. That left Iran with a choice: bow to Trump's gratuitous demands even though Iran was adhering to the deal or carry on enriching uranium as allowed under the JCPOA. Iran chose the latter course, in a move that experts say is actually "a calculated effort to get European leaders to reinforce the nuclear deal and halt the drift toward war." Experts also say that breaching the cap, for now, "does not pose a near-term proliferation risk." But that's very far from how some in the U.S. mainstream media portrayed it. Hours after the news broke, CNN Chief National Security Correspondent Jim Sciutto tweeted that Iran surpassing the 660-pound LEU stockpile limit "appears to be the first violation of the terms of the JCPOA following the U.S. withdrawal from the deal last year." This is completely false. Donald Trump first violated the terms of the JCPOA in November 2018 when he reimposed all economic sanctions on Iran without cause. Trump set this JCPOA-violation crisis in motion, not Iran.

In another example, editors at *The New York Times* headlined an opinion piece responding to the news: "Iran Is Rushing to Build a Nuclear Weapon—and Trump Can't Stop It."

There is no evidence that Iran is rushing to build a nuclear weapon. In fact, U.S. intelligence has concluded that Iran halted its nuclear weapons program sometime between 2002 and 2004. The text of the Times piece argued, somewhat controversially, that given everything that Iran has

endured from the United States, Iran probably should build a nuclear weapon to deter further American right-wing aggression. But the piece never presented any evidence that Iran, based on

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the latest news of breaching the LEU cap, is dashing toward a bomb. And its author, an American professor of political science at the University of Chicago, isn't involved in the Iranian leadership's decision-making processes. He is stating what he believes Iran should do, not what Iran is actually doing or plans to do. Similarly, but perhaps less surprisingly, the Wall Street

Journal editorial board

referred to the news as a "nuclear breakout," a term that is used to describe an actual move toward building nuclear weapons, which of course Iran is not doing.

Perhaps the most egregious reporting on Iran surpassing the LEU cap came in a piece from the seemingly left-leaning news outlet Vox. The original version of the story falsely claimed that Iran "vows to increase enrichment to weapons-grade level by July 7." Although Iran has gotten close, it has actually never enriched uranium to weapons-grade levels, and its leaders have made no such vow. Vox corrected that assertion, but the entire piece, entitled "Why Iran just violated part of the 2015 nuclear deal," never once

These are just a few examples of how the media has underserved the American public on the recent Trump-induced crisis with Iran. And it's reminiscent of how the mainstream U.S. media handled the Bush administration's march to war in Iraq. At that time, the media often relayed false or misleading administration claims at face value with little to no scrutiny and did the White House's bidding by framing the issue on its own aggressive terms, which in turn helped produce public opinion supportive of military action. This same dynamic appears to be at play today.

mentioned the actual reason Iran violated the deal, namely that Trump reimposed sanctions and thereby prevented Iran from shipping out its stockpiled LEU.

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Source: <https://lobelog.com/media-falsely-portrays-irans-nuclear-deal-breach-as-dash-to-bomb/>, 05 July 2019.

NUCLEAR DISARMAMENT

GENERAL

A Nuclear Global Zero is Not Yet Possible

27 years after the collapse of the Soviet Union, nuclear weapons are still the ultimate armament – their destructive power has no equal. The end of the Cold War seemingly reduced the importance of nuclear weapons. Without the

specter of totalitarian communism, there was no great existential threat for the Western powers to deter with nuclear weapons. A world without nuclear weapons, or the "global zero," to some seemed within reach.

While global zero is a goal worth striving for, nuclear weapons will only be abolished when they have been supplanted or made irrelevant by the next super weapon system. With the ability to level cities or military installations, nuclear weapons are the most powerful deterrent – the ultimate guarantor of security.

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weapons are the most powerful deterrent – the ultimate guarantor of security. In the meantime, the five official nuclear powers, as defined by Article IX of the NPT, must do everything they can

The NPT has so far been the most successful at preventing horizontal proliferation (more states getting nuclear weapons). When it comes to vertical proliferation (states stockpiling nuclear weapons), bilateral agreements with strong verification regimes have proven to be effective. The SALT and START between the United States and the former Soviet Union are a prime example of bilateral arms control.

to control the proliferation of these weapons. Increased proliferation increases the likelihood of a nuclear weapon used in anger. As such, additional controls on nuclear power plants and fissile materials must be developed in order to prevent new states from developing weapons. In conjunction, a new wave of arms control agreements is needed to build trust between the U.S. and

Russia, the largest weapons holders.

When understanding a state's desire to acquire nuclear weapons, one must ask, "What threat, real or perceived, needs to be deterred?" All states seek their own security. If the enemy has some, then one must get nuclear weapons as well, or else risk a major security threat. This is especially true when the enemy has overwhelming conventional military superiority and has shown that it will use it. Alternatively, states can ally with a larger state possessing nuclear weapons to seek shelter under its umbrella. Despite their allure, the world has not gone proliferation-happy, as President Kennedy once predicted could happen. This is largely due to arms control agreements and controls on

nuclear power technology. The NPT has so far been the most successful at preventing horizontal proliferation (more states getting nuclear weapons). When it comes to vertical proliferation (states stockpiling nuclear weapons), bilateral agreements with strong verification regimes have proven to be effective. The SALT and START between the United States and the former Soviet Union are a prime example of bilateral arms control.

Strict controls on nuclear power and fuel enrichment technologies can help control nuclear weapons proliferation. The same base technology underpins both nuclear weapons production and nuclear power generation. Low enriched uranium powers the majority of nuclear reactor designs. Nuclear weapons need either highly enriched uranium or plutonium. Reprocessing spent reactor fuel creates plutonium, while the same techniques to enrich reactor fuel can also enrich uranium to weapons-grade status. This is the crux of the current crisis with Iran – Tehran believes that the NPT grants Iran an “inalienable right to enrich,” while Washington and the U.N. Security Council believe otherwise.

Article IV of the NPT grants non-weapons states the right to access nuclear power; it does not explicitly mention enrichment. The key words are “for peaceful purposes.” Rigorous, multi-national inspections are necessary to ensure that uranium enrichment past the 20% threshold, and that plutonium acquired during reprocessing is not diverted towards weapons production. The IAEA Additional Protocol inspections are one way to ensure that nuclear energy programs remain “for peaceful purposes.” Controlling the nuclear fuel itself is another way. In this vein, the NSG was founded to promote the verified

peaceful use of nuclear power technology through promoting responsible export controls. An example of a comprehensive agreement that includes both inspections and tight control over the nuclear fuel cycle is the “gold standard” Section 123 agreement between the United States and the United Arab Emirates.

These and other agreements show that it is possible to control the spread of nuclear weapons. Sufficiently advanced states will have the latent capability to go

nuclear should they need to; the technology and knowledge cannot be unlearned. As such, verified reduction and rigorous export controls are the only ways to ensure that nuclear weapons do not proliferate, while getting the global number of warheads and weapons states down to a more manageable level. This is the most practical and realistic way to prevent nuclear Ragnarok; that is, until nuclear weapons are made irrelevant and a global zero can be achieved.

Source: John Ashley, <https://chargedaffairs.org/>, 08 July 2019.

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NUCLEAR SECURITY

TURKEY

\$72M Worth of Radioactive Element Used in Nuclear Reactors Reportedly Seized in Turkey

Authorities in Turkey reportedly discovered \$72 million worth of a radioactive element — used in nuclear reactors and found in the fallout of nuclear explosions — from a car. The 18.1 grams of californium were seized in the northern Bolu province of the country, law enforcement officials said, according to the *Daily Sabah*. Five people were being investigated in regards to the incident.

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The substance was seized by local anti-smuggling authorities and sent to the Turkish Atomic Energy Authority, officials said. Californium is a rare, man-made radioactive element. First created in 1950 at the University of California at Berkeley, it's used primarily in nuclear reactors. Only the U.S. and Russia have created californium. In March 2018, investigators seized what they thought was 1.4 kilograms of californium, but that find actually turned out to be a natural substance with no radioactivity.

Source: <https://www.foxnews.com/>, 08 July 2019.

NUCLEAR SAFETY

GENERAL

Five Myths about the Chernobyl Disaster

More than three decades ago, a reactor at the Chernobyl Nuclear Power Plant in the Ukrainian republic of the Soviet Union exploded. A fierce fire burned for the following two weeks, sending columns of radioactive gases and particles across the European landscape and beyond.

The accident is an enduring subject of fascination - HBO recently adapted the event into a hit miniseries, and the site is a popular tourist destination - leading to conjecture and misconception, reports Washington Post.

MYTH NO. 1: *It resulted in only a few fatalities and casualties.*

For the past three decades, official reports of casualties and deaths from the Chernobyl accident have been surprisingly modest. Two people died immediately. Twenty-nine died in hospitals, and much later, 15 children died of Chernobyl-induced thyroid cancers. These numbers have been repeated in recent articles in Newsweek and LiveScience. Estimates of Chernobyl's future

health effects are also low: In 2006, researchers at the U.N. International Agency for Research on Cancer estimated that Chernobyl-induced cancers by 2065 will total 41,000, compared with several hundred million other cancers from other causes. Forbes even claimed that "only the fear of radiation killed anyone outside the immediate area," by elevating rates of alcoholism and depression. The actual numbers may be far higher. Unfortunately, Belarus (where 70 percent of Chernobyl fallout landed), Russia and Ukraine have no public tallies of Chernobyl-related fatalities to update the count. But other state data gives us a rough sense of the number of people affected by the disaster over time. In January 2016, for example, the Ukrainian government said 1,961,904 people in Ukraine were officially victims of the Chernobyl disaster. Ukraine also pays compensation to 35,000 people whose spouses died from Chernobyl-related health problems.

These figures do not count Russia or Belarus, where estimates of cancers and fatalities are in the hundreds of thousands.

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MYTH NO. 2: *The Chernobyl accident had only regional consequences*

A Newsweek account says only that "a cloud of radioactive material rained down on the nearby towns and villages." A United

Nations report about recovery at Chernobyl, which sits on Ukraine's northern border, says simply that "the disaster affected Belarus, Ukraine and Russia." In HBO's recent miniseries fictionalising the disaster, a physicist briefing Soviet leader Mikhail Gorbachev says the radiation will spread as far as East Germany. The consequences of the accident reached much farther. The fallout map shows that Chernobyl radioactivity drifted widely across Europe, usually in areas with higher altitudes and precipitation.

Indeed, Swedish scientists were the first to report the Chernobyl incident, because nuclear workers in Sweden set off radiation detection devices as they were walking into a plant on the Monday morning after the accident. In 1986, 7,000 farmers

in northern England and southern Scotland had to pull their sheep from sale after Chernobyl fallout hit them. Two decades later, more than 350 farmers in Britain still faced restrictions on the movement of their animals and the sale of their meat. Consumer goods harvested in Chernobyl-affected territories continue to travel around the globe. A few years ago, France stopped a large shipment of radioactive mushrooms from Belarus. Chernobyl-contaminated berries from Ukraine regularly enter European markets, and some of those berries migrate to the United States.

MYTH NO. 3: *Nature is thriving in the zone around Chernobyl*

Some seeking an upside to the disaster have heralded the good news that the ecosystem around Chernobyl has rebounded. One company that offers birding tours in the exclusion zone describes it as an "involuntary park" that teaches "key lessons on how wildlife doesn't need us." Scientists have found up to a sevenfold increase in some large mammals and concluded that, though radiation is not good for animals, people have an even more detrimental effect. The Guardian calls the Chernobyl zone a "wildlife haven." Such studies tend to concentrate on data from censuses and cameras tracking large, charismatic fauna such as wolves, wild horses and wild boar. Census data tells scientists how many animals there are but little about their health. With chronic low doses of radiation, health effects are subtle and difficult to detect. Biologists studying small animals such as mice, voles and birds report finding animals with more frequent mutations, physical deformities and reduced populations. A team of scientists from Texas Tech University found higher-than-expected mutation rates in Chernobyl rodents exposed to chronic low doses. Scientists have also observed abnormalities in barn swallows that breed there, including deformed toes and beaks, and the same radiation has suppressed the growth of pine trees. Such problems might also affect large mammals, too, though they can't be detected by satellite photography.

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MYTH NO. 4: *Chernobyl was the worst nuclear disaster ever*

Chernobyl is often described as the most devastating nuclear disaster in human history. Business Insider, ranking it against other accidents at Fukushima and Three Mile Island, found Chernobyl the most damaging. The International Atomic Energy Agency rated Chernobyl a Level 7 accident, the highest rating possible. While Chernobyl released the most radioactive fallout at one time in an accident, other nuclear events issued far more radioactive isotopes into the atmosphere. The Chernobyl accident emitted between 50 million and 200 million curies of radioactivity. The first Soviet and American plutonium plants each spread an estimated 200 million curies of radioactive waste into the

surrounding environments as part of daily operations. Until the Test Ban Treaty of 1963 took effect, the nuclear powers, including the United States and the U.S.S.R., blew up 520 nuclear weapons in the atmosphere to test nuclear bombs, creating emissions of long-lasting radioactive isotopes in the billions of curies. Examining just one radioactive isotope is illuminating. Chernobyl issued an estimated 45 million curies of radioactive iodine (among other elements) - which is absorbed by human thyroids, and can cause thyroid disease and thyroid cancer - into the atmosphere. American and Soviet nuclear bomb tests released an estimated 20 billion curies of radioactive iodine between 1945 and 1962.

MYTH NO. 5: *Chernobyl shows that the Soviet Union was inept*

Chernobyl has come to stand for an enduring narrative that Soviet scientists and government officials were uniquely incompetent. "The Ferris wheel left in the city's decaying amusement park still stands in testament to the folly of the corrupt, paranoid and inept Soviet system," says USA Today. Grigori Medvedev's book, "The Truth About Chernobyl," promises an account of "absurdity and incompetence galore." In truth, the Soviet

response to the disaster was impressive. The Soviets are most often criticised for waiting three days to inform the public of the accident; concealing it did mean that people in neighboring nations, such as Poland, received protective prophylactic iodine later than is advisable. Soviet leaders did, however, act to protect their own citizens. Within 36 hours, they had relocated 50,000 residents of the city of Pripyat and were making plans to evacuate a large territory around the plant. (Japanese leaders waited a full two months before they admitted that three reactors at the Fukushima Daiichi nuclear power plant had melted down in March 2011.)

Then there was the medical response, as observed by a team of American doctors who joined Soviet doctors to treat the injured firemen and plant operators at Hospital No. 6 in Moscow. The Americans were impressed by how good Soviet doctors were at estimating radiation dosage by studying a patient's vital signs, and commented on the impressive range of Soviet treatments for radiation poisoning that were unknown in the West. Of the 19 patients who underwent risky transplantations of bone marrow or fetal liver, recommended by the American team, only one survived. More of the patients who had potentially fatal doses survived Soviet doctors' treatments.

Source: <https://www.nzherald.co.nz/>, 06 July 2019.

Chernobyl: The Continuing Political Consequences of a Nuclear Accident

The recent mini-series on the Chernobyl nuclear accident is a reminder that after 33 years the consequences of the accident are still very much with us. The costs to public health are extensively discussed, but the wider political consequences are also still felt. Chernobyl contributed to the

collapse of the Soviet Union, and continues to impact on confidence in nuclear energy around the world. The Chernobyl power plant in Ukraine (then part of the Soviet Union) comprised four "RBMK" reactors, a design unique to the Soviet Union. The principal reactor type around the world, the light water reactor, uses water as both moderator (to slow down neutrons to enable an ongoing nuclear reaction) and coolant (to remove heat and produce steam for power generation). In contrast, the RBMK uses graphite (a form of carbon) as the moderator and water as the coolant.

This graphite/water combination presented an inherent safety problem, that under certain operating conditions the RBMK could be very unstable, resulting in a risk of overheating. The RBMK's designers were well aware of this potential safety issue and prepared detailed instructions for reactor operators on how to avoid such an accident. But the KGB deemed this could

be a manual for saboteurs and classified it Top Secret, so the operators were never aware of the danger. On 25–26 April 1986 Chernobyl's Unit 4 reactor was scheduled for a routine shut down. The plant managers decided to take advantage of this to conduct a "safety test" – an experiment to see whether, if there was a failure in the external power grid immediately after shut

down, the reactor's generators (then spinning down) could produce sufficient power to control the reactor during the time it would take for the reactor's emergency generators to cut in (around one minute). The plant managers failed to obtain safety authorisation for this test. As part of the test (and in violation of safety rules) a number of the reactor's safety systems were disabled.

The Chernobyl "safety test" has been described as akin to testing an airliner's engines during a routine flight, something that should have been absolutely unthinkable. The experiment resulted

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The Chernobyl "safety test" has been described as akin to testing an airliner's engines during a routine flight, something that should have been absolutely unthinkable. The experiment resulted in the core becoming unstable and overheating, leading to a series of steam and other explosions, the destruction of part of the reactor structure, and the graphite core catching fire.

in the core becoming unstable and overheating, leading to a series of steam and other explosions, the destruction of part of the reactor structure, and the graphite core catching fire. This fire dispersed radioactive particles from damaged fuel into the upper atmosphere, contaminating widespread areas of Europe. In various ways the accident contributed to the collapse of the Soviet Union. The accident added to the public's distrust of government authorities. Within the Soviet leadership, the secrecy over dangerous operating procedures had a major impact on General Secretary Mikhail

Gorbachev's thinking. Gorbachev had already begun speaking of glasnost – the need for greater openness and transparency in government institutions and activities. The circumstances of Chernobyl reinforced that the Soviet culture of secrecy was at best regressive and at worst disastrous. Gorbachev initiated a series of reforms

which unintentionally hastened the collapse of the Soviet system. A further factor which weakened the Soviet regime was the enormous economic cost of dealing with the effects of the accident.

More broadly, the Chernobyl accident has had a major impact on public and political attitudes towards the safety of nuclear energy. Chernobyl was the second of three major nuclear accidents: The first was at Three Mile Island, in the US, in 1979. Three Mile Island was a PWR, the predominant type of light water reactor. The accident involved a combination of equipment failures and operator errors, resulting in a fuel melt down. Like other PWRs, Three Mile Island was surrounded by a massive containment structure which prevented virtually all the radiation released from the core escaping to the outside environment. The third major accident was at Fukushima, Japan, in 2011. The Fukushima reactors were early model boiling water reactors, a type of light water reactor. The reactors were damaged from flooding by a tsunami following a major earthquake, resulting in fuel melt downs,

hydrogen explosions from melting fuel cladding, and widespread radiation releases. Subsequent inquiries identified a number of deficiencies, including: (a) critical weaknesses in plant design and in emergency preparedness in the event of severe flooding, such as an insufficiently high flood wall, failure to protect emergency power supplies against flooding and, particularly important, a form of containment that was more limited compared to a modern PWR; (b) regulatory weaknesses; and (c) absence of an appropriate safety culture.

The negative sentiment towards nuclear energy, and a political unwillingness to even discuss the subject, is particularly problematic today when there is increasing pressure to move to low carbon forms of energy. The electricity sector faces the twin challenges of reducing use of fossil fuels and meeting increased demand due to fuel substitution in transport and other areas.

As a consequence of Chernobyl, a number of governments decided to phase out nuclear energy programs, and others decided against proceeding with new nuclear programs. This was despite the Chernobyl accident involving a unique reactor design, and a similar accident being physically

impossible with light water reactors. The negative sentiment towards nuclear energy was reinforced by the Fukushima accident, resulting in further decisions against nuclear programs. Again, the circumstances were situation-specific and the Fukushima reactors are not representative of modern reactors. In fact, the Three Mile Island accident demonstrated that a properly designed containment building can protect public health and safety from even the most serious accident. The negative sentiment towards nuclear energy, and a political unwillingness to even discuss the subject, is particularly problematic today when there is increasing pressure to move to low carbon forms of energy. The electricity sector faces the twin challenges of reducing use of fossil fuels and meeting increased demand due to fuel substitution in transport and other areas. The popular focus is on renewable energy sources, primarily wind and solar. These sources however have the disadvantage of being intermittent, they cannot be relied upon to produce power at all times required. Even with installation of

substantial overcapacity, energy storage systems and extensive grid connections, a level of baseload supply will be needed, and for countries lacking large scale hydro resources, nuclear is the only practical low carbon source of baseload power currently available.

While some renewables proponents argue that baseload power is no longer necessary, it is notable that in the UK, which is committed to achieve zero carbon emissions by 2050, nuclear energy is expected to supply 31% of electricity demand then. These issues are of vital importance to Australia. As we seek to transition away from fossil fuels our national security, as well as public and industry expectations, depend on energy security. We must be prepared to consider objectively the potential role of nuclear in the national energy mix. To the extent that public and political attitudes towards nuclear energy are affected by perceptions based on Chernobyl and Fukushima, governments must be prepared to carefully and fully explain all the facts, to dispel the belief that nuclear energy is simply too risky to consider.

Source: John Carlson, <https://www.lowyinstitute.org>, 09 July 2019.

JAPAN

Nuclear Safety Costs in Japan Surge to Staggering Heights

Japan's nuclear plant operators face ballooning costs for meeting safety requirements imposed six years ago, potentially throwing a wrench into the government's policy of promoting the atom as a low-cost, reliable energy source. The estimated total cost of bringing plants into compliance with current standards sits at roughly 4.8 trillion yen (\$44.2 billion), according to a Nikkei survey of nine of the 10 big regional electricity providers along with Japan Atomic Power

and Electric Power Development. The survey excluded Okinawa Electric Power, which has no nuclear capacity. In January 2013, the utilities had pegged the cost of safety measures at just 900 billion yen.

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About six months later the Nuclear Regulation Authority — the country's nuclear watchdog — imposed some of the world's toughest safety standards on July 8, 2013, to prevent a recurrence of the 2011 Fukushima Daiichi nuclear disaster, triggered by an earthquake and

tsunamis. These requirements are poised to drive up the cost of nuclear power generation. In 2015, the government estimated that nuclear energy would cost as little as 10.3 yen per kilowatt-hour to generate in 2030 — less than coal at 12.9 yen, or solar at 12.5 to 16.4 yen. But the price of nuclear rises by 1 yen per kilowatt-hour for every 100 billion yen that safety-related expenses add to the cost of a new reactor. Meanwhile, solar and wind have become cheaper, dropping below 10 yen per kilowatt-hour in a growing number of cases overseas and even becoming competitive with nuclear in certain areas. Consumers may end up bearing a portion of the burden through higher electricity rates.

Power companies are keen to restore generation capacity after all of the nation's nuclear facilities were gradually taken offline in response to the disaster. Idled reactors weigh heavily on their earnings as they will be forced to turn to costlier fossil fuels. The tougher safety measures require utilities to protect reactors against stronger earthquakes and larger tsunamis by taking such additional steps as reinforcing pipes. The new standards also mandate construction of off-site control facilities so that operators can remotely cool down reactors in the event of an intentional plane crash or another terrorist attack. The NRA said in 2015 that it would have reactors

shut down if these facilities were not completed within five years of the approval of architectural plans.

Kansai Electric Power, whose energy generation mix was especially nuclear-heavy before the disaster, has seen its cost estimate surge 3.6-fold since 2013 to 1.03 trillion yen. Kyushu Electric Power's has more than quadrupled to well over 900 billion yen, with the cost of the anti-terrorism safeguards alone at its Sendai and Genkai plants seen reaching about 460 billion yen. Chubu Electric Power faces a potential jump in costs for its Hamaoka plant, which sits near what could become the epicenter of a massive earthquake in the Nankai Trough. After the NRA pushed the government for a less conservative prediction of the impact of such a temblor, the Cabinet Office raised its estimate of the resulting tsunami's potential size to 22.5 meters — higher than the 22-meter seawall built around the Hamaoka facility. While the utility is reluctant to change the assumptions used in designing its safeguards, it still faces the risk that the NRA could demand a higher barrier.

Source: Suguru Kurimoto, <https://asia.nikkei.com>, 09 July 2019.

NUCLEAR WASTE MANAGEMENT

USA

Recycle Everything, America—Except Your Nuclear Waste

Americans have come late to the game on responsible consumerism, but they are making up for lost time with a passionate obsession about waste. It's no coincidence that Fox News, CNN, YouTube and USA Today have all reported that the deepest solo ocean dive found plastic waste seven miles below the surface, in the Mariana Trench. Now that Americans are "woke" about waste in general, they may turn to the specific kind produced by the nuclear energy industry. Plans to

revitalize US nuclear power, which is in dire economic straits, depend on the potential for new, "advanced" reactors to reduce and recycle the waste they produce. Unfortunately, as they "burn" some kinds of nuclear wastes, these plants will create other kinds that also require disposal. At the same time, these "advanced" reactors—many of which are actually reprises of past efforts—will increase security and nuclear weapons proliferation risks and ultimately do nothing to break down the political and societal resistance to finding real solutions to nuclear waste disposal.

The current nuclear dream is really no different from previous ones of the last 70 years: the next

The current nuclear dream is really no different from previous ones of the last 70 years: the next generation of reactors, nuclear power advocates insist, will be safer, cheaper, more reliable, less prone to produce nuclear bomb-making material, and more versatile (producing electricity, heat, and perhaps hydrogen), without creating the wastes that have proved almost impossible to deal with in the United States.

generation of reactors, nuclear power advocates insist, will be safer, cheaper, more reliable, less prone to produce nuclear bomb-making material, and more versatile (producing electricity, heat, and perhaps hydrogen), without creating the wastes that have proved almost impossible to deal with in the United States. The Nuclear Energy Innovation and Modernization Act

specifically describes the advanced reactors it seeks to support as having all those positive characteristics. This newest burst of enthusiasm for advanced reactors is, however, largely fueled by the idea that they will burn some of their long-lived radioisotopes, thereby becoming nuclear incinerators for some of their own waste. Many of these "advanced" reactors are actually repackaged designs from 70 years ago. If the United States, France, the UK, Germany, Japan, Russia, and others could not make these reactors economically viable power producers in that time, despite spending more than \$60 billion, what is different now?

Moreover, all of the "advanced" designs under discussion now are simply "PowerPoint" reactors: They have not been built at scale, and, as a result, we don't really know all the waste streams that they will produce. It's tempting to believe that having new nuclear power plants that serve, to some degree, as nuclear garbage disposals means

there is no need for a nuclear garbage dump, but this isn't really the case. Even in an optimistic assessment, these new plants will still produce significant amounts of high-level, long-lived waste. What's more, new fuel forms used in some of these advanced reactors could pose waste disposal challenges not seen to date. Some of these new reactors would use molten salt-based fuels that, when exposed to water, form highly corrosive hydrofluoric acid. Therefore, reprocessing (or some form of "conditioning") the waste will likely be required for safety reasons before disposal. Sodium-cooled fast reactors—a "new" technology proposed to be used in some advanced reactors, including the Bill Gates-funded TerraPower reactors—face their own disposal challenges. These include dealing with the metallic uranium fuel which is pyrophoric (that is, prone to spontaneous combustion) and would need to be reprocessed into a safer form for disposal.

Unconventional reactors may reduce the level of some nuclear isotopes in the spent fuel they produce, but that won't change what really drives requirements for our future nuclear waste repository: the heat production of spent fuel and amount of long-lived radionuclides in the waste. To put it another way, the new reactors will still need a waste repository, and it will likely need to

be just as large as a repository for the waste produced by the current crop of conventional reactors. Recycling and minimizing—even eliminating—the waste streams that many industries produce is responsible and prudent behavior. But in the context of nuclear energy, recycling is expensive, dirty, and ultimately dangerous. Reprocessing spent nuclear fuel—which some advanced reactor designs require for safety reasons—actually produces fissile material that could be used to power nuclear weapons.

This is precisely why the United States has avoided the reprocessing of spent nuclear fuel for the last four decades, despite having the world's largest number of commercial nuclear power plants. Continuing research on how to deal with nuclear waste is a great idea. But building expensive prototypes of reactors whose fuel requires reprocessing, on the belief that such reactors will solve the nuclear waste problem in America, is misguided. At the same time, discounting the notion that a US move into reprocessing might spur other countries to develop this same technology—a technology they could secretly exploit to produce nuclear weapons—is shortsighted and damaging to US national and world security.

Source: Allison Macfarlane, Sharon Squassoni, <https://thebulletin.org/>, 08 July 2019.



Centre for Air Power Studies

The Centre for Air Power Studies (CAPS) is an independent, non-profit think tank that undertakes and promotes policy-related research, study and discussion on defence and military issues, trends and developments in air power and space for civil and military purposes, as also related issues of national security. The Centre is headed by Air Marshal K.K Nohwar, PVSM VM (Retd).

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