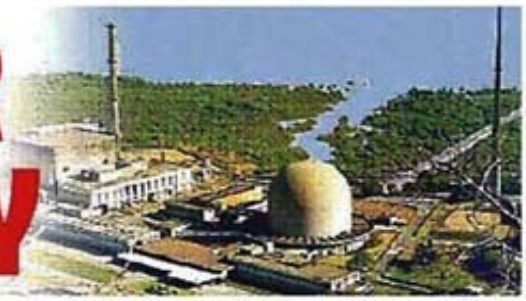
NUCLEAR SECURITY



A FORTNIGHTLY NEWSLETTER ON NUCLEAR DEFENCE, ENERGY AND PROLIFERATION FROM CENTRE FOR AIR POWER STUDIES

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OPINION – Scarlett Evans

Is China Powering the Future of Nuclear?

What does the future of nuclear power look like, and what will China's dominance mean for the rest of the world? The future of nuclear seems to be seated in China. Over the past two decades, the country has been steadily building its nuclear capacity, increasing the number of operating plants from three to more than 40 in 2018, with an additional 18 under construction.

Now, the country is the biggest platform in the world for nuclear power, making up more than half of new global nuclear investment and slated to overtake the US in nuclear power production sometime before 2030. So what does the future of nuclear power look like, and what will China's dominance mean for the rest of the world?

Nuclear Power in China: This year's World Nuclear Industry Status Report found that outside of China, global nuclear power generation declined for the third year in a row, with disasters such as Fukushima causing many nations to scale back on such a volatile power source. In contrast, China has been consistently favouring its development.

Now, the country is the biggest platform in the world for nuclear power, making up more than half of new global nuclear investment and slated to overtake the US in nuclear power production sometime before 2030. So what does the future of nuclear power look like, and what will China's dominance mean for the rest of the world.

According to the WNA, mainland China has over 40 nuclear power stations in operation, while the government's long-term target outlined in its Energy Development Strategy Action Plan 2014-2020 is set at 58GWe nuclear capacity by 2020, with an additional 30GWe hoped to be under construction. Cost has been identified as a driving factor of this rapid nuclear development, with an MIT study finding construction to be far cheaper in the East than the Western world. "In Korea, in China and the UAE, which is being built by the Koreans – the cost is $3,000-$4,000 per kilowatt," study co-author David Petti said, adding that by comparison in the West costs are "north of $8,000 per kilowatt".

In addition there is President Xi Jinping's 'war on pollution', which has seen a series of cuts on

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carbon-emitting power sources in an attempt to limit smog in the country. With coal-heavy options being pushed to the background, attention is turning to the alternative of nuclear power as a low-carbon energy source with capacity for a large base load of electricity.

"This rationale follows from China's need for energy security," says Mark Hibbs, Nuclear Policy Program senior fellow and author of The Future of Nuclear Power in China. "If China's power demand grows over the next twenty years at a rate just half of the average rate since modernisation began in the 1980s, China's power demand will double by 2040." "Unlike many Western countries," he adds, "China has continued to anticipate that the share of power generation from renewables in China will be limited in the longer term – through the middle of the century – to less than half of the total."

State-run corporation China General Nuclear Power Group (CGN) was looking to buy a 49% stake in eight UK nuclear power stations, including Sizewell in Suffolk and Dungeness in Kent. CGN's UK branch was also a driving factor behind the Hinkley Point C station currently under construction in Somerset, with the firm taking a 33.5% stake to offer financial assistance.

The World Nuclear Industry Status report said China is home to six of the nine nuclear reactors that commenced operations during 2017 and in the first half of 2018, with the other three located in Russia and Pakistan.

In addition, China was found to lead the way in technological advances, having reported the successful connection of the first EPR third-generation reactor to the grid and the successful completion of the first AP1000 third-generation reactor. As Hibbs says, the country's nuclear agenda is also driven by its "confidence that [it] will be able to secure and wield intellectual property in the nuclear technology field, including for exports and as a strategic lever in its foreign relations." Indeed, while China has become almost entirely self-sufficient in terms of reactor design and construction, its policy looks to 'go global' with its nuclear technology, seeking to export developments to other nations.

The Global Future of Nuclear: A clear target for China's nuclear power exports is the UK, which unlike other European countries is seeking to expand its own nuclear portfolio to meet climate targets. The country has up to six new nuclear projects planned over the next two decades.

In July this year, it was reported that state-run corporation China General Nuclear Power Group (CGN) was looking to buy a 49% stake in eight UK nuclear power stations, including Sizewell in Suffolk and Dungeness in Kent. CGN's UK branch was also a driving factor behind the Hinkley Point C station currently under construction in Somerset, with the firm taking a 33.5% stake to offer financial assistance.

While some see the rise of nuclear as a positive shift away from carbon-heavy sources, the UK's seemingly increasing reliance on China for nuclear projects has caused some to raise concerns over infrastructure security. CEO of non-profit Chinadialogue Isabel Hilton told The Guardian that such collaboration was an unprecedented first in the West: "No other OECD country has done this. This is strategic infrastructure, and China is a partner but not an ally in the security sense. "You are making a 50-year bet, not only that there will be no dispute between the UK and China, but also no dispute between China and one of the UK's allies. It makes no strategic sense."

The geopolitical impact of China's nuclear dominance has been noted before. A report from the Atlantic Council published in March argues for the necessity of the US engaging more in the global nuclear industry for 'military and commercial interests', expressing fear over Russian and Chinese industry dominance muscling the US out of potentially lucrative areas.

Indeed, Russia is one of the few countries vying with China in the proliferation of nuclear plants,

building nuclear reactors or pursuing commercial deals in India, Bangladesh, Turkey, Hungary, Belarus, Egypt, Jordan, Iran and Saudi Arabia – all places of geopolitical interest to the US. "US global nuclear engagement is critical," the report notes, "not only because it supports military needs and advances commercial interests, but also because it brings with it a culture that promotes safety, security of nuclear materials, and non-proliferation."

Indeed, Russia is one of the few countries vying with China in the proliferation of nuclear plants, building nuclear reactors or pursuing commercial deals in India, Bangladesh, Turkey, Hungary, Belarus, Egypt, Jordan, Iran and Saudi Arabia – all places of geopolitical interest to the US.

Hibbs says fears over security may well stand in the way of China flourishing in the nuclear industry "since potential foreign clients may not be willing to take political and commercial risks associated with a monopoly provider." Instead, he says it will likely dominate "if it is a leader in a field that includes established nuclear power industries in North America, Russia, and Western Europe, and the Asia-Pacific." Security concerns aside, it is undeniable that China is carving out a space for itself in the nuclear sector, and with global energy demands set to grow in the coming years, it seems unlikely to slow down.

Kim has been all talk and no real denuclearization. North Korea has never surrendered a single nuclear weapon, the first measure of denuclearization. Instead, this year it has probably built five to nine nuclear weapons, the exact opposite of denuclearization. As long as North Korea is nuclearizing, not denuclearizing, it should not be rewarded.

Source: https://www.power-technology.com, 10 October 2018.

OPINION – Bruce W. Bennett

Kim Jong UN's True Plan for North Korea's Nuclear Weapons

On March 6, North Korean Chairman Kim Jong UN met with South Korean officials and told them that he was prepared to negotiate the abandonment of his nuclear weapons with the United States. He wanted a summit meeting with President Trump to discuss the North Korean denuclearization in exchange for guarantees of North Korean security. Since that time, Kim has regularly promised to denuclearize, including his recent commitment to remove all nuclear weapons from the Korean Peninsula by early 2021. Secretary of State Mike Pompeo reported "real progress" after a meeting with Kim. Russia and China have since requested that the United Nations Security Council relax the economic sanctions on North Korea because of the "positive developments" in Korea.

But thus far, Kim has been all talk and no real denuclearization. North Korea has never surrendered a single nuclear weapon, the first measure of denuclearization. Instead, this year it has probably built five to nine nuclear weapons, the exact opposite of denuclearization. As long as North Korea is nuclearizing, not denuclearizing, it should not be rewarded.

Indeed, Kim's behaviour is difficult to understand given his stated plans to abandon his nuclear weapon program and instead improve the North Korean economy. Why waste hundreds of millions of dollars that could be spent on the economy on building new nuclear weapons that he plans to surrender in the next two years? Even if he was not satisfied with the U.S. security guarantees to date, his existing 30 to 60 nuclear weapons would likely be adequate to spur negotiations.

Actions speak far louder than words. Kim's actions suggest that his real objective is to delay U.S. actions against him until he can build a coercive nuclear weapon force with dozens of ICBMs to directly threaten the United States.

Kim has apparently claimed that he cannot begin real denuclearization because hardliners in North

Korea would seriously oppose such actions. It is surprising that Kim is admitting that he is not in full control of North Korea. Moreover, these concerns appear exaggerated. Many senior North Korean elites moonlight as entrepreneurs. The economic sanctions are really hurting their personal businesses. They know that denuclearization would substantially improve their personal economic situation, so it is possible that they would support it.

Since March, the United States has maintained the economic sanctions against North Korea, but has otherwise adopted a continuation of the "strategic patience" policy followed by the United States in the past. But there are some steps that could begin to clear the path toward true denuclearization. One might be to seek an immediate freeze of the North Korean nuclear weapons program.

North Korea also could be asked to provide the IAEA with a list of its nuclear reactors, and its facilities for uranium enrichment, plutonium reprocessing, and nuclear weapons assembly—potentially as much as 10 facilities in all. This list could identify the facility name, its purpose, its location and its capacity. A more comprehensive nuclear weapon declaration could be required later.

The North might be asked, for example, to surrender the nuclear weapons it has likely built in 2018 for disassembly by a team of French-U.K. nuclear weapon experts working with North Korean scientists and supervised by the IAEA. After disassembly, the critical nuclear materials could be taken out of North Korea by the French-U.K. team. The IAEA could place monitoring systems at the major North Korean nuclear weapon production facilities to verify that there is no further nuclear weapon production.

North Korean leader Kim Jong UN attends the joint press conference with South Korean President Moon Jae-in at Paekhwawon State Guesthouse on September 19, 2018 in Pyongyang, North Korea.

To facilitate such monitoring, North Korea also could be asked to provide the IAEA with a list of its nuclear reactors, and its facilities for uranium enrichment, plutonium reprocessing, and nuclear weapons assembly—potentially as much as 10 facilities in all. This list could identify the facility name, its purpose, its location and its capacity. A more comprehensive nuclear weapon declaration could be required later.

The IAEA could be charged with verifying the facility list. This would allow procedures to be developed for challenging inspections, as the North Korean list may not include all of its key production facilities known to the United States and South Korea. The fact that these tasks could be needed to simply establish a freeze on the North Korean nuclear weapon inventory illustrates that North Korea is a long way from starting to denuclearize, and thereby meeting its established commitments. Similar actions could also be taken with North Korean ballistic missiles, and especially its ICBMs.

In addition, given that the United States and South Korea have suspended their major military exercises, North Korea could be asked to do the same. All of these actions would be consistent with the spirit of the Chinese "Freeze-for-Freeze" proposal. North Korea may insist on compensation for these actions. President Trump has ruled out relaxation of the sanctions against North Korea until denuclearization is complete, so other actions would likely come under consideration.

To meet North Korea's interest in item one from the June 12 Singapore Agreement, which commits the U.S. and North Korea to establishing new relations, the United States could take several actions. First, it could ask China to join its requested "freeze" by suspending its major military exercises in its Northern Theatre opposite North Korea, demonstrating new U.S. concern for North Korean security. The United States could also invite North Korea to send perhaps 100 North Korean graduate students for social science and business studies at the best U.S. universities to help them learn about U.S. thinking and culture—

something the North Korean elites reportedly want.

Finally, the United States could offer to establish a liaison office in Pyongyang to support developing U.S.-North Korean relations. All of these actions might serve to illustrate that the U.S. wants to achieve a new relationship with North Korea. These could be worthy first steps, with many more steps required to get full dismantlement of the North Korean nuclear weapon program. If taken before the escalating North Korean nuclear weapon threat grows any further, these steps could make a difference.

Source: www.newsweek.com, 10 October 2018.

OPINION – Joshua S. Goldstein, Staffan A. Qvist

If we're Going to Save the Planet, we've Got to Use the Nuclear Option

Good news and bad news arrived from the world's top climate change experts. Good news: they can tell us in agonizing detail why the world should really, really keep the rise in global warming to less than 1.5 degrees Celsius. Bad news: the 132 authors of the 700-page report offer many ideas but no feasible plan for how to do that. As the International Panel on Climate Change's co-chair put it, "One thing the report did not aspire to do is answer the question of feasibility." So we can call it the Beach Boys Report ¯ "Wouldn't it be nice...."

The 1.5 degree target is rightly even more ambitious, but also even further from the reality of energy systems in the world today. In the first part of the 21st century, the fastest-growing energy source was coal. And energy use is going up rapidly because poor countries want to be richer ¯ and have a right to be. Climate goals and realities are not converging.

The 2015 Paris Agreement set an overall goal of staying below 2 degrees Celsius of global warming. However, the combination of the deal's country-by-country goals would not accomplish that, and no major country is on track to meet its goals anyway. The 1.5 degree target is rightly even more ambitious, but also even further from the reality of energy systems in the world today. In the first part of the 21st century, the fastest-growing energy source was coal. And energy use is going up rapidly because poor countries want to be richer ¯ and have a right to be. Climate goals and realities are not converging.

The main mitigation scenarios in the IPCC's new report depend heavily on wind and solar power. These are both important parts of a solution, but they are harder and harder to deploy as they constitute more of the power grid. That's because the outputs of wind and solar sources vary ¯ between day and night, between winter and summer, and often unpredictably. The desperately needed technologies to affordably store such renewable energy are still developing. Furthermore, renewable energies are diffuse, using large amounts of land, steel and concrete per unit of electricity generated, which makes it harder to expand them at the scale and pace called for by the IPCC's dire timeline.

Other steps can also move us in the right direction without getting close to the goal. Individuals can stop eating meat and start taking public transportation. Air conditioners can become more efficient. Farmers can change fertilizer practices. But all of these put together won't do nearly enough, and time is running out.

Here's a different idea: Let's look at countries or regions that have successfully cut carbon emissions. For the all-important electricity sector, the website electricitymap.org shows how many grams of carbon pollution a region creates for each kilowatt-hour of electricity it generates. For the world, the average is now about 500. It needs to drop below 50 within a couple of decades to prevent disaster.

In this effort, the world can be divided into three general tiers: places that use mostly coal, including Poland, India, China and Australia (they produce about 700 to 800 grams CO2/kWh); places that have mostly replaced coal with natural

gas and some renewables, such as the United States and Germany (about 500 grams; California has reached 200-300 grams with great effort); and places that have miraculously decarbonized their grids to below 50 grams.

Only two methods of electricity generation account for this. Some countries such as Norway and Uruguay are lucky enough to have vast hydroelectric capacity. Most nations don't, and new hydropower comes at enormous cost to ecosystems.

The other decarbonized grids can be found in places that rely on nuclear power, such as France, Sweden, and Ontario, Canada. Nuclear power is free of carbon pollution; is highly concentrated, which minimizes environmental impacts such as those from mining and waste; and operates 24/7 without needing batteries. Most importantly, it can scale up rapidly - exactly what's needed to bring the IPCC's goals out of fantasyland. Based on our analysis of many countries' experiences, what might take a century to do with renewables alone could be done in 20 years with nuclear power?

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Isn't n-n-nuclear too dangerous, too expensive, too creepy? Well, no. It's thousands of times safer than coal, which kills hundreds of thousands of people each year. Actually, nuclear power is the safest form of energy ever used, in terms of deaths per unit of energy.

Nuclear also generates far less waste than other energy sources, including renewables. The spent fuel from a lifetime of electricity use by an average American generated entirely from nuclear power would fit in a soda can. Someday we'll bury it, but for now the waste can be left safely in its dry casks, certified for a hundred years, while we attend to bigger issues like saving the planet.

Doesn't nuclear power contribute to nuclear weapons proliferation? No. Weapons programs do not depend on civilian nuclear power, which operates under stringent international safeguards. The most problematic nuclear weapons countries, such as North Korea, do not even have civilian nuclear power. In fact, nuclear electricity has enabled disarmament, as nearly 10 percent of U.S. electricity in the last two decades came from dismantled Russian warheads.

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Nuclear power needn't be too expensive either. Existing U.S. nuclear plants, which generate one-fifth of the nation's electricity, produce less expensive power than either coal or gas. In South Korea, electricity from nuclear power costs less than 4 cents/kWh, which is cheaper than that from any other source. The key to replicating South Korea's low costs is to focus on repeatedly building a standardized design, which brings costs down to $2 billion per gigawatt. That's about double the capital cost of a U.S. natural gas power plant, but half that of a U.S. coal plant and less than half of wind and solar power facilities with equivalent production.

The problem in North America and Europe is that older nuclear plants cost much less than new ones, even though we have better technologies today. The latest U.S. attempts to build nuclear power escalated to $12 billion per gigawatt. But then unlike South Korea, the United States has gone

decades without practice. Both Sweden and France have powered growing economies for decades on cheap nuclear power. Both transitioned off fossil electricity in less than 20 years. There is no reason the world can't do the same now.

The IPCC has told us how urgently the world needs to decarbonize to prevent a climate catastrophe. We need a realistic plan. It will include huge increases in renewable power, greater energy efficiency and shifts in agriculture. It must also include building 100 to 200 new nuclear reactors worldwide each year for the next few decades. Instead of merely taking steps in the right direction that don't add up, the world needs to get moving along this proven, feasible path to save our planet.

Source: The Huffington Post, 10 October 2018.

OPINION – T.V. Paul

The Power of Non-alignment

The NAM and its precursor, the Bandung Afro-Asian conference in 1955, were examples of soft balancing by weaker states towards great powers engaged in intense rivalry and conflict. As they had little material ability to constrain superpower conflict and arms build-ups, the newly emerging states under the leadership of India's Jawaharlal Nehru, Egypt's Gamal Abdel Nasser and Indonesia's Sukarno, and later joined by Yugoslavia's Josip Broz Tito, adopted a soft balancing strategy aimed at challenging the superpower excesses in a normative manner, hoping for preventing the global order from sliding into war.

The founders of the NAM, if alive today, could have taken solace in the fact that in the long run some of their goals were achieved due to a radical change in the policies of the Soviet Union under Mikhail Gorbachev.

Understanding a Movement: The NAM is often not given credit for what it deserves, because by the 1970s, some of the key players, including India, began to lose interest in the movement as they formed coalitions with one or the other superpower to wage their conflicts with their neighbours. It is also not theorised by scholars properly. The Western countries often portrayed non-alignment as pro-Soviet or ineffective and the general intellectual opposition was the result of the Western scholarly bias against a coalitional move by the weaker states of the international system. This is very similar to how upper classes or castes respond to protest movements by subaltern groups in highly unequal and hierarchical societies.

The international system is hierarchical and the expectation is that the weaker states should simply abide by the dictates of the stronger ones. It is often forgotten that when the Bandung meeting took place, the world was witnessing an intense nuclear arms race, in particular, atmospheric nuclear testing. The fear of a third world war was real. Many crises were going on in Europe and East Asia, with the fear of escalation lurking. More importantly, the vestiges of colonialism were still present.

Despite all its blemishes, the NAM and the Afro-Asian grouping acted as a limited soft balancing mechanism by attempting to delegitimise the threatening behaviour of the superpowers, particularly through their activism at the UN and other forums such as the Eighteen Nation Committee on Disarmament, as well as through resolutions.

"Naming" and "shaming" were their operational tools. They worked as norm entrepreneurs in the areas of nuclear arms control and disarmament. They definitely deserve partial credit for ending colonialism as it was practised, especially in the 1950s and 1960s in Africa, parts of Asia and the Caribbean through their activism at the UN General Assembly which declared decolonisation as a key objective in 1960.

Impact on N-tests: The non-aligned declarations on nuclear testing and nuclear non-proliferation especially helped to concretise the 1963 PTBT. They also helped create several nuclear weapon free zones as well as formulate the NPT. The

tradition of 'non-use of nuclear weapons', or the 'nuclear taboo', was strengthened partially due to activism by the non-aligned countries' at the UN. The non-aligned could find solace that it took a few more decades for a leader like Mr. Gorbachev to emerge in one of the contending superpowers, and that many of their policy positions were adopted by him, and later partially by the U.S.

Tradition of 'non-use of nuclear weapons', or the 'nuclear taboo', was strengthened partially due to activism by the non-aligned countries' at the UN. The non-aligned could find solace that it took a few more decades for a leader like Mr. Gorbachev to emerge in one of the contending superpowers, and that many of their policy positions were adopted by him, and later partially by the U.S.

As the great powers are once again launching a new round of nuclear arms race and territorial expansion and militarisation of the oceans, a renewed activism by leading global south countries may be necessary to delegitimise their imperial ventures, even if they do not succeed immediately. If these states do not act as cushioning forces, international order could deteriorate and new forms of cold and hot wars could develop. China, the U.S. and Russia need to be balanced and restrained and soft balancing by non-superpower states has a key role to play in this.

The alternative is to leave it to the great powers to engage in mindless arms race and debilitating interventions, which rarely create order in the regions. Restraining the established and rising powers through institutional and normative soft balancing may emerge as an option for developing countries in the years to come. They still need a leader like Jawaharlal Nehru to bring them together.

If the present trends continue, a military conflict in the South China Sea is likely and the naval competition will take another decade or so to become intense, as happened in earlier periods between Germany and the U.K. (early 1900s), and Japan and the U.S. (1920s and 1930s).

The U.S. as the reigning hegemon will find the Chinese takeover threatening and try different methods to dislodge it. The freedom of navigation activities of the U.S. are generating hostile responses from China, which is building artificial islets and military bases in the South China Sea and expanding its naval interests into the Indian Ocean. Smaller states would be the first to suffer if there is a war in the Asia-Pacific or an intense Cold War-style rivalry develops between the U.S. and China. Nuclear weapons need not prevent limited wars as we found out through the Ussuri clashes of 1969 and the Kargil conflict in 1999.

The Way Forward: What can the smaller states do? Can they develop a new 'Bandung spirit' which takes into account the new realities? They could engage in soft balancing of this nature hoping to delegitimise the aggressive behaviour of the great powers. The rise of China and India, with their own ambitious agendas, makes it difficult that either will take the lead in organising such a movement.

China's wedge strategy and its efforts to tie Afro-Asian states through the Belt and Road Initiative have limited the choices of many developing countries. However, despite the constraints, many have been able to keep China off militarily by refusing base facilities and also smartly bargaining with India and Japan for additional economic support. They thus are already showing some elements of strategic autonomy favoured by the NAM.

More concrete initiatives may have to rest with emerging states in the ASEAN grouping. Engaging China and India more intensely while restraining the U.S. and Russia from aggravating military conflict in Asia-Pacific can be the effort of the developing countries. Norm entrepreneurship has it value, even if it does not show immediate results.

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Interventions, which rarely create order in the regions. Restraining the established and rising powers through institutional and normative soft balancing may emerge as an option for developing countries in the years to come. They still need a leader like Jawaharlal Nehru to bring them together.

Source: The Hindu, 11 October 2018.

OPINION – Audra J. Wolfe

Yes, Radiation is Bad for You. The EPA's 'Transparency Rule' would be Even Worse

A headline from the Associated Press sparked outrage in the ordinarily quiet world of science policy. The Environmental Protection Agency, the story suggested, was considering relaxing guidelines for low-dose ionizing radiation, on the theory that "a bit of radiation may be good for you." Within hours, the AP had issued a correction. As it turned out, the EPA was not, after all, endorsing hormesis, the theory that small doses of toxic chemicals might help the body; much like sunlight triggers the production of vitamin D.

Instead, the EPA was doing something much scarier: It was holding hearings on the "Transparency Rule," which would restrict the agency to using studies that make a complete set of their underlying data and models publicly available. The rule is similar to an "Open Science" order issued by the Interior Department last month, and incorporates language from the HONEST Act, a bill that passed in the House in 2017 but later stalled in the Senate. The HONEST Act originally required that scientific studies provide enough data that an independent party could replicate the experiment — which is simply not realistic for large-scale longitudinal studies.

Transparency Rule," which would restrict the agency to using studies that make a complete set of their underlying data and models publicly available. The rule is similar to an "Open Science" order issued by the Interior Department last month, and incorporates language from the HONEST Act, a bill that passed in the House in 2017 but later stalled in the Senate.

Although these rules cite the need to base regulatory policy on the "best available science," make no mistake: They aim to strangle access to reputable studies. The Transparency Rule continues the Trump administration's pattern of anti-science policies. The White House's Office of Science and Technology Policy is a ghost town, with most of the major positions, including the director's post, vacant since January 2017. Agencies and departments across the board, including the State Department and the Agriculture Department, are dropping their science advisers and bleeding scientific staff. It's getting harder and harder for federal rule makers to access expertise.

Understanding what's wrong with "transparency," at least as defined by these policies, requires a closer look at how scientists work. Let's say you're trying to understand the health effects of a one-time, accidental release of a toxic chemical. This incident might be epidemiologists' only chance to investigate how this particular chemical interacts with both the air and the humans who breathe it, at varying doses, over a period of time. No matter how careful your approach, your study would fall short of the replicability standard. You wouldn't have baseline health information for the specific people who happened to be in the area. You might not have information on which residents had air filtration systems installed in their homes, or which residents were working outside when the incident took place. Your early results would, by definition, reflect only short-term health outcomes, rather

than long-term effects. And you couldn't replicate the study (with better controls) without endangering the health of thousands of people. In such cases, scientists have to extrapolate from existing, sometimes imperfect, data to protect the public.

Epidemiologists have community standards, including peer review, to evaluate these kinds of studies. A careful, peer-reviewed study of this hypothetical incident might well represent the "best available science" on this particular chemical. Regulators might rely on this study to establish the permissible levels of this chemical in the air we breathe. But now, let's also say that this study took place 30 years ago. The leading scientists involved are dead, and no one kept their files. The raw data are, effectively, lost. Should scientists at the EPA be blocked from using the study?

The Atomic Energy Commission, the agency in charge of the United States' nuclear weapons program, didn't even attempt to investigate the potential health effects of this constant, low-dose exposure to ionizing radiation on the world's population. Studies of low-dose radiation were expensive, inconvenient, and politically risky, potentially jeopardizing the weapons testing program and therefore the United States' ability to fight the Soviet Union. From the government's perspective, it was better not to know.

Despite what made headlines, the EPA's Oct. 3 hearing went beyond radiation. In fact, its lead witness, University of Massachusetts toxicologist Edward Calabrese, barely mentioned his theory of radiation hormesis. Instead, his testimony argued that the EPA should no longer rely on linear no-threshold (LNT) models for any number of hazards, including toxic chemicals and soil pollutants. In toxicology, LNT models assume that the biological effects of a given substance are directly connected to the amount of the exposure, with no minimum dose required. Radiation protections standards are based on LNT models; so are basic regulations involving ozone, particulate pollution, and chemical exposure.

The original studies asserting a LNT model for low-dose ionizing radiation were conducted in the 1950s. Like our hypothetical epidemiologist investigating a toxic chemical release, the geneticists who tried to understand the biological effects of atomic radiation were working with imperfect data, much of which is no longer available. The concept of a "comprehensive data management policy" simply did not exist in 1955. These particular studies were primarily based on survivors of the atomic bombing of Hiroshima and Japan. The scientists also extrapolated from high-dose exposure data in fruit flies and mice and from unethical high-dose experiments conducted on humans.

These studies are imperfect, but focusing on their limitations misses the broader scandal. These studies took place during the heyday of atmospheric nuclear weapons testing, an era when both the United States and the Soviet Union were pumping the atmosphere full of radioactive nucleotides. Some of the areas near the testing zones received so much radiation that they are still uninhabitable today. The tests coated the entire planet with a scrim of radiation. The Atomic Energy Commission, the agency in charge of the United States' nuclear weapons program, didn't even attempt to investigate the potential health effects of this constant, low-dose exposure to ionizing radiation on the world's population. Studies of low-dose radiation were expensive, inconvenient, and politically risky, potentially jeopardizing the weapons testing program and therefore the United States' ability to fight the Soviet Union. From the government's perspective, it was better not to know.

…A sensational headline distracted us from a broader crisis. Without government support for research of environmental hazards, the public's health is left to either the whims of industry researchers, who have a strong incentive to play down their dangers, or to public advocacy groups,

which are too easily smeared with charges of anti-industry bias. The "transparency" movement supposedly resolves this crisis of authority by giving the public access to the underlying data on which science is based, but it ignores the power dynamics that determine which research questions get asked, and why and how they're answered.

In the past, Americans looked to their federal science agencies and science advisers to resolve these sorts of disputes. But a few weeks ago, the EPA announced that it, too, would be eliminating its Office of the Science Adviser. With the science offices empty, who will decide? There is one bright spot in all of this: On Sept. 28, bipartisan legislation authorized the Energy Department to restart its low-dose radiation research program. But what about the other pollutants that the EPA supposedly regulates? Who will produce the kinds of science deemed acceptable under the "transparency" rule? "Transparency" has become another way to cultivate institutional ignorance. Americans deserve better from the agencies that are supposed to protect them. In the case of environmental hazards, what you don't know can hurt you.

Transparency" has become another way to cultivate institutional ignorance. Americans deserve better from the agencies that are supposed to protect them.

Source: https://www. washingtonpost. com, 08 October 2018.

NUCLEAR STRATEGY

PAKISTAN

Pakistan Successfully Test-fires Nuclear-capable Ghauri Ballistic Missile

Pakistan successfully test-fired Ghauri ballistic missile which is capable of carrying both conventional and nuclear warheads up to a distance of 1,300 kilometers, bringing many Indian cities under its range. The launch was conducted by Army Strategic Forces Command and was aimed at testing the operational and technical readiness of Army Strategic Forces Command, said the Inter Services Public Relations, the media wing of the army. "Ghauri Ballistic Missile can carry both both conventional and nuclear warheads up to a distance of 1,300 kms," it said in a statement.

Pakistan successfully test-fired Ghauri ballistic missile which is capable of carrying both conventional and nuclear warheads up to a distance of 1,300 kilometers, bringing many Indian cities under its range. The launch was conducted by Army Strategic Forces Command and was aimed at testing the operational and technical readiness of Army Strategic Forces Command.

Army Strategic Forces Command Chief Lt Gen Muhammad Hilal Hussain "appreciated the standard of training and operational preparedness of Army Strategic Forces," it said. Senior officials and scientists of the SPD were present to witness the launch. …

Source: https:// economictimes. indiatimes. com/, 09 October 2018.

RUSSIA

Chilling Footage Shows Putin's Submarines Carry out Mock Atomic Strike

The Russian Ministry of Defense has published shocking videos that show a range of nuclear missile drills including a submarine carrying out a mock atomic strike. This videos are the latest in a series of escalating war-games ordered by President Vladimir Putin, who acts as the supreme commander of the Russian armed forces. The chilling footage shows the crew of a Russian submarine following the steps to unleash a retaliatory strike with an atomic bomb. A Northern Fleet commander is seen giving orders to his crew, with a submariner confirming: "Yes sir, a rocket launch."

The missiles are seen firing out of the Arctic waters in the Barents and Okhotsk seas. According

to officials, the drills were "designed for retaliation against an enemy attack". The terrifying footage did not include the new Russian class of Yasen submarines, which can strike any European capital. The high-tech submarines have put the US Navy on edge over the submarines unprecedented land-attack capabilities.

Russia has deployed a ground-based cruise missile, the 9M729, designated by NATO as the SSC-8 "Screwdriver." With an estimated range of more than 1,000 kilometres, the missile violates the 1987 INF Treaty, which banned Washington and Moscow from testing, producing or deploying ground-launched missiles with a 500-to-5,500-kilometer range.

NATO have responded by ramping up their own anti-submarine-warfare tactics. Admiral James Foggo, the head of US Naval Forces in Europe and Africa, has said: "The Kalibr class cruise missile, for example, has been launched from coastal-defense systems, long-range aircraft, and submarines off the coast of Syria. "They've shown the capability to be able to reach pretty much all the capitals in Europe from any of the bodies of water that surround Europe."

Source: Oli Smith, https://www.express.co.uk, 13 October 2018.

USA

No, the U.S. didn't Just Threaten a Preventive Nuclear Strike

During an Oct. 2 press briefing, the U.S. permanent representative to NATO, Kay Bailey Hutchison, raised eyebrows with comments that suggested the United States is preparing to "take out" Russian missiles deployed in violation of the 1987 INF Treaty. No, this wasn't a threat of a preventive strike, and Hutchison's comments are in line with long-term trends in U.S. nuclear targeting. But the way they were delivered underscores the importance of public presentation in U.S. nuclear strategy. Here's what you need to know:

NATO have responded by ramping up their own anti-submarine-warfare tactics. Admiral James Foggo, the head of US Naval Forces in Europe and Africa, has said: "The Kalibr class cruise missile, for example, has been launched from coastal-defense systems, long-range aircraft, and submarines off the coast of Syria.

1. *What is the U.S. Complaint?* Russia has deployed a ground-based cruise missile, the 9M729, designated by NATO as the SSC-8 "Screwdriver." With an estimated range of more than 1,000 kilometres, the missile violates the 1987 INF Treaty, which banned Washington and Moscow from testing, producing or deploying ground-launched missiles with a 500-to-5,500-kilometer range.

2. *Hutchison did not Threaten a Preventive Strike:* While her initial statement was unclear and contained several inaccuracies, Hutchison clarified later that, if Russia did not come back into compliance with the INF Treaty, the United States would take corresponding measures to develop "the to take out a missile that could hit any of our countries in Europe and hit America in Alaska." She did not elaborate on the exact nature of such a capability, but it was relatively clear she was referring to the development of targeting options to pre-empt Russian use in the event of war, rather than a preventive strike in peacetime.

3. *What is the U.S. Targeting Policy?* In fact, Hutchison's comments follow a well-established pattern in U.S. targeting policy. Recent historical research explains how the United States has consistently sought to improve its ability to limit the damage the country would sustain in the event of a nuclear war by attacking the offensive systems of its nuclear rivals, a doctrine known as counterforce. Secretary of Defense Robert S. McNamara sketched out the concept in a 1962 speech, declaring that the

United States should focus on "the destruction of the enemy's forces," not Soviet cities. Counterforce has been part of U.S. planning since then.

During the 1970s, advances in warhead accuracy and intelligence collection capabilities made counterforce options more realistic, lending a new qualitative character to the arms race. As Austin Long and Brendan Green have argued, the Soviets were aware of these developments and took the best measures they could to protect their forces, which in turn spurred greater U.S. efforts to locate and target Soviet submarines and mobile missiles.

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When the Cold War ended, Russian nuclear forces atrophied because of a lack of funding, and arsenals were progressively cut. The accuracy of U.S. warheads and intelligence collection capabilities continued to improve. These developments, combined with emerging sensors, data analysis technologies and other trends, have led some nuclear thinkers to conclude that counterforce has become a more credible option than ever before.

While including hard-target-kill systems in the Carter administration's "countervailing" strategy later in the decade, Secretary of Defense Harold Brown also denied that the United States would have "a disarming first strike capability" against the Soviets.

4. *So what Makes Hutchison's Comments Controversial?* But Hutchison's comments depart from the established style of U.S. declaratory policy — i.e., what the U.S. government says in public about its nuclear posture. While officials have referred to counterforce capabilities in the past, they have generally done so in ways designed to downplay anxieties regarding U.S. plans for a preventive strike against one of its nuclear rivals.

Such a declaratory posture is almost as old as counterforce itself. After his Ann Arbor speech, McNamara began to dial back the rhetoric, progressively downgrading his estimates of the U.S. capability to limit damage by striking the Soviet Union first. In the mid-1970s, Nixon's secretary of defence, James R. Schlesinger, referred explicitly to the U.S. ability to kill "hard targets," including Soviet missiles in certain limited scenarios — but emphasized that the damage resulting from nuclear war would rule it out "for any sane leader." While including hard-target-kill systems in the Carter administration's "countervailing" strategy later in the decade, Secretary of Defense Harold Brown also denied that the United States would have "a disarming first strike capability" against the Soviets.

5. *Presentation of Nuclear Policy Matters*: The transition from the Carter to Reagan White House underscores the importance of presentation in declaratory policy. While the Reagan administration's nuclear targeting strategy was, in fact, a limited extension of Carter's, the presentation style created far greater controversy. While Carter-era officials talked about a "countervailing" strategy, the Reagan emphasized the goal of "prevailing" in a nuclear war and pledged to rebuild U.S. nuclear strength.

There are signs North Korea is still working on its nuclear program. Here's why 'denuclearization' is so problematic. This marked difference in tone led to a strong backlash from scientists, strategists and policymakers, who criticized the administration for fuelling the arms race and raising the chances of nuclear conflict with the Soviet Union. In the face of this backlash, President

Reagan changed tack, downplaying the idea of prevailing in a nuclear war. He switched his attention to the long-term vision of a space-based missile defence system.

The Hutchison incident also underlines the importance of presentation in declaratory policy. Officials in the Trump Department of Defense appear to know this well, couching counterforce policy in traditional nuclear-strategic language. The Trump administration's February 2018 NPR, perhaps the most hawkish such policy document for more than two decades, echoes the counterforce rhetoric of the Cold War: "The goal of limiting damage if deterrence fails in a regional contingency calls for robust adaptive planning to defeat and defend against attacks, including … capabilities to locate, track, and target mobile systems of regional adversaries."

The Trump administration's February 2018 NPR, perhaps the most hawkish such policy document for more than two decades, echoes the counterforce rhetoric of the Cold War: "The goal of limiting damage if deterrence fails in a regional contingency calls for robust adaptive planning to defeat and defend against attacks, including … capabilities to locate, track, and target mobile systems of regional adversaries."

This is almost exactly what Hutchison said, but the phrasing is radically different. The Nuclear Posture Review refers to "targeting mobile systems." Hutchison threatened to "take [them] out." While the NPR references unnamed "regional adversaries," Hutchison not only singled out Russia but also specified a particular Russian missile. And while the quote above was buried in a 100-page government document, Hutchison made public comments at a news conference.

These differences may appear subtle, but the global reaction to Hutchison's statement shows that they matter. Hutchison's unvarnished language, stripped of the euphemisms that usually accompany nuclear strategy statements, and delivered directly to a room full of reporters, shows that what officials say about U.S. nuclear policy can be less important than how they say it.

Source: https://www.washingtonpost.com, 04 October 2018.

BALLISTIC MISSILE DEFENCE

PAKISTAN

Pakistan Tests its Hatf-V Ballistic Missile

Pakistan has conducted a training launch using its Hatf-V/Ghauri I medium-range ballistic missile that, according to a statement from the military's ISPR media branch, was "aimed at testing the operational and technical readiness of Army Strategic Forces Command." An accompanying compilation clip of test was unusual in that it showed the inert re-entry vehicle striking the target area, an aspect not always shown in such tests.

Ghauri I is a liquid-fuelled missile with a range of 1,300 kilometres, and despite being described as able to carry nuclear or conventional warheads, analysts agree that the system, which has a mixed reliability record, has essentially been relegated to a training role. ... Using the stock of cheaper, less advanced Ghauri missiles for such test purposes leaves the more capable Shaheen series of solid-fuel missiles to be used operationally. Unlike the Ghauri, the Shaheen series of missiles do not require a large logistics train for carrying fuel, or potentially up to two hours to prepare the missile for launch, and can instead be launched within a matter of minutes.

Source: www.defensenews.com, 10 October 2018.

NUCLEAR ENERGY

KENYA

Kenya on Course to Develop Nuclear Energy

Kenya's ambition of having a nuclear power plant is still on course and it hopes to build its first such facility in the next 12-15 years, a senior Energy Ministry official said. Joseph Njoroge, principal

secretary for electricity, told Reuters the East African nation plans to turn to nuclear when it has fully exploited other sources of energy. "It (nuclear plant construction) may be in the next 12 or even 15 years ... the Kenya Nuclear Electricity Board is still a going concern and only working to prepare for nuclear," he said.

Hydropower accounts for 35 percent of Kenya's electricity generation, with the rest coming from geothermal, wind and heavy oil plants, the ministry says. Plans to develop a 1,050-megawatt coal-fired plant on the coast, using funding from China, have been delayed by court action from environmental activists.

While the former IRP drawn up in 2010 had incorporated 9.6GW of nuclear energy into South Africa's future energy mix – which translates into about eight power stations – nuclear energy had been dropped entirely from the new draft IRP2018 released for public comment in August. "We believe the IRP 2010 was a good benchmark with 9.6GW.

The development of nuclear energy will come after other resources have been fully exploited in line with growing demand for energy, Njoroge said. "That is after we have done a lot of exploitation of the geothermal, the coal that we also want to exploit, the wind, solar and all those," he said. "At that time the only option we will have to get clean energy will be from nuclear."

Source: http://www.iol.co.za/business-report/energy/kenya, 05 October 2018.

SOUTH AFRICA

Nuclear Power Still Viable for SA's Energy Mix – Industry

South Africa's nuclear industry will ask government to bring back the 9.6GW of nuclear energy into the country's energy mix. Knox Msebenzi, MD of the Nuclear Industry Association of South Africa (Niasa), said the industry had held a workshop to formulate its response to the draft Integrated Resource Plan (IRP) 2018, the roadmap for the country's electricity planning until 2030.

Knox said the nuclear industry was not against renewable energy or gas, and welcomed them into the mix, but believed for South Africa to kill off the nuclear industry would be bad for the country and may slow down the local medical nuclear industry. If the IRP brought back the 9.6GW into the electricity mix, he said it would attract industries to set up shop in South Africa and stimulate a nuclear supply chain industry.

While the former IRP drawn up in 2010 had incorporated 9.6GW of nuclear energy into South Africa's future energy mix – which translates into about eight power stations – nuclear energy had been dropped entirely from the new draft IRP2018 released for public comment in August. "We believe the IRP 2010 was a good benchmark with 9.6GW. It should be more," Msebenzi said after the workshop.

While many have welcomed the absence of nuclear power in the IRP2018, largely because of its huge expense and allegations about corruption in the government's proposed nuclear deal with Russia, Knox dismissed these concerns and said the industry believed nuclear power was still the most viable option. He said the workshop had shown that the IRP's economic modeling on the "least cost" scenario for electricity generation had been faulty. "We punched holes in that one," he said.

The industry workshop believed the methodology in the DoE modeling for the least-cost scenario had not taken into account all aspects of costs, including socio-economic costs. It had also not considered real costs of energy over time. "If you buy an item an item for R10 and it lasts a week, and you buy another for R20 and it lasts 20 weeks, it is clear which costs less. The IRP confuses price with true costs."

The nuclear industry's submission to the DoE, which has called for public comment on the draft IRP2018, would address what the industry considered flawed analyses regarding costs of the different technologies. This would show nuclear to be cost effective, he said. Knox said the nuclear industry was not against renewable energy or gas, and

welcomed them into the mix, but believed for South Africa to kill off the nuclear industry would be bad for the country and may slow down the local medical nuclear industry. If the IRP brought back the 9.6GW into the electricity mix, he said it would attract industries to set up shop in South Africa and stimulate a nuclear supply chain industry. Knox said there were a variety of nuclear technologies available, including the small modular reactors.

The funding on South Africa's Pebble Bed Modular Reactor project, which cost around R11bn over about a decade, was stopped before it produced any reactors. Finance Minister Nhlanhla Nene testified in the Zondo Commission into state corruption that former president Jacob Zuma had pressured him to sign a nuclear deal with Russia that would have had profound economic consequences for South Africa for decades to come.

Economic challenges created by large light-water reactors have resulted in renewed interest in advanced non-light-water reactors from the commercial sector. NEICA establishes the National Reactor Innovation Center (NRIC) to facilitate advanced reactor research. The Congressional Budget Office (CBO) estimates that the implementation of this legislation will cost the federal government $340 million over fiscal years 2018 through 2022.

Nene believes his refusal to comply, in the absence of any funding model or feasibility study, was one of the reasons Zuma fired him. But Knox said issues of corruption were a governance issue. "One cannot blame a technology for bad governance. As a nation we can't say: 'We can't have a certain technology because we are scared certain people are going to be corrupt'. If that is the case, remove the corrupt people." Asked how corruption could be avoided if it may involve a president of the country, Know replied: "Well, he's gone now, isn't he?"

The DoE never made public the cost of the government's proposed nuclear expansion programme of 9.6GW, nor how it would be funded. Nene said in this testimony that in the absence of any funding model or feasibility study, his Treasury staff had looked at possible of costs if the programme were broken down into "sizable chunks", taking into account the exchange rate at the time. They calculated that 2.4GW of nuclear power, about a quarter of the proposed programme, would cost R250bn. Asked at the commission if that would mean the entire 9.6GW could exceed one trillion rand, Nene replied: "It could have." Asked what the implications of this would be on the country, Nene replied: "Our concern was that the recovery of the nuclear build programme through the tariff would have had profound consequences for the economy and South African users of electricity." ...

Source: https://www.fin24.com, 07 October 2018.

USA

Bill Encouraging Private-Public Nuclear Energy Collaboration Signed into Law

On September 28, President Donald Trump signed NEICA, the Nuclear Energy Innovation Capabilities Act (S. 97), into law after the House passed the bill by voice vote on September 13. The bill, sponsored by Senator Mike Crapo (R-ID), encourages partnerships between the DOE and private companies to develop new nuclear energy technologies.

According to the Senate Committee on Energy and Natural Resources' report issued after consideration of the bill, nuclear power today relies on light-water reactor technology developed in the 1950s. Economic challenges created by large light-water reactors have resulted in renewed interest in advanced non-light-water reactors from the commercial sector. NEICA establishes the National Reactor Innovation Center (NRIC) to facilitate advanced reactor research. The Congressional Budget Office (CBO) estimates that the implementation of this legislation will cost the federal government $340 million over fiscal years 2018 through 2022.

... Several other bills to advance nuclear energy including S. 2795, H.R. 4979, H.R. 4084, and S. 512 have been introduced in recent years, but

NEICA is the first to pass both chambers of Congress. On September 6, Senator Lisa Murkowski (R-AK) introduced a separate bill (S. 3422) that would establish advanced nuclear reactor goals and provide for the full operations of a fast neutron reactor by 2025. S. 3422, the Nuclear Energy Leadership Act, was also referred to the Committee on Energy and Natural Resources and currently awaits further consideration.

Source: https://www.americangeosciences.org, 28 September 2018.

NUCLEAR COOPERATION

CHINA–MIDDLE EAST

China's Nuclear Diplomacy in the Middle East

On September 21, China's Ministry of Justice published its draft Atomic Energy Law, which urges its vast nuclear industry to go forth into the world and secure a portion of the nuclear export market. Unlike the "Gold Standard" interpretation of the "1+2+3" agreement in the U.S. Atomic Energy Act of 1954, China will not officially limit a partner country's access to the full nuclear fuel cycle in exchange for nuclear cooperation.

This is an important distinction and is the same policy that Russia subscribes to in its nuclear export agreements. While both countries may not be willing to export enrichment technology, they will not explicitly state this or preclude any future partnership on the nuclear fuel cycle. Nuclear exports are an extension of their foreign policy as they seek to secure long-term geopolitical influence and they are signalling that negotiations are always on the table with the Global South.

China now boasts a solid reputation against proliferation and support for the nuclear order, but it has shown a flexibility to negotiate with all actors; this causes concerns for the non-proliferation regime. The nuclear order currently relies on multinational efforts to constrain with whom a supplier state can partner, but this top down perspective challenges China's nuclear energy promises to the Middle East and North Africa (MENA) region, including Iran.

China's proliferation policy until Deng Xiaoping's 1978 "reform and opening up" policy was characterized by countering the imperialist powers, and it stood firm with the Third World, arguably advocating proliferation. China now boasts a solid reputation against proliferation and support for the nuclear order, but it has shown a flexibility to negotiate with all actors; this causes concerns for the non-proliferation regime. The nuclear order currently relies on multinational efforts to constrain with whom a supplier state can partner, but this top down perspective challenges China's nuclear energy promises to the Middle East and North Africa (MENA) region, including Iran.

China has a unique opportunity to capture a significant portion of the nuclear export market because of their finance schemes and domestic experience. However, MENA states will view China as underperforming in its diplomatic promises if collaboration does not turn into geopolitical gains or enhanced security assurances. China's efforts to influence the international order will find an audience in the MENA region as states hedge their bets against a distracted and noncommittal United States, but China will not be coaxed into overextension to prove their geopolitical worth — to the distress of MENA states.

The United Arab Emirates are the only MENA country to sign the gold standard U.S. nuclear agreement, which precludes them from the full nuclear fuel cycle and ensures there cannot be any military dimensions to nuclear cooperation. Even though they have no intentions of completing the nuclear fuel cycle soon, many MENA states refuse to sign this interpretation of the U.S. agreement simply to preserve their sovereign rights guaranteed to them under the NPT.

The Onus is on the Supplier: China and Russia dominate the civil nuclear import conversation among the MENA states because, for many, the United States' nuclear export doctrine equates to removing it from the running. The United Arab

Emirates are the only MENA country to sign the gold standard U.S. nuclear agreement, which precludes them from the full nuclear fuel cycle and ensures there cannot be any military dimensions to nuclear cooperation. Even though they have no intentions of completing the nuclear fuel cycle soon, many MENA states refuse to sign this interpretation of the U.S. agreement simply to preserve their sovereign rights guaranteed to them under the NPT.

Concerns about Russian and Chinese nuclear exports to India and Pakistan respectively are cited as evidence of their violations of the supplier nuclear order. India and Pakistan remain outside the NPT, possess nuclear weapons, and both desperately want to be normalized and accepted into the NSG. The NSG represents the most stringent multinational body that places restrictions on supplier states' nuclear exports and acceptance to it bestows nuclear prestige. The NSG was initiated largely in response to India's 1974 nuclear explosive test, but NSG sanctions were lifted on India in 2008 and China's recent deals with Pakistan are strictly civilian; China is proving its credentials.

At the sixth ministerial meeting of the China-Arab States Cooperation Forum in 2014, President Xi Jinping gave a speech identifying his strategic vision for energy collaboration as the "1+2+3" cooperation pattern. The first step refers to energy cooperation primarily on oil and natural gas; the second to the two wings of infrastructure construction and trade and investment facilitation; the third to high-tech collaboration on nuclear energy, space satellites, and new energy.

Civil nuclear cooperation is officially a part of China's BRI and combating climate change is central to China's pitch. MENA states are very concerned about climate change and shoulder the refugee burden from the Syrian crisis as the West observes a rise in populism and calls to build walls. China seeks to connect infrastructure across borders and create a network of reliance while positioning itself as a leader in the Paris Climate Agreement.

China Zhongyuan Engineering Corporation (CZEC) is the overseas nuclear project platform of China National Nuclear Corporation (CNNC) – one of China's central nuclear companies. CZEC markets itself as: "The SOLE exporter of the complete nuclear industrial chain in China; the FIRST overseas nuclear project constructor in China; the LARGEST overseas nuclear project contractor in China."

CZEC has established offices in Iran, Saudi Arabia, Egypt, and Algeria, which demonstrates a degree of seriousness about its nuclear export intentions to the MENA states along the BRI. China elevated its Hualong One nuclear reactor to the status of high-speed rails as China's "business card," meaning MOUs are signed, a framework is created granting the Chinese access to key decision-makers, and thus the door is opened for negotiations on other BRI projects.

The MENA countries are used to the geopolitics of oil and natural gas, weapons imports, and military bases and they have used these deals to hedge their bets against the strategic goals of regional and foreign powers. These tools of statecraft have blocked criticism of human rights violations and prevented intervention (with varying success) from professed leaders of the rules-based international order, and the BRI's bilateral and multilateral agreements move this from an implied agreement to a formalized ranking of priorities. China focuses the principle of "non-interference in internal affairs" squarely on so-called domestic humanitarian violations, which enables illiberal democracies. But when crisis arises, will China's geostrategic moves protect its investments?

***Non-interference Policy and Overextension*:** Iran and China signed a Comprehensive Strategic Partnership in 2016 and article 17 highlighted their attention to a new geopolitical paradigm: *Both sides reaffirm their support for the multi-polarization process of the international system… [And] non-interference in the internal affairs of countries… [And] oppose all kinds of use of force or threatening with use of force or imposition of unjust sanctions against other countries as well.*

The White House's increasingly hostile rhetoric and actions toward Iran – including pulling out of the Iran nuclear deal and the 1955 Treaty of Amity, imposing oil sanctions set to begin anew in November, and creating an Iran Action Group – set the stage for greater conflict and chaos. If regime change becomes U.S. policy, then Tehran's first calls will be to Beijing and Moscow. However, even with the U.S. presence in the MENA region receding due to a citizenry disturbed by U.S. actions and trillions of dollars spent with little domestic benefit, China is unlikely to guarantee Iran security assurances.

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Iran sought to cement security assurances from China and Russia by hosting the first Regional Security Dialogue on September 26, but little emerged that could dissuade an aggressive United States. China continues to nimbly manoeuvre through the Gulf crisis by pursuing counterterrorism operations with Qatar, signing $70 billion in deals with Saudi Arabia, and advancing BRI and free trade zone negotiations with the Gulf Cooperation Council when many in the West have relegated that Council to history.

China will not upset the nuclear order and prefers to retain the onus of preventing proliferation on the supplier state because that gives it leverage. It is distinctly not in China's interest for any new nuclear states to crop up and maintaining a little ambiguity in its nuclear export policy allows it to pay lip service to the Global South and keep the West engaged in improving the nuclear order.

China wants to sustain economic and diplomatic relations through crises of leadership turnover, authoritarian rule, and humanitarian violations. However, infrastructure is one of the first targets in a crisis and China is hardly in a place to threaten military action against the United States as a form of deterrence. China's efforts to create a multipolar world do not include security assurances to turbulent regions, but economic incentives are meant to secure influence. China's military is operating very selectively in Syria and it intends to expand its capabilities, but it will not be coaxed into competition with the United States just yet.

Conclusions: Momentum on regulating China's nuclear industry increased with China's Nuclear Safety Law entering into force on January 1, 2018 and the State Council's issuance of guidelines for the standardization of the nuclear system in August. China's domestic nuclear expansion has stalled since 2016 so it must expand to new markets and increase its bureaucratic efficiency to support its massive nuclear industry.

China will not upset the nuclear order and prefers to retain the onus of preventing proliferation on the supplier state because that gives it leverage. It is distinctly not in China's interest for any new nuclear states to crop up and maintaining a little ambiguity in its nuclear export policy allows it to pay lip service to the Global South and keep the West engaged in improving the nuclear order. With evolving states the nuclear non-proliferation regime is also evolving Arguably the nuclear order's greatest achievement is its ability to adapt to new challenges and this is only successful when the world engages.

We can expect that China will continue to set up nuclear export offices and slowly expand their nuclear presence. Nuclear power is a decades-long process for nuclear newcomers and making nuclear an integral part of the BRI shows that this project intends to expand for decades. Promise fatigue is real, and the excitement surrounding the BRI could wither if there are not immediate results, but climate change is petrifying and will keep

MENA states interested in Chinese nuclear for many decades to come.

Source: https://thediplomat.com, 09 October 2018.

CHINA–UK

State-run China General Nuclear Power Corp (CGN), a leading developer of reactors in the country, said on Oct 13 a proposed project in Britain was not imperilled by new US rules blocking it from acquiring American technology. CGN and China National Nuclear Corporation (CNNC) are jointly promoting an advanced third-generation reactor known as the Hualong One to overseas clients. CGN aims to deploy the technology at a proposed nuclear project at Bradwell in England.

Amid growing trade tensions, the US Department of Energy said it was tightening controls on exports to China of civil nuclear technology to prevent use for military or other unauthorised purposes. CGN said in a statement the project in England did not use American technology. "We will continue to push forward with the new nuclear power project in England with our partners," it said. CGN came under scrutiny anew in the United States last year with a National Security Council-led review of China's efforts to obtain nuclear material, equipment and advanced technology from U.S. companies, US government officials told reporters.

The review was prompted by China's accelerated efforts to acquire US intellectual property to the detriment of US businesses and military interests, they said. The officials said the indictment in 2016 of a Chinese-American nuclear engineer, Allen Ho, was one of the factors that led to the review. Ho, a naturalised US citizen, pleaded guilty last year to conspiring to produce "special nuclear material" in China in violation of the U.S. Atomic Energy Act. CGN was also charged. …

Source: https://www.straitstimes.com, 13 October 2018.

CHINA–USA

Trump Administration Announces Measures to Restrict Nuclear Technology Exports to China

The Donald Trump administration has said that it would sharply restrict exports of civilian nuclear technology to China that officials claimed was being diverted to power new generations of Chinese submarines, aircraft carriers and floating nuclear power plants. The move came a day after the Justice Department announced the arrest of a Chinese intelligence officer who was charged with stealing secret information from GE Aviation, one of the largest suppliers of jet engine. "The United States cannot ignore the national security implications of China's efforts to obtain nuclear technology outside of established processes of the US-China civil nuclear cooperation," Secretary of Energy Rick Perry said after his department announced the measures.

As per the new policy, there will be a presumption of denial for new licence applications or extensions to existing authorisations related to the China General Nuclear Power Group, which is currently under indictment for conspiring to steal US nuclear technology.

These national security measures are results of a US government policy review prompted by concerns regarding China's efforts to obtain nuclear material, equipment, and advanced technology from US companies. The policy guidance establishes a clear framework for disposition of authorisation requests for transfers to China that are currently on hold because of military diversion and proliferation concerns. As per the new policy, there will be a presumption of denial for new licence applications or extensions to existing authorisations related to the China General Nuclear Power Group, which is currently under indictment for conspiring to steal US nuclear technology.

"For decades, China has maintained a concerted, central government-run strategy to gain nuclear advantage," a senior administration official told reporters during a conference call. These efforts are necessary to strike an appropriate balance

between the long-term risk to US national security and economic interests, as well as the immediate impact to the US nuclear industrial base, the Department of Energy said.

"China is actively pursuing our advanced nuclear technology for diversion to military use in its third-generation nuclear power submarine, in the development of a nuclear-powered aircraft carrier and in strategic dual-use nuclear-powered platforms, such as small modular reactors and floating nuclear power plants deployable in the South China Sea," the official said.

China was already using nuclear power on man-made islands it created in the South China Sea. "We know that they are developing platforms for use on these islands and for nuclear-powered icebreakers, also floating nuclear power plants, which give the potential for rapid deployment to any platform that it could be tethered to.

The official alleged that China was already using nuclear power on man-made islands it created in the South China Sea. "We know that they are developing platforms for use on these islands and for nuclear-powered icebreakers, also floating nuclear power plants, which give the potential for rapid deployment to any platform that it could be tethered to," the official said.

In 2017, China imported nuclear technology worth $170 million from the US. The administration "carefully weighed" the economic impact, the official said. "We understand the US industry may suffer in the short term. We believe that in the long term, this policy will benefit the US and protect the American nuclear industry," the official asserted. The move appeared to be part of a more concerted effort by the administration to put new pressure on China beyond the tariffs that Trump has announced on Chinese goods, according to media reports.

A decade after the historic Indo-US nuclear deal, experts said the pact did not lead to India setting up foreign-built reactors, but helped fuel domestic power plants and give access to critical technologies in strategic areas. The Indo-US nuclear cooperation agreement gave a fillip to the ties between the two nations, which since then have been on an upswing.

Source: https://www. firstpost.com, 13 October 2018.

INDIA–USA

Indo-US Nuke Deal Helped Fuel Domestic Power Plants, Gave India Access to Critical Tech

A decade after the historic Indo-US nuclear deal, experts said the pact did not lead to India setting up foreign-built reactors, but helped fuel domestic power plants and give access to critical technologies in strategic areas. They also felt the pact, signed on October 10, 2008, gave India the recognition of being a responsible nuclear weapon state with strong non-proliferation credentials. The Indo-US nuclear cooperation agreement gave a fillip to the ties between the two nations, which since then have been on an upswing.

India conducted a nuclear test in 1974, following which a torrent of sanctions hit the country's defence, nuclear and space programmes hard. "We knew that we had limitations on nuclear trade, so there was a need for progress within," said Anil Kakodkar.... India developed PHWRs, which are currently the backbone of the Indian nuclear power generation. In 1998, after conducting nuclear tests, India declared itself a nuclear weapon state. The feeling in the West was that the rationale behind sanctions did not hurt India's nuclear military programme," Kakodkar, who is also the member of the AEC, said.

On the other hand, as the number of nuclear reactors rose, the need for uranium hit the domestic reactors, adversely affecting their performance, said RK Sinha, the former chairman

of AEC and former secretary, DAE. "At that time, the concept of global warming was also gaining ground," Kakodkar said, noting India required energy for its growing economy.

Sinha said by 2006-2007, the performance of Indian reactors had reduced 50-55 per cent due to shortage of nuclear fuel. He also pointed out an instance of RAPS unit 5, whose operations had to be delayed due to shortage of uranium. The plant later went on to create a record of a continuous run of 765 days on Saturday at its full capacity of 220 MWe. A major aspect of the Indo-US nuclear deal was the NSG that gave a special waiver to India that enabled it to sign cooperation agreements with a dozen countries, said former diplomat Rakesh Sood and India's special envoy of the Prime Minister for Disarmament and Non-proliferation Issues from 2013 to 2014.

There have been specific agreements for import of uranium from France, Kazakhstan, Australia, Canada and Russia. the long-term uranium arrangements enabled India to run the existing plants at 80 per cent efficiency. According to the responses by the government on questions in Parliament, India imported over 7841.51 metric tonnes of nuclear fuel from 2008-2009 to 2017-18. Work is also on to create a uranium reserve by importing the element to ensure the power reactors under IAEA safeguards do not face fuel shortage.

The pact also enabled India to separate its civilian and military programmes. The country currently has 15 of its reactors under the IAEA. Post waiver, India signed nuclear cooperation agreements for peaceful means with the US, France, Russia, Canada, Argentina, Australia, Sri Lanka, United Kingdom, Japan, Vietnam, Bangladesh, Kazakhstan and Korea.

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Building of foreign nuclear reactors was a major aspect of the Indo-US deal. For this, two sites were earmarked—Mithi Virdi for General Electric Hitachi Nuclear Energy and Kovadda in Andhra Pradesh—for building 12 reactors. MV Ramana of University of British Columbia said in terms of building foreign reactors, despite the waiver from the Nuclear Suppliers Group, there was "absolutely no construction" at any sites identified for imported reactors. "Even the government doesn't have much hope that they would be importing large numbers of light water reactors anytime soon," Ramana said.

Requesting anonymity, a former senior DAE scientist claimed the GE Hitachi Nuclear Energy is reluctant to take up the project citing the Civil Liability Nuclear Damage (CLND) Act, 2010. In case of Westinghouse, it is yet to submit a techno-commercial offer, including "reasonable" tariff and a working reference plant. Unless these criteria are not fulfilled, we will not be going ahead with the deal," the scientist said.

In terms of electricity generation, nuclear power's share of the total power production in the country in 2008 was 2.03 percent, which rose to 3.2 per cent in 2017, Ramana said. Another aspect which Kakodkar pointed out that the deal helped "build confidence" of other countries in India and the cooperation has now been extended to other areas like defence technology. Kakodkar said after the deal India has joined three major control regimes like the export control regimes—the Missile Technical Control Regime, Wassenaar Arrangement and Australia Group, while work is on for India's entry into the elite NSG.

Source: https://economictimes.indiatimes.com, 11 October 2018.

NUCLEAR DISARMAMENT

NATO

NATO Countries not Showing Readiness to Join Nuclear Disarmament Effort

Russia regrets that none of NATO members have shown readiness to join the nuclear disarmament effort, Director of the Russian Foreign Ministry's Non-Proliferation and Arms Control Department Vladimir Yermakov told a meeting of the UN General Assembly's First Committee on 9 October 2018.

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"Further progress towards nuclear disarmament is impossible if all states which possess military nuclear potential do not join the efforts. First of all, this concerns particular countries of the NATO military bloc. However, to our great regret, none of them have so far signalled this desire," Yermakov said. The text of his speech was posted on the ministry's website. For a process of eliminating nuclear weapons, it is vital to simultaneously enhance security of all its participants in the course of reducing nuclear arsenals, the diplomat stressed. Three NATO member-states possess nuclear weapons: the United States, the United Kingdom and France.

Source: http://tass.com, 10 October 2018.

USA

US Urge Dialogue on Challenges to Eliminate Nuclear Weapons

The U.S. arms control chief urged the world's nations to hold "a realistic dialogue" about rising global tensions and the challenges that must be overcome to create the conditions for nuclear disarmament. Undersecretary of State Andrea Thomson told the General Assembly's disarmament committee that this proposal "offers a practical way forward," unlike the U.N. treaty to prohibit nuclear weapons, which she called unrealistic.

"A realistic assessment of the security environment must recognize, regrettably, that we have much work to do to create conditions conducive to nuclear disarmament," Thomson said. She pointed to high regional tensions in South Asia, the Middle East and elsewhere as well as growing nuclear stockpiles in Asia. She said Russia and China are modernizing and expanding their nuclear capabilities "and pursuing destructive counter-space weapons at the same time they are becoming increasingly assertive in challenging the existing international order." She said Iran is refusing "to come clean about its past nuclear weapons program" and continues to destabilize the Middle East "with its support for terrorism and militancy."

Thomson said, without elaborating, that the U.S. nuclear stockpile is down by approximately 88 percent from the Cold War peak. She said the U.S. and Russia are continuing to implement the New Start Treaty and met "the central limits" in February, putting their nuclear stockpiles "at their lowest points since the 1950s." But she said numbers don't tell the whole story.

In addition, Thomson accused Syrian President Bashar Assad's government of using chemical weapons and Russia of using the chemical agent Novichok in an attack in southern England. Assad and Russia deny using chemical weapons. These challenges "cannot be simply wished away or ignored" by supporters of the treaty to ban nuclear weapons, Thomson said. She said they mistakenly see the accord as "a silver bullet that can jump start nuclear disarmament without addressing the security challenges that cause states to rely on nuclear deterrence or engaging in the difficult work that can produce real reductions in nuclear weapons."

The treaty was adopted in July 2017 by a vote of 122-1 with one abstention and will go into effect after 90 countries formally accept it. According to the U.N., it currently has 19 acceptances, approvals or ratifications. Thomson said, without elaborating, that the U.S. nuclear stockpile is

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Thomson said a U.S. paper, "Creating the Conditions for Nuclear Disarmament," submitted at a preparatory meeting in Geneva this spring for the 2020 review conference of the Nuclear Non-proliferation Treaty was not an attempt "to place additional 'conditions' or roadblocks on progress on nuclear disarmament" as some countries thought. She said that what the U.S. is offering with the paper "is an invitation for all states to join us in a realistic dialogue about the state of the security environment — the world as it is — and how we can shape that environment in a way that makes progress on disarmament possible."

Source: www.miamiherald.com/, 10 October 2018.

NUCLEAR TERRORISM

GENERAL

IAEA Holds Table Top Exercise to Strengthen Detection and Response Capabilities in Maritime Nuclear Security Events

An IAEA regional workshop, organized in Malaysia in cooperation with the Global Initiative to Combat Nuclear Terrorism, used a table top exercise to help participants strengthen their capacity to detect and respond to nuclear security events in coastal and maritime areas. The workshop looked at mechanisms to create national preparedness strategies, models for regional and international coordination, and cooperation during the detection and response to a nuclear security event.

Maritime environments present specific issues for coordinating roles and responsibilities of various national agencies as the threat can move from international to national waters and onto land. The three countries taking part in the workshop – Indonesia, Malaysia, and the Philippines – are cooperating to manage and respond to security threats within their shared maritime borders. The United States and Mauritania attended the workshop as observers.

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"Nuclear terrorism continues to be a defining challenge that requires coordinated preparedness and response capabilities throughout a national government and local authorities," IAEA Division of Nuclear Security Director Raja Abdul Aziz Raja Adnan said as he opened the workshop. The about 50 participants in the workshop, held in August 2018, discussed structures, protocols, resources, and plans that link senior decision makers to operators. They also identified sustainability strategies for capabilities that support nuclear security authorities, including operational personnel, technical experts, and senior leaders....

Source: https://www.iaea.org, 03 October 2018.

USA

State Department: Don't Forget about Threat of Nuclear Terrorism

National security officials shouldn't forget about the dangers posed by the threat of nuclear terrorism, according to a senior State Department official. "It is, in a sense, our solemn charge to do everything we can to make sure you don't have to hear about it because it has been entirely suppressed," Christopher Ashley Ford, the assistant secretary of state for international security and non-proliferation, told a national security conference. "But it's still good to talk about nuclear smuggling and nuclear terrorism from time to time, to ensure that everyone remains

focused upon keeping this true." Ford touted the success of international monitors and investigators in preventing such attacks, but he emphasized that the threat of radiological or nuclear terrorism persists.

Even though "it is trickier than one would imagine" to build such a bomb, it remains all too simple, Ford said, adding that smugglers and prospective terrorists can hope to benefit, finally, from "lax security practices in Russia" and other former Soviet satellite states. "We cannot be sure how much R/N material is already out there on the black market," Ford said, in an address delivered Saturday but published. "There are a great many nuclear material scams out there, but not everything is a scam, and there have been enough real cases to make clear that we must take this challenge very seriously indeed."

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Ford noted that "countries have reported 18 seizures of weapon-usable nuclear material" since the fall of the Soviet Union. "The bad news is precisely what makes the good news of this success so good: Some bad actors do continue to seek such materials, and there is a black market out there in which traffickers do sometimes attempt to buy or steal — and of course, to sell — such things," he said. "We need to make sure these people fail."

Source: https://www.washingtonexaminer.com, 01 October 2018.

NUCLEAR SAFETY

KOREAN PENINSULA

First, Cooperate on Nuclear Safety in the Korean Peninsula

Last month in Pyongyang, South Korean President Moon Jae-in and North Korean leader Kim Jong UN held their third summit in less than a year, concluding with agreements that ranged from security issues to the economy, and even a pledge to make a joint bid for the 2032 Summer Olympics. Yet, despite positive assessments of the summit's outcome by Presidents Trump and Moon, many observers remain sceptical about real progress because of the conspicuous lack of a concrete statement by North Korea for denuclearization.

Absent since the restart of dialogue with North Korea is any discussion on inter-Korean nuclear safety cooperation, despite concerns over possible safety risks at the North Korean nuclear complex. Inattention to the facility could have dire consequences for the peninsula: radioactive fallout does not recognize borders.

For example, because of its inability to acquire civil nuclear technology from abroad, North Korea might try to develop its own power reactor from a variation of outdated Soviet designs such as the RBMK-1000 type that resulted in the most catastrophic man-made disaster in history, the 1986 Chernobyl nuclear accident. On the other hand, the possible dismantlement of nuclear facilities such as the Punggye-ri nuclear test site, which contains hazardous material and radioactive elements, could contaminate the surrounding environment and expose North Korean workers if there is improper clean-up.

In addition, as the operator of several fuel cycle facilities, North Korean leaders and experts no doubt would be interested in learning more about Japan's costly lessons with nuclear safety. Despite having sophisticated industrial capability and arguably high nuclear safety standards, Japan has experienced deadly accidents in fuel cycle facilities — most notably the accident at a fuel fabrication plant in Tokaimura in September 1999, when the mishandling of enriched uranium led to the death of two workers from acute radiation exposure, and permanent injury of another. The accident, attributed to poor safety culture and inadequate regulatory oversight, exposed 436 people to radiation.

Without strict safety practices and adequate protection, North Korea might experience a similar scenario. Furthermore, the country has issues related to emergency response and communication in the event of a nuclear accident because of the secretive nature of its nuclear program. In particular, because North Korea terminated all cooperation with the IAEA in 2009, it would be difficult for outsiders to learn about any incident and provide support, if necessary. It is equally difficult for North Koreans to improve their safety culture and standards without an adequate, transparent working environment.

Why make nuclear safety an early priority in the high-level diplomatic process with North Korea? The number, pervasiveness and close-to-the-border locations of nuclear facilitate in North Korea are reasons enough. The significant role of nuclear energy in electricity generation in South Korea, where 24 nuclear power units contribute almost 30 percent of the electricity production, means South Korean experts would have much to share.

South Korea has had to overcome its own safety problems, such as the cover-up of a plant blackout at the Kori-1 nuclear power unit in 2012, and the revelation of falsified test results for safety-grade equipment in the same year. Scientists and engineers from these two countries should be enabled to cooperate on nuclear safety by sharing information about their safety practices. Besides, communication platforms have existed for this kind of engineering diplomacy.

Indeed, South Korea has had to overcome its own safety problems, such as the cover-up of a plant blackout at the Kori-1 nuclear power unit in 2012, and the revelation of falsified test results for safety-grade equipment in the same year. Scientists and engineers from these two countries should be enabled to cooperate on nuclear safety by sharing information about their safety practices. Besides, communication platforms have existed for this kind of engineering diplomacy.

Striving for the middle-power status in the region, South Korea has proposed several initiatives aimed at regional integration among Northeast Asian countries; thus, the issue of nuclear safety in North Korea would be a perfect opportunity for Moon to promote a nuclear safety initiative for bilateral cooperation of nuclear safety professionals from the two Koreas. Cooperation on nuclear safety is a worthy, mutually beneficial and genuinely humanitarian effort, and South Korea should actively encourage it by providing strong material, technical and moral support.

Track-II on nuclear safety in North Korea also would help regional countries to decouple that urgent issue from the strategic, but politically-mired, denuclearization issues. Given the proximity between the North Korea-China border and suspected nuclear facilities, it would be beneficial for China to support such dialogue, because any serious accident at one of these facilities likely would mean radioactive fallout in China.

The format of an expert dialogue on nuclear safety also would provide the United States a reason for its tacit approval of such events, given their informality that is similar to numerous track-II events between American and North Korean experts throughout the years. In addition to helping to protect the region from safety risks related to North Korea's nuclear complex, "engineering diplomacy" through cooperation on nuclear safety is inherently about building confidence — something that has been in short supply in discussions related to North Korea, and will be essential for reaching any agreements.

Source: https://thehill.com 06 October 2018.

NUCLEAR WASTE MANAGEMENT

GENERAL

Global Nuclear Waste Management System Market

The report on "Global Nuclear Waste Management System Market" describes an in-depth study of the market aspects such as the, growth rate and current size of the industry. A broad analysis of

the consumer demands, futuristic growth opportunities, and prevailing trends are also drafted in the report.

This report on Nuclear Waste Management System Market by analyses the current market data of the market and its growth rate based on 5 year's data along with company profiling of major market players and builders. The in-depth information of Nuclear Waste Management System market will allow market analysts to monitor profitability in the future. The information on trends and developments will focus on market and materials, capacities, technologies,

This report comprehends the innovative approaches picked up by the vendors in the Global Nuclear Waste Management System Market to differentiate the products through Porter's Five Forces Analysis. Along with this, it also points out the ways through which these businesses can strengthen and increase their revenues in the near future. Ongoing technological advancements are responsible for the remarkable development of the Global Nuclear Waste Management System Market.

The report presents a round-up of vulnerabilities which companies operating in the market must avoid in order to like sustainable growth through the course of the forecast period. Besides this, profiles of some of the leading players operating in the global Nuclear Waste Management System Market are included in the report. Using SWOT analysis, their weaknesses and strengths are analysed.

Source: http://www.digitaljournal.com, 10 October 2018.

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 Vinod Patney, SYSM PVSM AVSM VrC (Retd).

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