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OPINION – Shyam Saran

Global N-Order in a Flux

The global nuclear order, which had been built up, step by step, since the 1960s, has begun to unravel. The building blocks of the order were both bilateral and multilateral. The bilateral components included a series of nuclear arms control agreements between the US and the then Soviet Union. Though the UK and France had independent, though modest nuclear arsenals, these were practically subsumed within the US deterrent system. China became a nuclear weapon state in 1963 with a small arsenal designed for deterrence. Nuclear doctrines thus evolved mainly in a binary East-West frame.

Multilateral agreements which followed would not have worked unless they were underpinned by US-Soviet concurrence. The first such agreement was the PTBT of 1963, prohibiting further testing of nuclear weapons over ground. More importantly, an agreement on the non-proliferation of nuclear weapons, the NPT of 1970, was based on a consensus reached between the US and the Soviet Union that it was in their interest to prevent the spread of nuclear weapons to additional states. While India signed the PTBT, it rejected the NPT because it imposed no credible commitment on the part of the nuclear

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weapon states to engage in nuclear disarmament within a specific time frame, while non-nuclear weapon states committed themselves not to produce or acquire such weapons. This was an unequal treaty which India was not prepared to accept. The NPT nevertheless became an anchor of the global nuclear order.

Post NPT, one witnessed a dramatic nuclear arms race between the two superpowers. The arms control agreements reached between them, such as at the Strategic Arms Limitation Talks, stipulated ceilings beyond which their arsenals would not expand. An agreement was reached

in 1972 on limited ABM defence. The ABM treaty had logic in terms of the doctrine of MAD, where deterrence prevailed because each side had the power to annihilate the other, protective defence being allowed only for the capital city. It is only since the 1980s that they began to negotiate arms reductions such as the INF agreement of 1988 which eliminated medium and short-range nuclear delivery systems. The SALT I and II, which extended over the decades of the 1980s and the 1990s, resulted, for the first time, in significant reductions in the nuclear arsenals of both the US and the Soviet Union (later the Russian Federation). From some 40,000 weapons in the arsenals of the two countries, the numbers came down to about 10,000. When the New START agreement was concluded in 2011, the arsenals were to be reduced further in a 10-year time frame to 1,550 each. There were limitations on the number of launch vehicles too. The two sides also concluded an Open Skies Treaty in 1992, which other countries also joined to ensure transparency and compliance with arms limitations and confidence building measures. It is this carefully constructed edifice of the global nuclear order which is rapidly unravelling.

The ABM treaty in 2002 and the INF agreement in 2019 have been repudiated by the US, and Russia has followed suit. There are indications that the US will not extend the New START treaty beyond 2021 and the Open Skies agreement may be the next casualty. A CTBT concluded in 1995 but is not yet in force though a moratorium on nuclear testing is in place. India refused to join the consensus and eventually even the US, its main champion,

failed to ratify it. The moratorium is under strain as a new generation of nuclear weapons are being developed and the reliability of existing weapons need to be confirmed. The consensus underlying the NPT is also being eroded. The 2015 NPT review conference failed to agree on an outcome document.

There are now nine countries with significant nuclear arsenals and the dynamic among them is complex and unpredictable. There are others waiting in the wings. Nuclear doctrines which evolved during the Cold War based on the US-Soviet binary are no longer adequate. But China resists joining any trilateral negotiations while the prospects for a truly multilateral nuclear disarmament agreement remain bleak.

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The geopolitical situation is sliding towards great power confrontation and rising regional tensions. This is exacerbating an already frayed nuclear order. As a nuclear weapon state, India will need to carefully assess the impact of these developments on its national security and the efficacy of its nuclear deterrent. These are uncertain times that demand both doctrinal agility and integrative approaches across domains to stay ahead of the curve.

What is Driving this Unravelling of the Global Nuclear Order?

One, the Cold War binary no longer prevails as China emerges as a significant nuclear power, with sophisticated weapons and delivery systems. The nuclear club is no longer confined to five states. There are now nine countries with significant nuclear arsenals and the dynamic among them is complex and unpredictable. There are others waiting in the wings. Nuclear doctrines which evolved during the Cold War based on the US-Soviet binary are no longer adequate. But China resists joining any trilateral negotiations while the prospects for a truly multilateral nuclear disarmament agreement remain bleak.

Two, advances in technology are adding to the complexity. The nuclear domain is getting integrated with cyber and space domains. The development of hypersonic glide weapons is heightening threat perceptions. Any arms control or disarmament effort will need to go beyond the nuclear category.

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uncertain times that demand both doctrinal agility and integrative approaches across domains to stay ahead of the curve.

Source: <https://www.tribuneindia.com/news/comment/global-n-order-in-a-flux-125340>, 12 August 2020.

OPINION – Farhad Rezaei

The Strategic Consequences of Ending the Arms Embargo on Iran

In 2015, the UN Security Council passed Resolution 2231, endorsing the nuclear agreement between Iran and the major world powers, officially called the Joint Comprehensive Plan of Action (JCPOA) But the resolution also established a five-year embargo on conventional arms sales going in and out of Iran, replacing earlier resolutions that had levied more permanent restrictions on such sales. Five years on, the moratorium is set to expire on October 18, 2020, although the Trump administration is determined to extend it. If it does expire, Iran will, at least in theory, be allowed to import and export heavy weaponry such as tanks, combat aircraft, and missile systems virtually overnight.

This raises the questions: What are the implications for Iran if the ban is not extended? What are the strategic consequences to the US security and countries in the Middle East? Will Iran rush to rebuild its conventional military arsenal by purchasing new arms, possibly from Russia and China?

To answer these questions, an examination of the current state of Iran's military capability and strategy is imperative. Iran has made remarkable progress in producing domestic military weapons and hardware, meaning it may not rush to rebuild its conventional military arsenal by purchasing new arms from foreign suppliers. However, Iran will

stand to profit from selling its locally produced military equipment to neighbouring countries if the embargo expires.

It is important to acknowledge that even if the arms embargo on Iran falls away, the regime will remain under a web of other legal restrictions and sanctions that would likely reduce its ability to import and export conventional weapons. These restrictions and sanctions include the EU arms embargo on Iran, US sanctions on Iran's banking and financial sector, and the potential threat of secondary sanctions against Chinese or Russian companies that may try to sell arms to Iran, as well as the UN resolutions addressing potential buyers of Iran's arms like Yemen (through UN Resolution 2216) and Lebanon (through UN Resolution 1701). But, supposing Iran can circumvent these obstacles, what might the consequences of an expired arms embargo be?

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Background on Iran's Military Strategy: The Islamic Republic of Iran has been under a US arms embargo, distinct from the various multilateral UN embargoes, since the 1979 Islamic Revolution. During the Iran-Iraq war, which began in 1980 and lasted eight years, that embargo limited Iran's ability to purchase arms with which to defend itself. The conflict also impoverished Iran, limiting its financial ability to create a strong conventional military force. To prevent such a bitter experience from ever happening again, Iran's post-war military doctrine called for a self-sufficient and radical deterrence posture in order to increase the costs to any would-be aggressor. As a result, today Iran's deterrence relies on a multi-layered asymmetrical approach consisting of missile systems, irregular naval warfare, and proxy networks that can carry out terror attacks on opponents in the region and beyond.

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First, Iran has heavily invested in developing

indigenous ballistic missile and missile defense systems to compensate for its limited and obsolete air force assets. Over the years, it has developed what the US Defense Intelligence Agency considers the largest missile arsenal in the region, comprising various types of ballistic and cruise missiles, most of them capable of carrying nuclear warheads.

Iran plans to continue prioritizing the development and acquisition of advanced ballistic missiles, and will continue the transition from liquid to solid propelled systems, which offer greater self-sufficiency—the country has begun producing its own solid fuel for its missiles at its Jajarm Aluminum Production Complex in the northeast. Solid-fuel propellants could also allow the Islamic Revolutionary Guard Corps, a branch of Iran's armed forces, to bury its missiles in sealed canisters for years without the need for underground bases.

Iran has also started working on developing strategic missile defense capabilities, using diverse launch points and hiding mobile systems, which would allow its army to intercept incoming targets from anywhere. The newest system, called the Khordad-15, is "capable of detecting fighter jets and combat drones from 150 kms away and of tracking them within a range of 120 kms and is able to detect stealth targets at a distance of 85 kms," according to Iran Defense Minister Brig. Gen. Amir Hatami. The Khordad-15 is credited with shooting down the US RQ-4A Global Hawk surveillance aircraft—one of the most sophisticated drones the US has—over the Strait of Hormuz in June 2019.

Additionally, the Revolutionary Guard has developed the "Falaq" radar system, a local version of the Russian-made "Gamma" system, and the Bavar-373, an overhauled version of the Russian S-300 surface-to-air missile system. According to Russian military sources, the Bavar-373 "will not only replace the Russian-supplied

S-300, but also surpass it."

Of course, these missile programs constitute only one component of Iran's air power. The Revolutionary Guards has also devoted a significant portion of military investments to the development of an advanced air industry, manufacturing fighter jets and drones. In fact, Iranian military officials credited their drones with having played a pivotal role in the victory of the Assad regime on the Syrian battleground, and US-based expert Seth Frantzman of the Middle East Centre for Reporting and Analysis recently expressed concern that "Iran is becoming a drone superpower."

The second component of Iran's strategic doctrine that has received a substantial proportion of military investments is the asymmetrical hybrid naval approach, part of the so-called Anti-Access/Area Denial strategy. The purpose of these investments is to limit American naval operations in the Persian Gulf and beyond, in hopes of being able to disrupt select maritime choke points.

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able to disrupt select maritime choke points. In 2012, the Revolutionary Guard, in collaboration with the Imam Hussein University, published a document entitled "Strategic Maritime Triangle, Irregular Maritime Warfare," outlining the area denial strategy to prevent the US Navy from destroying Iran's critical targets.

The idea was derived from the lessons of Iran's efforts to mine the Straits of Hormuz during the "Tanker War" portion of the Iran-Iraq war in 1987. In April 1988, Iranian mines damaged a US Navy ship, resulting in the launch of the American Operation Praying Mantis. That operation destroyed two offshore Iranian oil terminals and several Iranian warships, contributing to Ayatollah Khomeini's decision to accept the cease-fire with Iraq several months later. Iran's naval failure, however, spurred the Revolutionary Guard to search for an improved area denial strategy.

Today, the naval branch of the Revolutionary Guard, in conjunction with the regular navy, still employs traditional area denial capabilities, such as land and sea-based anti-ship missiles and sea mines. But it also relies on asymmetrical guerrilla tactics such as the deployment of speed boats for swarming operations, man-operated suicide boats, and drone boats loaded with explosives.

To this end, the Revolutionary Guard has produced various types of submarines as well as military speed boats. Reportedly, it has manufactured over 1,500 of these fast boats, designed to carry out rapid swarming attacks in Persian Gulf waters.

The third component of Iran's strategic doctrine is to work through proxy networks, which extend to Iraq, Syria, Lebanon, and Yemen. Arguably, the Quds Force, the special Revolutionary Guard unit responsible for extraterritorial operations, has sway over 20 nonstate groups in the Middle East and Africa, including Lebanese Hezbollah, with an estimated 45,000 fighters, and the Iraqi Popular Mobilization Forces, with more than 100,000 fighters.

The proxy network provides Tehran with security benefits, including assistance with countering foreign intelligence threats, intelligence sharing, counterterrorism, and enabling the country to project its power beyond its borders. Furthermore, according to a 2018 Carnegie Endowment report, this strategy has enabled Iran to reduce the number of its combat fatalities in regional wars, particularly on the Syrian battlefield.

Effects of an Expiring Arms Embargo: Because of Iran's remarkable advances in domestic defense and control systems, it is unlikely that lifting the arms embargo would make a significant difference in how the country maintains its conventional military capability. Most of Iran's military hardware is locally produced, meaning

there is little pressure or demand for major systems.

Moreover, even if the Iranians do rush to purchase conventional weapons from Chinese or Russian suppliers, it would have little overall effect given Iran's recent history; Iran has not initiated a war with its neighbours in the last 150 years. But it has repeatedly fallen victim to military occupation, referred to by CIA strategists as Iran's "modern

tradition of defeat." So any new arms procurement would likely be for defensive or deterrent purposes and would be perceived by Iranians as an insurance policy against any potential attack on Iran by its adversaries.

Plus, Iran's defense budget is a fraction of its regional rivals'. According to the SIPRI, Iran's defense budget in 2019 was an estimated \$12.6 billion. Compare that to the US

defense budget of \$732 billion, the Saudi defense budget of \$61.9 billion, and the Israeli defense budget of \$20.4 billion. Iran's leaders are well aware that if they begin a build-up of conventional military capacity, the result would be that world powers, including the US and European countries, would flood the Middle East with more advanced weaponry. Ironically, such a situation could end up restraining Iran, given that other countries are better able to engage in arms competition if the need arises.

It also remains unlikely that arms suppliers—such as Russia and China—would offer sophisticated and offensive weaponry to Iran for combative or defensive purposes, as long as Iran's rhetoric remains antagonistic toward its neighbours. The history of arms dealing between these countries also suggests that Russia and China will be cautious to sell any arms to Iran that may result in Israel and Saudi Arabia losing their qualitative edge over Iran. After all, China and Russia also maintain good relationships with Jerusalem and Riyadh.

Iran's defense budget in 2019 was an estimated \$12.6 billion. Compare that to the US defense budget of \$732 billion, the Saudi defense budget of \$61.9 billion, and the Israeli defense budget of \$20.4 billion. Iran's leaders are well aware that if they begin a build-up of conventional military capacity, the result would be that world powers, including the US and European countries, would flood the Middle East with more advanced weaponry.

But while an expiring arms embargo might not have much of an effect on Iran's imports, it is possible that Iran would become a major regional supplier of military hardware through its exports. Iran would stand to profit from selling its domestically produced arms and other military hardware at a much lower price than what other countries are able to offer, including missiles and defense missile systems, tanks, drones, submarines, speed boats, and multi-purpose tactical armoured vehicles.

One of the first potential buyers of Iran's military hardware is likely to be Syria. On July 8, 2020, the two countries signed a defense pact to boost bilateral military cooperation, particularly in the realm of air defense. Likewise, in 2019, Iran offered to build up Iraq's air defense network, aiming to give Baghdad the capability to counter air strikes from Israel. Iran has also expressed interest in supplying Yemen and Lebanon with defensive weapons as well, although the specific UN resolutions barring such transfers make it highly unlikely that Sana'a and Beirut would be able to import Iranian arms, at least for now.

It is precisely this concern about Iran's ability to export conventional arms that is partially motivating the US to try and extend the embargo at the United Nations. But whether such exports would ever amount to much, or substantially change the dynamics of the region, is uncertain. What is certain, though, is that the fate of the arms embargo is inextricably linked with the fate of the 2015 nuclear agreement, and members of the UN Security Council will have to decide which is riskier—allowing Iran to supply its neighbours with arms, or dealing yet another blow to the

already enfeebled nuclear deal.

Source: <https://thebulletin.org/2020/08/the-strategic-consequences-of-ending-the-arms-embargo-on-iran/#>, 14 August 2020.

OPINION – Jennifer Spindel

Artificial Intelligence and Nuclear Weapons: Bringer of Hope or Harbinger of Doom?

In 2017, Russian President Vladimir Putin said whichever country leads in the development of artificial intelligence will be "the ruler of the world." Artificial intelligence (AI) is not unlike electricity: it is a general-purpose enabling technology with multiple applications. Russia hopes to develop an artificial intelligence capable of operations that

approximate human brain function. China is working to become the world leader in AI by 2030, and the US declared in 2019 that it would maintain its world leadership on artificial intelligence. Will the world's major powers seek to use AI with their nuclear weapons and

command and control systems? Pairing nuclear weapons – arguably the previous ruler of the world – with this new technology could give states an even greater edge over potential competitors. But the marriage between nuclear weapons and artificial intelligence carries significant risks, risks that currently outweigh potential benefits. At best, using AI with nuclear weapons systems could increase time efficiencies. At worst, it could undermine the foundations of nuclear deterrence by changing leaders' incentives to use nuclear weapons.

Opportunities in Data Analysis and Time

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Efficiencies: Artificial intelligence could be a boon for drudgery type tasks such as data analysis. AI could monitor and interpret geospatial or sensor data, and flag changes or anomalies for human review. Applied to the nuclear realm, this use of AI could be used to track reactors, inventories, and nuclear materials movement, among other things. Human experts would thus be free to spend more of their time investigating change, rather than looking at data of the status quo.

Incorporating artificial intelligence into early warning systems could create time efficiencies in nuclear crises. Similar to the boon for data analysis, AI could improve the speed and quality of information processing, giving decision-makers more time to react. Time is the commodity in a nuclear crisis, since nuclear-armed missiles can often reach their target in as little as eight minutes. Widening the window of decision could be key in deescalating a nuclear crisis.

Challenges Posed by Risks, Accidents, and Nuclear Deterrence: Incorporating artificial intelligence into nuclear systems presents a number of risks. AI systems need data, and lots of it, to learn and to update their world model. Google's AI brain simulator required 10 million images to teach itself to recognize cats. Data on scenarios involving nuclear weapons are, thankfully, not as bountiful as internet cat videos. However, much of the empirical record on nuclear weapons would teach an AI the wrong lesson. Consider the number of almost-launches and near-accidents that occurred during the Cold War; both U.S. and Soviet early warning systems mistakenly reported nuclear launches. Although simulated data could be used to train an AI, the stakes of getting it wrong in the nuclear realm are much higher than in other domains. It's also hard to teach an AI to feel the doubts and suspicions that human operators relied on to detect false alarms and to change their minds.

Accidents are also amplified in the nuclear realm. There are already examples of accidents involving automated conventional weapons systems: in March 2003, U.S. Patriot missile batteries shot down a British fighter plane and a U.S. fighter jet while operating in "automated mode," killing the crews of both planes. Accidents are likely to increase as AI systems become more complex and harder for humans to understand or explain. Accidents like these, which carry high costs, decrease overall trust in automated and AI systems, and will increase fears about what will happen if nuclear weapons systems being to rely on AI.

Beyond accidents and risks, using AI in nuclear weapons systems poses challenges to the foundations of nuclear deterrence. Data collection and analysis conducted by AI systems could enable precision strikes to destroy key command, control, and communication assets for nuclear forces.

Beyond accidents and risks, using AI in nuclear weapons systems poses challenges to the foundations of nuclear deterrence. Data collection and analysis conducted by AI systems could enable precision strikes to destroy key command, control, and communication assets for

nuclear forces. This would be a significant shift from Cold War nuclear strategy, which avoided this type of counterforce targeting. If states' can target each other's nuclear weapons and command infrastructure, then second-strike capabilities will be at risk, ultimately jeopardizing mutually assured destruction. For example, AI could identify a nuclear submarine on patrol in the ocean, or could interfere with nuclear command and control, thus jeopardizing one, or more, legs of the nuclear triad. This creates pressure for leaders to use their nuclear weapons now, rather than risk losing them (or control over them) in the future.

Even if states somehow agree not to use AI for counterforce purposes, the possibility that it could one day be used that way is destabilizing. States need a way to credibly signal how they will – and won't – use artificial intelligence in their nuclear systems.

The Future of AI and Nuclear Stability: The opportunities and risks posed by the development of artificial intelligence is less about the technology and more about how we decide to

make use of it. As the SIPRI noted, “geopolitical tensions, lack of communication and inadequate signalling of intentions” all might matter more than AI technology during a crisis or conflict. Steps to manage and understand the risks and benefits posed by artificial intelligence should include CBMs and stakeholder dialogue.

CBMs are crucial because they *reduce mistrust and misunderstanding*, and can help actors signal both their resolve and their restraint. As with conventional weapons, *transparency* about when and how a state plans to use artificial intelligence systems is one type of CBM. *Lines of communication*, which are particularly useful in crisis environments, are another type that should be explored.

Continued dialogue with stakeholders including governments, corporations, and civil society will be key to developing and spreading norms about the uses of artificial intelligence. Existing workshops and dialogues about the *militarization of artificial intelligence*, and artificial intelligence and *international security* show that such dialogues are possible and productive. The international community can consider building on existing cooperative efforts concerning cyberspace, such as the U.N.’s work on *norms and behaviour in cyberspace*, the *Cybersecurity Tech Accords*, and Microsoft, Hewlett, and Mastercard’s Cyber Peace Institute. This dialogue will help us understand the scope of potential change and should give us incentives to move slowly and to push for greater transparency to reduce misperception and misunderstanding.

Source: <https://www.europeanleadershipnetwork.org/commentary/bringer-of-hope-or-harbinger-of-doom-artificial-intelligence-and-nuclear-weapons/>, 17 August 2020.

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OPINION – Maxim Schoofs, Francesco Pezzarossi

Covid-19 is Affecting Nuclear Disarmament

The Covid-19 pandemic is having a significant impact on all areas of international politics, disarmament being one of them. Disarmament is undoubtedly a multifaceted field. While on one side some of its aspects have to do with advocacy and information sharing, on the other side a key part is strictly related to policy-making and treaty negotiation. In the year 2010, the new strategic arms reduction treaty or ‘New Start’ was created. In this bilateral agreement, the US and Russia had agreed to reduce their strategic nuclear warheads and delivery systems significantly. Both parties would “only” be allowed to possess 1550 long-range nuclear warheads and 700 deployed delivery systems.

To verify each state is abiding by the agreed-upon terms, a series of on-site inspections would occur each year, 18 to be precise. The treaty makes a distinction between two types of inspection. A Type 1 inspection entails the inspection of military sites with deployed and non-deployed strategic systems. A Type 2 inspection only entails the inspection of those sites with non-deployed strategic systems. The inspections provide both parties with insight into the amount of strategic nuclear weapons and the missiles capable of delivering them. Every year each side can conduct ten type 1 inspections and eight type 2 inspections. So far, both sides have performed all inspections for each year. However, in 2020 the US has only conducted two Type 1 inspections and Russia has only conducted two Type 2 inspections.

Postponed Inspections and Future Scenarios: Due to the COVID-19 pandemic, the inspections have been postponed and it is unclear if the remaining 32 inspections will be conducted or not. It is in the interest of both parties to conduct at least one more inspection of both types before the end of the year.

As the treaty expires on the 5th of February 2021, both the US and Russia will likely want a final assessment of the other party's adherence to the treaty. This is the last remaining bilateral nuclear arms control treaty between the US and Russia, its existence is an important part of global disarmament. When the treaty expires in February, three things can happen. The first option is that the treaty is extended until 2026.

A second option is that the US and Russia replace the 'New Start' with a different disarmament treaty. From an international security point of view, both of these options are desirable yet unlikely. The third and most likely option is that both parties cannot come to an agreement and abandon the treaty, which would mean that for the first time in almost 50 years, there would be no disarmament treaty between the US and Russia regarding their nuclear arsenals.

No less evident are the repercussions of the Covid-19 pandemic on the review conference of the NPT, which is regarded as the cornerstone of the global nuclear non-proliferation regime. The quasi-universal scope of the Treaty – 191 States have joined it – explains the fundamental role of the NPT in the global pursuit of nuclear disarmament.

After the success of the 2010 Review Conference, the 2015 Review Conference ended without reaching consensus on a substantive outcome document. The 2020 Review Conference, which has now been postponed to 2021 due to the ongoing pandemic, may turn into a great occasion for the international community to reaffirm the multilateral commitment to preserve and strengthen the global non-proliferation regime. Unfortunately, the path towards the 2021 Conference has plenty of hurdles. As it clearly emerged from the past Review Conferences, one of the most problematic issues relates to the recurrent dissatisfactions among

many of its parties. As the former UN High Representative for Disarmament Affairs Sergio Duarte recently explained, "An exacerbation of this pattern could lead to any or some of them to exercise the right ensured by article X.1 and leave the Treaty. This would create a major crisis and must be prevented." Indeed, while the asymmetry of the parties' rights and duties initially found its justification in the logic of bargain – non-proliferation was bargained for the progressive disarmament of the major nuclear powers – frustration has increased over time as nuclear weapon States have consistently modernized their arsenals despite their disarmament commitment under Article VI.

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The dynamic negotiating processes behind the scenes of the 2021 NPT Review Conferences are not isolated from the other aspects of nuclear disarmament. As Ambassador Duarte pointed out "early agreement on the extension of the 'New Start' beyond its expiration in February next year – that is, before the Review

Conference – would be a welcome signal of the will of the two largest possessors of nuclear weapons to further reduce existing arsenals," thus helping prevent a failure of the conference. Aside from the political dynamics closely underpinning NPT negotiations, it is worth recalling that the frustration of a significant portion of States parties has already emerged. Such irritation contributed to the conclusion of the Treaty on the Prohibition of Nuclear Weapons (TPNW), signed in New York in 2017.

Some States and many civil society organizations, including the Nobel prize-winner ICAN, are striving to increase the number of ratifications. Having Ireland, Niue, Nigeria, Saint Kitts and Nevis deposit their instruments of ratification on the occasion of the 75th anniversary of Hiroshima and Nagasaki nuclear bombings, the number of States parties

has now increased to 44. In this way, only six ratifications are missing to the TPNW's entry into force. There is never an ideal time for a global health crisis but when it comes to nuclear disarmament it could not have come at a worse time. Hopefully, inspections can be resumed so that transparency can be restored between the US and Russia before the expiration of the 'New Start'. Perhaps even more important is that dialogue on the matter can be resumed as well. Zoom calls and other kinds of digital solutions might be effective tools for small groups, but when it comes to discussions where delegates from all around the world need to participate, a zoom call will never have the same impact as the practice of in-person diplomacy. One thing is for sure, the coming months will be crucial for the future of nuclear disarmament.

Source: <https://www.brusselstimes.com/opinion/127317/covid-19-is-affecting-nuclear-disarmament/>, 19 August 2020.

OPINION – Stephen Kuper

Annual Japanese Defence white Paper Reveals Continued Focus on Indo-Pacific

The 2020 incarnation of the annual Japanese defence white paper has revealed little new about the island nation's primary strategic focus, however it has shed light on the nation's rapidly evolving defence modernisation and recapitalisation efforts.

Japan has closely followed the modernisation of the Chinese armed forces and raised concerns about the nation's defence capabilities. The pre-war power has long sought to shake off the chains of the pacifist constitution enforced upon it by the US, UK, Australia and other allies following

the end of the war in the Pacific. However, Japan's geo-strategic realities have rapidly evolved since the end of the Cold War, when the US could effectively guarantee the security of the island nation.

Growing Chinese assertiveness in the South China Sea and modernisation efforts resulting in the

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fielding of key power projection capabilities, including aircraft carriers and supporting strike groups, fifth-generation combat aircraft, modernised land forces, area-access denial and strategic nuclear forces, combined with growing political and financial

influence throughout the region is serving to shake Japan's confidence. In response, Japanese PM Abe Shinzo has repeatedly earmarked increased funding for the nation's defence budget, expanding the capabilities of the Japan Self-Defense Force (JSDF) to operate independently of direct US support – establishing the nation as an emerging great power with traditional great power style strategic economic, diplomatic and military capabilities. Accordingly, the latest incarnation of the annual defence white paper (DWP) process, 'Defense of Japan 2020', has built on the

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success of the 2019 Defense White Paper to include a range of assessments of the geo-strategic environment of the Indo-Pacific, Japan's place in the world and critically, the nation's capability development and acquisition plans in response.

Alliances and the

Changing Geo-strategic Environment: Strategic partnerships and alliances form the basis of Japan's post-war international engagement. Particularly the relationship with the US, but increasingly, regional powers like Australia and India are playing larger roles in the nation's strategic calculus. Recognising these factors, the

DWP states the continued importance the US plays in Japan's planning and its response to the broader evolution of the Indo-Pacific region's geo-strategic paradigm: "The US recognises strategic competition with revisionist powers, namely China and Russia, as the central challenge to US security.

"Especially, the US ranks China at the top of its list of priorities and places the greatest emphasis on the security of the Indo-Pacific region to strengthen deterrence against China. "Under the recognition that nuclear capabilities of North Korea, classified as 'rogue regimes' in its strategic documents, constitute an extraordinary threat to the United States, it has maintained sanctions and continues to pursue de-nuclearization of North Korea, while maintaining strong military readiness of the US forces including US Forces Korea.

"The US prioritises the allocation of military forces to the Indo-Pacific region and Europe while reducing forces in the Middle East and Africa. The US, however, still needs to deal with security issues in the latter regions, which makes it difficult to describe that such transition of the US force posture is smoothly progressing." Regional alliances are central to Japan's strategic security and stability and provide additional support and capability aggregation among the allies as the US continues to rebalance its forces around the world. Accordingly, the Japanese DWP identifies: "The Indo-Pacific region is the core of the world's vitality, supporting more than half the world's population. It is important to establish this region as a free and open global commons to secure peace and prosperity in the region as a whole. "In order to promote a 'Free and Open Indo-Pacific', the MOD/SDF will strengthen defence co-operation and exchanges with countries in the region."

Supporting this, the Japanese white paper expands its focus on enhancing relationships with regional and global security partners, including Australia, India, the ASEAN nations, South Korea, the European Union, Canada and New Zealand. The

Australia-Japan relationship is the nation's closest and most mature in Asia and is underpinned by the strategic, economic, political and legal interests of both countries. The countries work closely in strategic alliance with the US, and lead in critical regional partnerships with countries such as India and the Republic of Korea.

Enhancing Capabilities: The rate of technological evolution has reshaped the field of warfare and the weapons and platforms that will be used. Japan's proximity to China and developments in the ballistic missile, force projection, cyber capability and anti-space domains has prompted a growing response from Japan across a number

of domains. In particular, the Japanese 2020 DWP focuses on developing the capacity of the nation to respond to "inter-state competition" with key focal points of capability developments, including:

- Continued development of the future Japanese F-X fighter aircraft, improving the technological reliability and reducing development costs, leveraging Japanese led development and international cooperation;

- Extensive investment in the Maritime Self-Defense Force (JMSDF) particularly in the surface fleet, including reinforced destroyer units with a new class of destroyers, minesweeper units and new patrol ships supporting "steady-state ISR" in Japan's territorial waters;

- The Ground Self-Defense Force (JGSDF) will maintain rapidly deployable basic operational units furnished with advanced mobility and intelligence, surveillance, and reconnaissance (ISR) capabilities, and mobile operating units equipped with specialised functions. The GSDF will strengthen its ability to deter and counter threats by taking measures including persistent steady-state manoeuvres;

- To be able to counter an invasion of remote islands, the GSDF will maintain surface-to-ship guided missile units and hyper-velocity gliding projectile units for remote island defence;

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· The JSDF will also establish new units in the domains of space, cyberspace and electromagnetic spectrum, strengthen its posture, build comprehensive air and missile defence capability, and maintain a maritime transport unit as an integrated unit; and

· The Air Self-Defense Force (JASDF) will maintain ground-based warning and control units capable of conducting sustained surveillance in the airspace around Japan, and air warning and control units capable of conducting airborne warning, surveillance and control also during situations with heightened tensions, such as “gray-zone” situations – including fighter aircraft units reinforced by high-performance fighter aircraft, and aerial refueling and transport units.

Your Thoughts: The rapidly developing qualitative and quantitative capabilities of regional surface warship and submarine fleets, namely by Russia and China – combined with the increasing proliferation of surface vessels and submarines designed and built by the aforementioned nations by emerging peer competitors – serves to stretch the tactical and strategic capabilities of the RAN.

Additionally, the increasing proliferation of advanced anti-ship ballistic and anti-ship cruise missiles, combined with the growing prominence of naval aviation – again led by China but also pursued by Japan and India – is serving to raise questions about the size and the specialised area-air defence, ballistic missile defence, power projection and sea control capabilities of the RAN.

Australia is defined by its relationship and access to the ocean, with strategic sea lines of communication supporting over 90 per cent of global trade, a result of the cost-effective and reliable nature of sea transport.

Indo-Pacific Asia is at the epicentre of the global maritime trade, with about US\$5 trillion worth of

trade flowing through the South China Sea and the strategic waterways and choke points of south-east Asia annually.

The Indian Ocean and its critical global sea lines of communication are responsible for more than 80 per cent of the world’s seaborne trade in critical energy supplies, namely, oil and natural gas, which serve as the lifeblood of any advanced economy.

Enhancing Australia’s capacity to act as an independent power, incorporating great power-style strategic economic, diplomatic and military capability, serves not only as a powerful symbol of Australia’s sovereignty and evolving responsibilities in supporting and enhancing the security and prosperity of Indo-Pacific Asia.

Source: [https://www.defenceconnect.com.au/key-enablers/6690-annual-](https://www.defenceconnect.com.au/key-enablers/6690-annual-japanese-defence-white-paper-reveals-continued-focus-on-indo-pacific)

[japanese-defence-white-paper-reveals-continued-focus-on-indo-pacific](https://www.defenceconnect.com.au/key-enablers/6690-annual-japanese-defence-white-paper-reveals-continued-focus-on-indo-pacific), 24 August 2020.

OPINION – Andrea Stricker

Add Taiwan to the IAEA

Washington recently showed solidarity with Taipei by sending a delegation led by Health and Human Services Secretary Alex Azar, the most senior U.S. official to visit Taiwan in decades. But amid rising Chinese efforts to infringe the sovereignty of its neighbours, including provocative military manoeuvres and verbal threats, the US can do more to protect Taiwan’s independence – starting with galvanizing support for Taipei’s membership in international organizations and UN agencies.

There is an especially strong case for Taiwanese admission to the IAEA, which monitors global nuclear proliferation. Taiwan has stellar non-proliferation credentials, whereas China bears responsibility for the proliferation of nuclear-weapons technology to some of the world’s most dangerous regimes. But it is Taipei that

Taiwan has stellar non-proliferation credentials, whereas China bears responsibility for the proliferation of nuclear-weapons technology to some of the world’s most dangerous regimes. But it is Taipei that was ejected from the IAEA, thanks to the UN’s 1971 decision to switch official recognition to the PRC on the mainland — and Taipei that has been blocked by Beijing as it bids to join or re-join various international organizations, pacts, and regimes.

was ejected from the IAEA, thanks to the UN's 1971 decision to switch official recognition to the PRC on the mainland — and Taipei that has been blocked by Beijing as it bids to join or re-join various international organizations, pacts, and regimes.

Taiwan not only adheres to the NPT despite its official non-member status; it is a top performer. Assisted by a U.S.-IAEA-Taiwan agreement, Taipei applies the IAEA's highest standard of "integrated safeguards" to its civilian nuclear program, as well as the watchdog's rigorous verification agreement, the Additional Protocol. Yet Taiwan was not always so upstanding. Until 1988, Taipei had a relatively advanced nuclear weapons program, sparked by the first Chinese nuclear test in 1964. By the program's end, and shortly before Taipei rejected authoritarian governance in favour of democratic reform, Taiwan was roughly one to two years away from having nuclear weapons.

Following U.S. pressure, Taiwan shut down its nuclear weapons program and became a non-proliferation paragon. Every year since 2006, the IAEA has reached a "broader conclusion" that all of Taipei's nuclear materials and activities are in peaceful uses. The agency reportedly continues to inspect Taiwan's defunct nuclear weapons-related sites.

By contrast, despite being an IAEA member state since 1983, Beijing has contributed to some of the world's most intractable proliferation problems. It directly provided nuclear facilities to North Korea, Iran, and Pakistan. Beijing also looked the other way as Chinese companies sold related equipment and technology to all three regimes, as well as to

others. Most recently, a U.S. intelligence report leaked to the media alleged that China may be helping Saudi Arabia to construct two covert facilities in remote desert areas, which Washington suspects have a nuclear use. This is in spite of Riyadh's crown prince openly pledging to match Iran's nuclear capabilities. With China's assistance, Saudi Arabia is also constructing another clandestine facility for ballistic missiles. Beijing has plans to roughly double its own nuclear weapons stockpile over the next decade, Washington estimates, a clear departure from current downsizing

trends for states that possess nuclear weapons under the Nuclear Non-Proliferation Treaty. The U.S. Defense Intelligence Agency also suspects that China plans to upgrade its nuclear-capable missile delivery capabilities.

Even though Taipei clearly merits a role at the IAEA, the UN's 1971 decision to revoke recognition of Taiwan poses non-trivial legal obstacles. The IAEA is a UN subsidiary agency and the international community has not recognized Taiwan as a state. The IAEA's statute does not prevent non-UN members

from joining, but it does refer to members as "states."

If the IAEA's members moved to support Taipei's membership in any case, the 35-member IAEA Board of Governors would need to recommend it by a vote of two-thirds. Next, the IAEA General Conference, composed of 171 member states, would need to do the same.

Even if the smaller Board of Governors recommended Taipei's membership, it is unlikely today that the General Conference would concur, since many members of the 125-nation Non-

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Aligned Movement, which frequently vote as a bloc, support China. Beijing would use all means of diplomatic and economic coercion or threaten to prevent Taipei's membership.

However, China's own actions may be turning the tide in favour of support for Taiwan's membership in the IAEA and other international organizations.

Beijing's provocations include myriad violations of its international agreements, aggression against Hong Kong, India, and nations in the South China Sea, and construction of concentration camps for Muslim Uighurs at home. China's actions have dashed any hope it could become a "responsible stakeholder" in the post-Cold War order. These actions also make it imperative to defend those whom China may next assault.

Washington and its allies should make clear to Beijing the ramifications of its threats to violate the autonomy of Taiwan. These measures should include, but not be limited to, the U.S. elevating Taipei's status in international organizations. Congress has already expressed support for Taiwan's expanded membership in international organizations. In March 2020, it passed into law the Taiwan Allies International Protection and Enhancement Initiative Act, or the TAIPEI Act, which directed the U.S. government to "advocate, as appropriate...for Taiwan's membership in all international organizations in which statehood is not a requirement and in which the US is also a participant" and to work for Taipei's observer status in other international organizations.

As encouraged under the 1979 Taiwan Relations Act, America should also improve the quality and deterrent factor of its defense assistance to ensure Taipei's security. U.S. protection of Taiwan's sovereignty through support for its membership in key organizations would both raise Taipei's profile internationally and send a clear message to China about contemplating

aggression against its smaller neighbour. Unlike China, Taiwan has proven it is a reformed, model member of the global community when it comes to non-proliferation and many other issues. It should be treated accordingly.

Source: <https://www.defenseone.com/ideas/2020/08/add-taiwan-international-atomic-energy-agency/167927/>, 24 August 2020.

OPINION – Hanna Notte

US-Russian Arms Control in the Middle East: Defining the Diplomatic Playing Field

In the rich history of US-Russian (and before that, US-Soviet) cooperation on WMD arms control and non-proliferation, the Middle East has long occupied a central place. At the 1995 NPT Review and Extension Conference, Arab states were given assurances, through a resolution sponsored by Russia, the US and the UK, that NPT states parties would pursue the goal of establishing a WMD-Free Zone in the Middle East. From the mid-2000s, Russia and the US worked within the "P5+1" framework on resolving the Iranian nuclear dispute. While such cooperation was never without friction, it culminated in the 2015 Joint Comprehensive Plan of Action (JCPOA). Finally, US-Russian cooperation in destroying Syria's declared chemical weapons (CW) in 2013-2014 was hailed as a notable arms control achievement at a time of growing bilateral friction.

More recently, however, widespread worries about a bilateral US-Russian arms control agenda in disarray – given the fate of the INF and Open Skies Treaties, and the unresolved future of New START – have been compounded by serious setbacks to cooperative arms control in the Middle East. The Trump administration walked away from the JCPOA in May 2018, launching a "maximum pressure" campaign against the Islamic Republic. Equally unnerving, US-Russian cooperation on Syria's CW has dissolved into outright

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confrontation over efforts at pursuing attribution and accountability for CW use. A closer look at these two examples suggests that US-Russian diplomacy on Middle East arms control is characterised by three tensions: that between coercion and consent, that over legal interpretations of agreements reached, and that between arms control and extraneous motivations. In the end, it all boils down to priorities of interest.

Syria's Chemical Weapons: From Cooperation to Confrontation: Starting with the disarmament of Syria's CW, US-Russian cooperation in 2013-14 was enabled by a variety of factors, including the resonance of previous bilateral exchanges on the Syrian stockpile and modest expectations of positive "spill over" into the US-Russian relationship. That said, the perception of a coercive threat to Syria at the time (remember President Obama's "red line" threat) was critical: Russia viewed cooperation as a means to avert possible Western military action against Syria, following the August 2013 chemical attack in East Ghouta.

It was also crucial that the US and Russia were able to agree on a hybrid legal framework underpinning CW disarmament, which entailed both an Executive Council decision by the Organisation for the Prohibition of Chemical Weapons (OPCW) and UN Security Council (UNSC) Resolution 2118. Under ordinary circumstances, CW disarmament takes place within the purview of the 1997 Chemical Weapons Convention (CWC), which mandates that an acceding state provide a comprehensive declaration of all CW and production facilities. Those are verified through OPCW-led on-site inspections, before the OPCW and the state jointly implement a plan for CW destruction. In the Syrian case, Western countries pushed for important exceptions to this routine, including the passing of a UNSC resolution and an extremely tight destruction schedule. In its subsequent reading of the hybrid framework, Russia repeatedly emphasized the regular, consent-based

CWC component, and hence the voluntary and sovereign nature of Syria's engagement in disarmament. This resulted in a dilemma for Washington, since condoning a modicum of engagement with the Syrian government contradicted the principled US position that President Assad had lost all legitimacy to lead his country.

As allegations of CW use in Syria resumed from 2014, US-Russian disagreement over the pursuit of attribution and accountability played out over various efforts, including the Fact-Finding Mission (FFM), the Joint Investigative Mechanism (JIM) and most recently the OPCW's Investigation and Identification Team (IIT). Western states have since lamented continued CW use by the Syrian government – unrestrained by Russia and undeterred both by

Russian officials, meanwhile, have questioned the objectivity and even legality of the OPCW's recent engagement with the Syrian CW file, accusing Western countries of instrumentalising the hybrid legal framework to single out Syria for special "mistreatment", rather than implementing international law objectively.

Obama's original "red line" and the Trump administration's punitive airstrikes in April 2017 and April 2018. Russian officials, meanwhile, have questioned the objectivity and even legality of the OPCW's recent engagement with the Syrian CW file, accusing Western countries of instrumentalising the hybrid legal framework to single out Syria for special "mistreatment", rather than implementing international law objectively. This contestation is currently epitomised in the quarrel over the IIT's first report, published in April, which attributes culpability for CW use in March 2017 to the Syrian Arab Air Force.

The JCPOA: "Can't have Your Cake and Eat it too": Turning to Iran's nuclear program, evidence of Iran violating its IAEA safeguards agreement in the early 2000s spurred international efforts for a diplomatic solution. Before 2005, Russia partnered with the EU to elicit Iranian acceptance of the IAEA's additional protocol, which would allow the agency to make unannounced visits to Iranian nuclear installations. And when Iran, following the presidential election of Mahmoud Ahmadinejad, rejected its agreement with the

EU-3, the IAEA Board of Governors - supported by Russia - moved the Iran file to the UN Security Council. Moscow consistently emphasized Tehran's right to the peaceful use of nuclear energy, while opposing the weaponization of Iran's program. In that spirit, Russia softened, though never vetoed, a string of UNSC resolutions concerning Iran's nuclear program between 2006 and 2010.

US-Russian cooperation within the "P5+1" framework then culminated in the adoption of the 2015 JCPOA, which imposed restrictions on Iran's nuclear activities in return for the lifting (or suspension) of nuclear-related sanctions. UNSC Resolution 2231, which endorsed and supported implementation of the JCPOA, stipulated that the conventional arms embargo against Iran expire in October 2020. Listed parties to the nuclear deal were also granted the ability to invoke a "snapback" of all UN restrictions lifted by the agreement.

In May 2018, the Trump administration withdrew from the JCPOA, citing concerns not only with the perceived flaws of a "rotten" agreement – such as its "sunset" provisions – but also with the Islamic Republic's alleged export of dangerous missiles and support for terrorist proxies across the region. Emphasizing the linkage between the nuclear file and what it called Iran's "regional behaviour", the Trump administration demanded that the Islamic Republic start acting like a "normal nation" and initiated a policy of "maximum pressure", which has included biting economic sanctions. Since Resolution 2231 was never amended to reflect the US withdrawal from the JCPOA, Washington has recently threatened to force a unilateral "snapback" of all UN sanctions against Iran, should the Security Council fail to extend the arms embargo. Russia, meanwhile, has vehemently resisted what it considers a blatant US violation of an existing UNSC resolution and an impermissible linkage between the nuclear file and other aspects of Iran's foreign policy. Recent

US diplomatic efforts at garnering support for an extension of the arms embargo – which were dealt a final blow in the relevant UNSC vote on August 14 – were rebuffed repeatedly by Russian diplomats, who derided the US' attempt at "having its cake and eating it too."

Defining the Diplomatic Playing Field: Notwithstanding the obvious differences between the Syrian and Iranian examples, they point to three fundamental tensions:

The Tension between Consent and Coercion (and Related, Carrots and Sticks):

Returning to Syria in 2013, the perception of a credible military threat was critical to elicit Syria's accession to the CWC. Indeed, it appears that some degree of coercion is necessary, especially in today's Middle East, to

The Trump administration's "maximum pressure" campaign, devoid of any carrots (engaging a party through consensual approaches is one possible carrot, but obviously not the only one), has thus far failed to elicit the desired Iranian policy changes.

compel reluctant leaders to part with what they have long viewed as strategic weapons required to ensure regime survival or face external adversaries. That said, the current impasse over Iran's nuclear dispute suggests that a "sticks only" approach is problematic. The Trump administration's "maximum pressure" campaign, devoid of any carrots (engaging a party through consensual approaches is one possible carrot, but obviously not the only one), has thus far failed to elicit the desired Iranian policy changes. Russia and the United States have in the past often disagreed on the right balance between carrots and sticks in dealing with Middle Eastern players, and will likely continue to do so. Should Joe Biden be elected US President in November, however, we could see a return to greater convergence.

The Tension over Interpretations of International Law:

As discussed, the legal terms underpinning CW disarmament in Syria crystallized through a hybrid framework which, however, left room for later disagreement regarding the OPCW's mandate for verifying Syria's initial chemical declarations and investigating CW use. In short, the hybrid framework was both key to the initial successful cooperation and the enabler of its

subsequent erosion. Similar legal contestation has now infested the Iranian nuclear issue. The Trump administration's contention that it remains a legal party to Resolution 2231, notwithstanding its withdrawal from the JCPOA, is considered untenable by Russia. It appears that, as and when a joint US-Russian interest in arms control is overtaken by other calculations, the underlying agreements become increasingly contested, with Moscow and Washington offering nuanced legal interpretations to make their respective cases. Rather than speaking truth to power, arms control agreements then say what their powerful architects take them to say.

The Tension between Arms Control and other Motivations: These tensions between coercion and consent, and between this or that legal interpretation of any given agreement, boil down to a broader conundrum: All too often, arms control objectives simply clash with other motivations, especially in the dynamic context that is today's Middle East. In Syria, US-Russian cooperation in 2013 was possible due to a short-lived interest convergence. To US officials, pursuing the narrow interest of chemical disarmament was a noble thing even if Washington had to "bite the bullet" and accept a role for the Syrian government in the process. Russia, on the other hand, managed to avert military action and understood that the hybrid disarmament framework would bolster President Assad. As CW attacks resumed from 2014, the brief moment of US-Russian interest convergence was lost. Meanwhile, having prioritised the narrow interest of pursuing a nuclear agreement with Tehran in 2015, the Obama administration left other considerations – such as concerns with Iran's foreign policy – to be dealt with later. Egged on by leaders in the Gulf and Israel, the Trump administration then rushed to redress that "original sin" of the JCPOA, ignoring Iran's argument (backed by Russia) that raising issues

originally considered "extraneous to the JCPOA by mutual agreement" is impermissible.

Conclusion: US-Russian diplomacy on WMD arms control in the Middle East will continue to be defined by these tensions. Yet, it is the final one – the degree to which arms control is put on the back burner, due to other motivations – that is

If the examples of Syrian CW disarmament and the Iranian nuclear dispute are any guide, the prospects for arms-control achievements in the region appear dim, unless the US and Russia make them a joint priority, which in turn enables them to compromise on legal approaches and an agreeable mix of carrots and sticks.

decisive. If the examples of Syrian CW disarmament and the Iranian nuclear dispute are any guide, the prospects for arms-control achievements in the region appear dim, unless the US and Russia make them a joint priority, which in turn enables them to compromise on legal

approaches and an agreeable mix of carrots and sticks. But as long as their broader interests in the region and in their bilateral relationship remain as starkly at odds as is the case today, we should not hold our breath.

Source: <https://valdaiclub.com/a/highlights/us-russian-arms-control-in-the-middle-east/>, 24 August 2020.

BALLISTIC MISSILE DEFENCE

ISRAEL

Israel PM: Arrow-2 Missile Defence System Tested Successfully

Israeli PM Benjamin Netanyahu announced that Tel Aviv has successfully tested the Arrow-2 ballistic missile interceptor, developed in collaboration with the United States. "I commend the defense establishment and the defense industries for another successful test of the Arrow-2 weapon system," Netanyahu said in a statement issued on 12 August, adding that Israel has "proven again that the State of Israel possesses defensive and offensive capabilities that are among the strongest and most advanced in the world."

"I would like to express deep appreciation to our US ally for jointly advancing our security. Our

enemies and those who seek our ill should know the State of Israel is prepared for any threat," he said.

Earlier, the Israeli Ministry of Defence said that it had conducted a successful test of the Arrow-2 missile defence system against long-range ballistic attacks in central Israel, jointly with the US Missile Defense Agency. Israeli Defence Minister Benny Gantz said: "Israel faces far and near challenges and our technological know-how...promises that we will always be one step ahead of our enemies and defend the State of Israel," adding that "the joint test with the United States expresses the friendship and partnership between our countries, and the United States' deep commitment to the security of Israeli citizens." "We will continue to work together to strengthen the capabilities of the security system – in the air, at sea, on land and in cyberspace," Gantz added.

With China's growing belligerence and military might across Taiwan Strait that depicts People Republic's hostile intentions and war rhetorics against the breakaway island nation, Taiwan's military on August 22 took to anti-aircraft, anti-tank and vessel missiles combat in mock invasion drills.

Source: <https://www.middleeastmonitor.com/20200814-israel-pm-arrow-2-missile-defence-system-tested-successfully/>, 14 August 2020.

TAIWAN

Taiwan's Defence Ministry Showcases Military Power Amid Heightened Tensions with China

Taiwan's military fired ballistic missiles from assault helicopters and fighter jets dropped bombs on targets at sea and the island's shore in the drill. With China's growing belligerence and military might across Taiwan Strait that depicts People Republic's hostile intentions and war rhetorics against the breakaway island nation, Taiwan's military on August 22 took to anti-aircraft, anti-tank and vessel missiles combat in mock invasion drills. Visuals released by Taiwan's defense ministry depict Taiwanese armed forces as fighter aircrafts flew across the de facto "median line", issuing warnings to China not to underestimate the island's defense capabilities in cross-Strait military exercises. "The most egotistical country

can thoughtlessly provoke a war and the most ignorant government can be caught in the flames of war," ANI quoted Taiwan's Defense Ministry as saying, citing its official statement. "Repeated provocation" by China's People's Liberation Army will no longer work, the ministry added.

In the drill, Taiwan's military fired ballistic missiles from assault helicopters and fighter jets dropped bombs on targets at sea and the island's shore. Tanks and missile trucks fired from land during the large-scale military drill throughout the island. Recently, Taiwan also conducted major live-fire military exercises with its air force, naval and ground defense troops dubbed as "Han

Kuang" in order to portray to China the nation's military power and capabilities to "defend its sovereignty". The armed forces drill came as People's Republic expanded its military activity surrounding the island in the disputed South China Sea waters. Taiwan's

President Tsai Ing-wen said in a statement that Han Kuang military exercises for the armed forces evaluate the development of combat abilities. He added, the world would see Taiwan's efforts to defend the country's territory.

On August 22, the Taiwanese defines ministry warned, "It would have only been the effect of triggering the wrath and antipathy of Taiwan's people, and hurt peace and stability across the Taiwan Strait." The warnings come in the backdrop of PLA Eastern Theatre Command's activation of combat exercises north and south of Taiwan Strait. In footages released by China's State-run broadcasters, the People's Liberation Army is seen displaying its novel Tianlei 500, a 500kg (1,100lb) precision-guided munitions dispenser and air-to-surface missile.

PLA's Military Activities on Rise: Taiwan's Foreign Minister Joseph Wu warned in July, saying, China might be preparing to "solve the Taiwan issue", indicating People's Republic intentions of

overtaking the island like Hong Kong, according to reports. Further, Wang Ting-yu, member of Taiwan's Foreign Affairs and National Defense Committee said that this year, 2020, PLA's military activities in the Southeast part of the Taiwan Strait have been more than usual, first noticed by the global military think tanks and China watchers in April-May. In a separate report, Wang claimed that Taiwan anticipated China to escalate military pressure in the region prior to a full-fledged invasion.

Source: Zaini Majeed, <https://www.republicworld.com/world-news/rest-of-the-world-news/taiwan-defence-shows-military-might-to-china-in-mock-invasion-drills.html>, 23 August 2020.

USA-POLAND

US and Poland Sign Enhanced Defense Cooperation Agreement

US Secretary of State Mike Pompeo and Polish Minister of National Defence Mariusz Błaszczak signed an Enhanced Defense Cooperation Agreement (EDCA) between their two countries in Warsaw on 15 August. US President Trump and his Polish counterpart, Andrzej Duda, agreed most of the provisions of the agreement in 2019. In addition, the US presence in Poland will be increased from 4,500 to 5,500 troops and infrastructure will be built to accommodate up to 20,000 US soldiers. Poland will cover some of the costs, such as those for infrastructure and logistics, that are estimated at PLN500 million (USD136 million) a year. The infrastructure covered does not include the US Aegis Ashore ballistic missile defence site in Redzikowo.

The EDCA provides the legal framework for US military and civilian personnel to be deployed to Poland, including families and private contractors. It supplements the 1951 NATO Status of Forces

Agreement (SOFA), according to a 15 August US State Department fact sheet on the agreement. It lists the facilities that US troops will use in Poland. Poznań will accommodate a command and control (C2) facility that will probably be used by the V Corps Forward Headquarters. An armoured brigade combat team will be located in Tągań Toruń and Skwierzyń, where new infrastructure will be provided. Special forces will be located in Lubliniec, where an operational base will be established to accommodate a company.

Source: Jakub Link-Lenczowski, <https://www.janes.com/defence-news/news-detail/us-and-poland-sign-enhanced-defense-cooperation-agreement>, 19 August 2020.

NUCLEAR ENERGY

CHINA

New Reactor in China Connected to Grid

Tianwan 5, a 1118 MWe (gross) Chinese ACPR1000 reactor, has been connected to the grid after 55 months construction. Unit 6 alongside it started construction about nine months behind it. Unit 5 becomes the 48th commercial reactor in operation and takes China's nuclear power capacity to 46.5 GWe. Tianwan 5&6 (phase III of the plant) were built as Chinese-designed reactors instead of continuing the line of four Russian VVER-1000s, as negotiations on pricing for units 3&4 had become drawn out. Due to urgency in meeting power demands, it appeared likely that Jiangsu Nuclear Power Corporation might build units 5&6 ahead of 3&4, using the ACPR1000 local technology with French provenance. The phase IV reactors, Tianwan 7&8, will be Russian VVER-1200 types, with construction start expected in December.

For units 5&6 ACPR1000, an EPC contract between Jiangsu NP and China Nuclear Power Engineering Corporation was signed in 2011, making CNPE the

The EDCA provides the legal framework for US military and civilian personnel to be deployed to Poland, including families and private contractors. It supplements the 1951 NATO Status of Forces Agreement (SOFA), according to a 15 August US State Department fact sheet on the agreement.

project manager. It contracted for both nuclear islands in June 2016 with China Nuclear Industry Huaxing Construction Co. Dongfang Electric is supplying turbine generators using Arabelle low-speed technology, built under an agreement with GE Alstom. These are being supplied to most large new nuclear plants in China.

Source: <https://www.world-nuclear.org/our-association/publications/weekly-digest/latest-world-nuclear-association-weekly-digests.aspx>, 14 August 2020.

China Progresses New Reactor Projects

Construction on two significant reactor projects in China is proceeding while awaiting official authorisation in certain respects for installation of main components. In both projects there is significant equity from major generating companies which do not have authority to build and operate nuclear power plants on their own.

At Shidaowan in Shandong province the first of two CAP1400, or Guohe, reactors has been under construction for more than a year. This is a local development of the Westinghouse AP1000, four of which are now operating at Sanmen and Haiyang (and two more are under construction at Vogtle in USA). In 2009 the State Nuclear Plant Demonstration Company – a 55-45% joint venture company by State Nuclear Power Technology Corporation (SNPTC) and China Huaneng Group – was set up to build and operate an initial demonstration unit of the CAP1400, at Huaneng’s Shidaowan site near Rongcheng. The 1500 MWe design was completed in 2012 and approved by the National Energy Administration in 2014. Most major components were ordered then and have been delivered. SNPTC has full intellectual property rights for the CAP1400 and hence sees export potential. The site is where the innovative small high-temperature gas-cooled reactor, HTR-PM, is being built.

At Changjiang on Hainan Island, China National Nuclear Corporation (CNNC), in joint venture with China Guodian Corporation (49%), is building its

first multi-purpose small modular reactor, the ACP100, or Linglong One. The basic design was completed early in 2016, with integral steam generators so that the whole reactor can be shipped from the factory in Bashan, Jilin province, as a single module. It produces about 125 MWe or 1000 GJ/hr process heat. It appears that full construction of the first of a pair began in April. It involves a joint venture of three companies for the demonstration plant: CNNC New Energy Corporation as owner and operator, the Nuclear Power Institute of China as the reactor designer, and China Nuclear Engineering Group being responsible for plant construction. More ACP100 units are planned at two sites in Jianxi province and then in Zhejiang and Heilongjiang provinces. At Changjiang there are two 600 MWe reactors operated by Hainan Nuclear

Power Co Ltd, a CNNC joint venture with 49% Huaneng share.

Source: <https://www.world-nuclear.org/our-association/publications/weekly-digest/latest-world-nuclear-association-weekly-digests.aspx>, 14 August 2020.

UAE

Ambassador Yousef Al Otaiba Statement on Barakah Nuclear Energy Plant Delivering Clean Energy to the UAE Grid

Ambassador Yousef Al Otaiba issued the following statement regarding Unit 1 of the Barakah Nuclear Energy Plant’s successful connection to the UAE grid.

“Unit 1 of the UAE’s Barakah Nuclear Energy Plant is now beginning to generate the first megawatts of clean electricity and powering the country’s homes, businesses, and industries. The successful synchronization of this unit to the UAE grid is already producing tangible environmental benefits. Once all four units of the power plant are fully operational, the Barakah plant will supply up to 25% of the UAE’s electricity without producing any carbon emissions.

CNNC New Energy Corporation as owner and operator, the Nuclear Power Institute of China as the reactor designer, and China Nuclear Engineering Group being responsible for plant construction.

This milestone demonstrates the UAE's commitment to generating clean, safe, and reliable baseload electricity. "The UAE has built the first peaceful nuclear energy plant in the Arab world and this accomplishment is a testament to the country's ongoing international cooperation and deep commitment to nuclear security. An early milestone was achieved over ten years ago with the signing of the U.S.-UAE 123 Agreement when both countries agreed to the strongest bilateral civil nuclear cooperation deal in non-proliferation history. The UAE's voluntary commitment to forgo domestic enrichment and reprocessing of nuclear material was a significant development. The agreement serves as a model for the establishment of a peaceful and safe civilian nuclear energy program.

"The connection of the first unit of the Barakah Nuclear Energy Plant to the UAE electricity grid is a momentous occasion for the Emirates Nuclear Energy Corporation and for partners of the UAE's peaceful nuclear energy program. Electricity output will be steadily raised over the coming months, with Emirati families and businesses benefiting from this clean source of electricity. This positive environmental impact will be felt throughout the region and for generations to come."

Source: <https://www.prnewswire.com/news-releases/ambassador-yousef-al-otaiba-statement-on-barakah-nuclear-energy-plant-delivering-clean-energy-to-the-uae-grid-301115040.html>, 19 August 2020.

NUCLEAR COOPERATION

UKRAINE-UAE

Ukraine to Explore New Vistas of Cooperation with UAE: Envoy

Ukraine looks forward to new areas of cooperation with the UAE, a top envoy said in Abu Dhabi. Yuriy Polurez, Ambassador of Ukraine to the UAE, said the high-level bilateral visits between the

leaderships had strengthened relations. The envoy thanked the UAE for sending humanitarian relief packages during the pandemic and facilitating repatriation of its stuck nationals.

...The ambassador said cooperation with the UAE is one of the strategic priorities of Ukraine's foreign economic policy in the region. "This year the UAE was ranked among the top 10 countries regarded as the most desirable by Ukrainian exporters."

Ukraine is ready to offer cooperation in nuclear energy, where Ukrainian specialists have unique experience, as well as in the training of Emirati specialists on nuclear safety." The ambassador said Ukraine is looking forward to boosting trade ties in new areas.

Focus on Bolstering Ties:

Polurez noted the trade relations had reached \$1 billion in 2019. So far 30 bilateral agreements and MoU were inked, and 15 more were under

consideration. Among areas of cooperation are space science and nuclear energy. ... Ukraine is ready to offer cooperation in nuclear energy, where Ukrainian specialists have unique experience, as well as in the training of Emirati specialists on nuclear safety." The ambassador said Ukraine is looking forward to boosting trade ties in new areas. ...

Source: <https://www.khaleejtimes.com/uae/abudhabi/ukraine-to-explore-new-vistas-of-cooperation-with-uae-envoy-24-August-2020>.

URANIUM PRODUCTION

KAZAKHSTAN

Kazakhstan Extends Uranium Production Cut Through 2022

Kazakhstan's national operator for the import and export of uranium, Kazatomprom, has announced this week the company's intent to extend production cut by 20 percent through 2022 in an effort to balance the global uranium market. "The decision to keep production similar year-over-year, and extend production curtailment into 2022, is indicative of a global uranium market that is still recovering from a long period of oversupply," said Galymzhan Pirmatov, Chief Executive Officer of Kazatomprom, according to a statement published to the company's website on August 19.

"We are simply not seeing the market signals and fundamental support needed to ramp up mine development in 2021 and take our low-cost, tier one production centers back to full capacity in 2022," he added. The new regulations are expected to remove up to 5,500 tons of uranium from the anticipated global primary supply in 2022, with uranium production in Kazakhstan staying similar to the level expected in 2021 and ranging between 22,000 and 22,500 tons, according to the statement.

In early April, the company announced that its facilities across Kazakhstan would be working at reduced capacity within three months which was expected to cause production cuts by about 17.5 percent in 2020. The statement was made in the wake of a state of emergency declared in Kazakhstan due to the novel coronavirus outbreak. Before the lockdown, the company was expecting the production output to reach about 22,800 tons in 2020.

The country of almost 19 million people, Kazakhstan has reported more than 103,000 cases of infections with the fatality rate standing at 1,415 as of August 20. Harsh restrictions introduced by the country's government to contain the spread of the deadly virus halted most economic activities, causing many people to lose their jobs. A range of companies has announced a temporary halt on production in their local manufacturing facilities until further notice.

Officials in Kazatomprom are convinced that uranium prices and long-term contracting activity will remain unsustainably low due to the market uncertainty attributed to the COVID-19 pandemic. The company has not taken any decision regarding mine development activity beyond 2022 as it

Kazakhstan is the world's largest producer of uranium, with 60 years of experience in nuclear fuel supply. The Central Asian country possesses about 12 percent of the world's recoverable uranium. There are about 50 known deposits and 22 uranium mines in Kazakhstan operated by state-owned Kazatomprom and through joint ventures.

The recent agreement between Israel and the United Arab Emirates reflects a profound shift in which Gulf Arab states opposed to Iran no longer consider relations with Israel off limits. Does the Israel-UAE agreement known as the Abraham Accord strengthen their security ties with regard to Iran.

continues to monitor market conditions.

"We cannot rule out the possibility of further production disruptions due to COVID-19, given that the measures necessary to ensure the health and safety of our staff will continue to be our first priority," the statement reads.

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largest reserve of its kind that can store up to 90 metric tons of uranium suitable for making fuel to feed a light-water nuclear reactor.

Kazatomprom's attributable production represented approximately 24 percent of global primary uranium production as of 2019. All of the company's

mining operations are located in Kazakhstan. Earlier this year, the company announced the deal with a Buenos Aires-based mining corporation Dioxitek, according to which Kazakhstan will cover the South American country's short supply for its nuclear reactors.

Source: <https://caspiannews.com/news-detail/kazakhstan-extends-uranium-production-cut-through-2022-2020-8-20-19/>, 20 August 2020.

NUCLEAR PROLIFERATION

IRAN

Are Gulf Arab States Aligning toward Israel?

The recent agreement between Israel and the United Arab Emirates reflects a profound shift in which Gulf Arab states opposed to Iran no longer consider relations with Israel off limits.

Does the Israel-UAE agreement known as the Abraham Accord strengthen their security ties with regard to Iran?

Israel has had a long-standing, although quiet, relationship with the smaller Gulf states such as Bahrain, Oman, and the UAE. These ties have mainly involved security cooperation in terms of intelligence sharing. For many years, the stalled Israeli-Palestinian peace process has impeded formal diplomatic ties. That wall was breached by this accord. The security cooperation might not change, but this agreement is still an important and momentous achievement. And it might yet presage other Gulf countries formalizing their own ties with Israel.

What other Gulf Countries could Move to Improve ties with Israel? Bahrain and Oman are the mostly likely Gulf states to next move toward normalizing relations with Israel, while also seeking to maintain ties with Iran. This will not be easy. There is much concern in the Gulf that the US has not been a *steadfast opponent of Iran* even despite the current administration's "maximum pressure" sanctions campaign against the regime. Gulf leaders considered the Barack Obama administration's nuclear agreement with Iran to be too lenient and have noted President Donald J. Trump's comments about reaching a new accord with Tehran. And Democratic presidential candidate and former Vice President Joe Biden has already committed himself to reviving the nuclear agreement if elected, thus easing sanctions on Iran. Given the doubts about U.S. resolution and reliability, the gravitational pull is bringing Israel and the Gulf states closer together. They both fear

Iran's regional ambitions and its nuclear aspirations. This nascent alliance is coming together because of their mutual enemies as opposed to shared interests.

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similarly decried the agreement as a historical betrayal of the Palestinian struggle. However, the reaction in Tehran is not uniform. Ali Motahari, former deputy speaker of parliament and an important figure in reformist circles, pointed the finger at Iran itself. While condemning the agreement, he stressed that "[The government is] also guilty. We have frightened the Arabs and caused them to look to Israel as a foil." Another reformist leader, former Vice President Mohammad Ali Abtahi, echoed this theme. "We

The region's alignments are constantly shifting given the series of extraordinary events that have taken place over the past decade. The Iraq War and later Arab Spring provoked convulsions whose impact is still being felt. The United States is a hesitant power in the Middle East today, and there is an unusual bipartisan consensus that it has committed too much time and resources to the region.

What has been the response in Tehran to the Israel-UAE agreement? The announcement has largely been condemned by the Iranian government on the grounds that it betrays the Palestinian cause. The foreign ministry has described the agreement as "strategically stupid" and a "dagger in the back of the Palestinian people and all Muslims." The Iranian Revolutionary Guard Corps are finding ourselves in a situation where our neighboring Arab countries are turning to Israel to confront Iran," he told the New York Times. The reform movement might not have much sway in the government but it is still an important force in conditioning public opinion.

In the end, Tehran has a lot at stake here. On the one hand, the wall of Arab solidarity against Israel could be starting to crack. Security cooperation between the Gulf Arab countries and Israel is increasing. And yet, Iran cannot act too impetuously given its own ample economic ties with the UAE. At a time when Iran

faces heavy sanctions, it cannot jeopardize its remaining commercial relations. This will serve to restrain the much-aggrieved mullahs.

Does this Agreement Mark a Shift in the Region's Strategic Alignment?

The region's alignments are constantly shifting given the series of extraordinary events that have taken place over the past decade. The Iraq War and later Arab Spring provoked convulsions whose impact is still being felt. The United States is a hesitant power in the Middle East today, and there is an unusual bipartisan consensus that it has committed too much time and resources to the region. Amid the coronavirus pandemic and a rising China, the United States' focus is likely to be on domestic needs and Asia.

The establishment of diplomatic ties between Israel and the UAE is a reflection and not a cause of these altering alignments. The new cadre of Arab leaders such as the UAE's Sheikh Mohammed bin Zayed is becoming more assertive and their public's attachment to the Palestinian cause seems to have diminished. This generational shift and the fears of an empowered Iran are causing actions that were once considered inconceivable.

Source: Ray Takeyh, <https://www.cfr.org/in-brief/are-gulf-arab-states-aligning-toward-israel>, 17 August 2020.

Donald Trump's Iran Move at UN Amplifies 'America First' Snub of Allies

The U.S. move to "snap back" UN nuclear sanctions on Iran involves legal arcana unlikely to be resolved quickly. What's clear, however, is that the Trump administration took an approach certain to inflict damage on Iran and relations with America's allies. For critics and supporters alike,

For critics and supporters alike, the disputed U.S. effort to force the restoration of international sanctions on Tehran was peak "America First," a policy undertaken with little pretence of diplomacy and without regard to the consequences.

That maximalist strategy risks grave consequences. For the last three years, U.S. allies have kept up a public facade that the trans-Atlantic relationship remains strong despite all their disagreements and Trump's criticism. But that will be harder to maintain now, especially after Pompeo's crack about siding with the ayatollahs and showing a failure of leadership by refusing to support the U.S.

the disputed U.S. effort to force the restoration of international sanctions on Tehran was peak "America First," a policy undertaken with little pretence of diplomacy and without regard to the consequences. They see a conflict between

President Trump's decision to walk away from the nuclear accord crafted during the Obama administration, only to rely on the architecture of that 2015 deal to demand stringent new punishments on Iran. And in response to their rebuke, the U.S. ridiculed its allies for "siding with the ayatollahs."

...For some observers, the U.S. move is a distillation of Trump's style in another sense: It seeks to blow up a deal without having anything to replace it. They draw parallels to the debate over health care in the U.S., where the Trump team has sought to dismantle the Affordable Care Act without any viable alternative on the horizon.

The move came days before Republicans kick off their convention to re-nominate Trump for the presidency on the 24th August. And the timeline of events — a 30-day window for a UNSC vote and the October expiration of a UN arms embargo — means the dispute will be front-and-centre during the final weeks of the U.S. election campaign. European allies expressed shock and disappointment that the U.S. was so willing to be isolated — first by suffering a humiliating defeat when only one other country, the Dominican Republic, voted with it last week to extend the expiring arms embargo, and then by invoking snapback over almost universal opposition.

The team led by Secretary of State Michael Pompeo is "trying to turn an international agreement and the international system on their heads," said Ellie Geranmayeh, a senior fellow at the European Council on Foreign Relations. "It's really nothing short of vandalism on a broad scale."

That maximalist strategy risks grave consequences. For the last three years, U.S. allies have kept up a public facade that the trans-Atlantic relationship remains strong despite all their disagreements and Trump's criticism. But that will be harder to maintain now, especially after Pompeo's crack about siding with the ayatollahs and showing a failure of leadership by refusing to support the U.S.

Opposition to the multinational agreement was a foreign policy rallying cry for Trump, Republicans and some Democrats soon after it was negotiated. They said it lifted sanctions on Iran in the short-term without providing any long-term guarantee that the Islamic Republic wouldn't seek nuclear weapons. In the meantime, they argued, Iran used fresh investment and cash flows to fuel conflicts from Syria to Yemen. Fulfilling a campaign promise, the President withdrew the U.S. from the accord in 2018 and began tightening U.S. sanctions on Tehran. The "maximum pressure" strategy had an impact, fuelling inflation and undermining domestic support for President Hassan Rouhani's government. And yet, the other nations participating in the accord refused to abandon it altogether. So the U.S. has returned to the UN to argue it still had standing to use its framework to punish Iran. It's an argument few others believe. Opposition from China and Russia was expected, but soon after Pompeo made the U.S. position official, the U.K., France and Germany issued a joint statement criticizing the move. It may have been the most direct joint rebuke yet of Trump's "America First" doctrine.

"France, Germany and the UK are committed to preserving the processes and institutions which constitute the foundation of multilateralism," the nations said. Rebuking the allies, Pompeo said, "America won't join in this failure of leadership. America will not appease. America will lead." Supporters of the strategy argue that it puts the U.S. in position to address some of the key flaws of the original deal — chiefly that many of its most strict restrictions on Iran expire, or "sunset," in

coming years. Trump has repeatedly predicted that Iran will return to the negotiating table after he wins a second term, a claim officials in Tehran have ruled out.

"If the president wins re-election he's set up well to address the sunsets and step up maximum pressure and then the regime will be desperate enough to negotiate," said Richard Goldberg, senior adviser at the Foundation for Defense of Democracies, which has helped guide the Trump administration's Iran sanctions policies.

30-Day Clock: Opponents of the U.S. strategy say that while the nuclear accord was imperfect, it was the best available tool to ensure Iran never again sought to develop a nuclear weapon. Pompeo now insists time is running out on Tehran.

Opponents of the U.S. strategy say that while the nuclear accord was imperfect, it was the best available tool to ensure Iran never again sought to develop a nuclear weapon. Pompeo now insists time is running out on Tehran.

He contends that the U.S. notification at the UN starts a 30-day clock that will wind down with the council required to restore sanctions.

Other nations say they will simply ignore the U.S. move, arguing that it means

nothing as long as the U.S. continues to renounce the accord. That may also be a calculated bet that Trump will lose in November and that an administration led by Democrat Joe Biden would take a different tack. Yet the U.S. move augurs what could come next should Trump win a second term: a foreign policy built even more on individual transactions rather than a broader sense of mutual gain. There was a hint of that approach in the Iran debate, when Pompeo visited the Dominican Republic to attend the country's presidential inauguration. The trip followed the Caribbean nation's decision to cast the lone vote in support of the failed U.S. effort just days earlier to extend the arms embargo on Iran indefinitely. Critics say that's an approach historically adopted by China, which has generally shied away from alliances and conducts foreign policy on more transactional terms. ...

Source: <https://www.livemint.com/news/world/donald-trump-s-iran-move-at-un-amplifies->

america-first-snub-of-allies-11598098218030.html, 22August 2020.

SAUDI ARABIA

Germany Urges S. Arabia to Comply with Nuclear Arms Control Treaty

Germany on 12 August called on Saudi Arabia “to fully comply” with the NPT following a news report about the discovery of a secret nuclear facility in north-western Saudi Arabia. The German government’s critical stance on nuclear power is well known. It is of central importance that Saudi Arabia fully complies with its NPT obligations and that its nuclear program is subject to the international verification standards (‘safeguards’) of the IAEA,” the Foreign Ministry told media representatives via an e-mail.

The NPT is a landmark international treaty whose objective is to prevent the spread of nuclear weapons, to promote cooperation in the peaceful uses of nuclear energy and to further the goal of achieving nuclear disarmament and general and complete disarmament.

With China’s assistance, Saudi Arabia has constructed a facility for the extraction of uranium yellowcake — a potential precursor for a nuclear reactor — in a remote desert location near the small town of Al Ula, the *Wall Street Journal* newspaper reported last week, citing Western officials with knowledge of the site. The facility, which has been kept secret, has sparked concern among Riyadh’s Western allies that the kingdom may try to expand its atomic program to keep open its option to build atomic weapons, according to the report.

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Revelations of the yellowcake processing facility is expected to further increase concern among Riyadh’s neighbours and its Western allies about Saudi nuclear ambitions, especially after Saudi Crown Prince Mohammed bin Salman vowed in 2018 that “if Iran developed a nuclear bomb, we will follow suit as soon as possible.”

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Yellowcake is processed from naturally occurring uranium ore and can be further enriched to create fuel for nuclear power plants and, at very high levels of enrichment,

nuclear weapons.

While the Saudi Energy Ministry has “categorically” denied the *Wall Street Journal* report that the Gulf country has built a uranium ore milling facility, it admitted to contracting with Chinese companies for uranium exploration in Saudi Arabia.

Riyadh triggered major concerns about a likely nuclear arms race in the volatile Gulf region by moving forward with building a research reactor and inviting companies to bid on building two civilian nuclear power reactors without agreeing to

oversight and inspection by the IAEA, Vienna-based UN nuclear watchdog, according to the Al Jazeera media network.

A US congressional committee published a report in May 2019, warning the administration of President Donald Trump was allowing US companies to offer Saudi Arabia nuclear technologies without first obtaining non-proliferation guarantees to ensure the know-how would not be used to eventually produce a weapon.

In February 2019, government whistle-blowers had alarmed the US House of Representatives that

the Trump administration was evading the Congress to allow future sales of nuclear technology to Saudi Arabia, without non-proliferation safeguards, thus potentially paving the path for an atomic arms race in the Middle East.

Source: <https://www.aa.com.tr/en/europe/germany-urges-sarabia-to-comply-with-nuclear-arms-control-treaty-/1939394#>, 12 August 2020.

NUCLEAR NON-PROLIFERATION

CHINA-SOUTH KOREA

South Korea, China Reaffirm Plans for Leaders' Summit

Senior South Korean and Chinese officials on 22 August, reaffirmed plans to arrange a summit between their leaders "at an early date" once coronavirus concerns subside, Seoul's presidential office said. At a meeting in the South Korean port city of Busan, top Chinese diplomat Yang Jiechi and South Korea's national security adviser, Suh Hoon, also discussed the international standoff over North Korea's nuclear weapons program and rising tensions between Washington and Beijing, the Blue House said in a statement.

The government of South Korean President Moon Jae-in has been eager to improve bilateral relations that have been strained since South Korea deployed a U.S. anti-missile system on its soil in 2017 over Chinese objections. Moon had hoped to host Chinese President Xi Jinping in Seoul during the earlier half of the year, but the spread of COVID-19 prevented the visit.

Yang, a Politburo member of the Chinese Communist Party's powerful Central Committee, promised "constant communication and cooperation" with South Korea while supporting efforts to denuclearize the Korean Peninsula and stabilize peace, according to the Blue House, which didn't provide further details.

Moon's government is eager to resume engagement with North Korea, which has virtually cut off all inter-Korean cooperation amid nuclear negotiations with the Trump administration that have stalled over disagreements in exchanging sanctions relief for nuclear disarmament.

Moon's government is eager to resume engagement with North Korea, which has virtually cut off all inter-Korean cooperation amid nuclear negotiations with the Trump administration that have stalled over disagreements in exchanging sanctions relief for nuclear disarmament. China, North Korea's major ally and economic lifeline, had endorsed the easing of U.S.-led sanctions and pressure to induce denuclearization steps from the North.

During the Busan meeting, Yang also briefed Suh on China's position regarding its intensifying row with the Trump administration that has expanded from trade issues and now includes Hong Kong,

Chinese Muslims, spying accusations and control of the South China Sea. Suh said "co-prosperity and friendly cooperation" between Washington and Beijing are critical for the interests of Northeast Asia and the world, the Blue House said. Rising U.S.-Chinese tensions

have rattled South Korea, which worries about being squeezed between its main military ally and biggest trading partner.

Source: <https://www.dtnpf.com/agriculture/web/ag/news/worldpolicy/article/2020/08/22/south-korea-china-reaffirm-plans>, 22 August 2020.

IRAN

U.S. Moves to 'Snap Back' U.N. Sanctions on Iranian Regime

The U.S. is restoring U.N. sanctions against the Islamic Republic of Iran to ensure the regime cannot buy and sell advanced weapons systems or build a nuclear bomb. U.S. Secretary of State Michael R. Pompeo announced the move at the UN on August 20 and called for international support in addressing the Iranian regime's malign behaviour. "Our message is very, very simple: The US will never allow the world's largest state sponsor of terrorism to freely buy and sell planes, tanks, missiles, and other kinds of conventional

weapons," Pompeo said. "These U.N. sanctions will continue the arms embargo."

UN Security Council Resolution 2231 that endorsed the 2015 Iran nuclear deal allows the U.S. to "snap back" sanctions against Iran, a provision Obama-era officials emphasized at the time. The re-imposed sanctions will take effect 30 days from Pompeo's announcement. In addition to extending the arms embargo that was set to expire in October, the U.S. action requires the Iranian regime to stop testing ballistic missiles and halt uranium enrichment, which could support a nuclear weapons program. The move comes as Iran's leaders in June denied the International Atomic Energy Agency's request to access two nuclear sites and have repeatedly violated the arms embargo.

A recent U.N. report says Iran's regime defies the embargo by providing arms to proxy groups and terrorist organizations across the Middle East. The report also said the caches of weapons seized off the coast of Yemen in November 2019 and February 2020 came from Iran, and that weapons used in the September 2019 attacks on Saudi Arabian oil fields also were of Iranian origin.

Saudi Arabia joined Bahrain, Kuwait, Oman, Qatar and the UAE in a recent letter urging the U.N. Security Council to renew the arms embargo, Pompeo said. "As Iran's neighbours, they know better than anyone else the havoc Iran could create with these weapons."

The U.S. has been using economic sanctions to compel the regime to stop fuelling conflicts in the Middle East and halt its pursuit of nuclear weapons. "We will never allow the Islamic Republic of Iran to have a nuclear weapon," Pompeo said. "Today's action puts additional

pressure on Iran to behave like a normal country and to come back to the bargaining table," he said.

Source: <https://ge.usembassy.gov/u-s-moves-to-snap-back-u-n-sanctions-on-iranian-regime/>, 24 August 2020.

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USA

US Trilateral Negotiations Subvert Int'l Consensus on Nuclear Disarmament: Chinese Envoy

The so-called trilateral arms control negotiations raised by the US subvert the international consensus on nuclear disarmament, a Chinese envoy said on 14th August. Wang Qun, Chinese envoy to the UN and other international Organizations in Vienna, made his remarks after U.S. Secretary of State Mike Pompeo urged Beijing to take part in the so-called trilateral talks during his visit to Vienna 14th August. "The international community has a clear consensus on how to carry out global nuclear disarmament, and a series of international legal instruments have been formed on this basis," said Wang.

He pointed out that these instruments clearly stipulate that the US and Russia, with the largest nuclear arsenals in the world, bear a special responsibility for disarmament, and should continue to drastically reduce their nuclear weapons in a verifiable, irreversible and legally-binding manner. When conditions are ripe, other nuclear-weapon states will join the multilateral disarmament negotiation process, said Wang, noting that the maintenance of global peace and stability in the over 70 years after World War II cannot be separated from the above-mentioned consensus and non-proliferation system.

He emphasized that China never evades its international obligations for nuclear disarmament, and has always been a participant, supporter and

China never evades its international obligations for nuclear disarmament, and has always been a participant, supporter and defender of the existing international non-proliferation mechanisms and the post-war international system.

defender of the existing international non-proliferation mechanisms and the post-war international system. "We will never be absent from what we should do," said Wang. "But we will only participate in relevant processes on the basis of abiding by the internationally recognized consensus on nuclear disarmament." Wang dismissed Pompeo's insistence on dragging China into the trilateral negotiations as "wishful thinking," urging Washington to hold serious talks with Russia and stop looking for excuses for withdrawing from international treaties and organizations.

Source: http://www.china.org.cn/world/2020-08/16/content_76603917.htm, 16 August 2020.

USA–RUSSIA

US and Russia Still at Odds as Clock Ticks Away on Their Last Remaining Arms Control Treaty

After the latest round of nuclear disarmament talks on 18 August, the US and Russia remain at odds over several key issues, but open the door an inch towards a possibly temporary extension of the New START Treaty, which is set to expire in less than six months. "There are some areas of convergence, but we do remain far apart on a number of key issues," US Special Presidential Envoy for Arms Control, Marshall Billingslea, said...after two days of talks with his Russian counterpart, Deputy Foreign Minister Sergei Ryabkov.

The 2010 New START, the last remaining bilateral nuclear arms-control accord, which caps the number of deployed long-range nuclear warheads each country can have, is set to expire in February 2021, unless Washington and Moscow agree to roll it over. A first round of disarmament talks between the two powers had ended with no apparent breakthrough on a possible extension of the New START Treaty in late June. Both sides agreed to set up several joint working groups on 'strategic stability', for which they held additional

consultations in late July on space security, doctrines and potentials as well as transparency and verification.

China 'Obstacle' Solved? For more than a year, negotiations stalled over American insistence of China joining a future accord, a proposal repeatedly rejected by Beijing and frowned upon by Moscow. Russia, meanwhile, has said that if China is part of a new treaty, Britain and France should also be included. "But in view of non-readiness of the above-mentioned countries, the US and Russia should concentrate on the bilateral track," Russian negotiator Ryabkov said.

However, after the talks, Billingslea said a framework with Russia was the primary objective and "can include China in due course", effectively softening Washington's stance on the matter. "What we've said is that we view New START as deeply flawed and that it is not particularly in the

US interest to simply extend that treaty," Billingslea told reporters in a telephone briefing, saying Washington informed Moscow of its terms for extending the accord.

"We've got to address these unconstrained warheads

that exist outside of the treaty, and to which the Russian Federation is systematically adding more and more and more," he said. Those terms include addressing what Washington says is Moscow's build-up of shorter-range nuclear weapons that are not covered by the treaty, and making the verification system more robust. Modifications would also concern the exchange of telemetry information, data generated during missile flight tests, and to address how quickly inspectors could be sent to a site, and the frequency of inspections.

If Moscow would agree to comply with such steps, Billingslea said he would recommend US President Trump to consider a temporary extension of New START, possibly preceded by a meeting between President Trump and Russian President Putin. "The two Presidents, I presume, would like to get together," Billingslea told reporters. "We laid

For more than a year, negotiations stalled over American insistence of China joining a future accord, a proposal repeatedly rejected by Beijing and frowned upon by Moscow. Russia, meanwhile, has said that if China is part of a new treaty, Britain and France should also be included.

down what we need to see from the Russian Federation, and it is now a question of whether they are ready to walk down that path with us.”

According to Billingslea, such an outcome might be possible if the two leaders settled on a politically binding agreement that affirmed the main elements the Trump administration believes should be featured in a future nuclear weapons treaty. “Russia understands our position. And what remains to be seen is if there is the political will in Moscow to get this deal done. The ball is now in Russia’s court,” Billingslea said after the meeting with Ryabkov. Ryabkov demanded the extension of the treaty without any new conditions.

Moscow has repeatedly announced it is seeking to extent the accord, but insisted on its long-standing call for US missile defence to be limited. “Russia stands for an extension of the START Treaty, but is not ready to pay any price for that,” Ryabkov said after the talks, according to his ambassador to the UN in Vienna. A follow-up meeting has not yet been scheduled, but a potential new date was floated in two weeks’ time.

Election Factor: With less than 100 days to go until the US Presidential election, an agreement in principle would constitute a considerable win for Trump, who during his term came under fire from Democrats and parts of his Republican base for exiting several international landmark agreements.

In 2019, Washington withdrew from the 1987 Intermediate-range Nuclear Forces (INF) Treaty, which banned a whole class of medium-range ground-launched nuclear-capable missiles of 500 to 5,500 kilometres, with senior officials saying Moscow had deployed a cruise missile in violation of the INF pact. Russia denied the missile’s range puts it outside the accord.

The Trump administration’s latest move was to

pull the country out of yet another major global landmark accord in May, the 35-nation Open Skies Treaty, allowing unarmed surveillance flights over signatory states, due to Russian non-compliance. Former Vice-President and Democratic presidential nominee Joe Biden has called the New START treaty “an anchor of strategic stability” and said he will pursue the accord’s extension if elected president, which may factor in Moscow’s deliberations.

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Source: Alexandra Brzozowski, <https://www.euractiv.com/section/defence-and-security/news/us-and-russia-still-at-odds-as-clock-ticks-away-on-their-last-remaining-arms-control-treaty/>, 19 August 2020.

NUCLEAR DISARMAMENT

MALTA

Malta Signs Nuclear Arms Prohibition Treaty

Malta joined other member states of the UN to sign a treaty working towards a world free from nuclear weapons, becoming the 84th member state to do so. “The signature of this important treaty continues to underscore Malta’s unwavering commitment towards nuclear non-proliferation, and highlights its commitment towards achieving prosperity through peace,” a statement read.

The Treaty on the Prohibition of Nuclear Weapons prohibits, among others, the production, stockpiling, transfer, stationing and threat of use of nuclear weapons. It also prohibits the deployment of nuclear weapons on national territory and the provision of assistance to any state in the conduct of prohibited activities. Whilst other treaties exist banning a whole myriad of dangerous weapons, this particular treaty is the first of its kind by calling for a prohibition of nuclear weapons.

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Malta, through its Permanent Representative in New York, will be chairing an event organised by the UN to commemorate the International Day Against Nuclear Testing. "For Malta, the NPT and its three pillars of nuclear disarmament, nuclear non-proliferation and the peaceful uses of nuclear energy, remain the cornerstone of the multilateral nuclear disarmament and non-proliferation." The signing comes a few days after the commemoration of the 75th anniversary of the atomic bombings of Hiroshima and Nagasaki on the 6 and 9 August 1945.

Source: Karl Azzopardi, https://www.maltatoday.com.mt/news/national/104380/malta_signs_nuclear_arms_prohibition_treaty_#.X0W0Ey1h1o4, 25 August 2020.

NUCLEAR SAFETY

FINLAND

Benefits of Blockchain for Safeguards

Does blockchain offer new opportunities for safeguards of nuclear materials? A prototype developed for Stuk, Finland's nuclear regulator, lays a foundation for improving data integrity and provenance of nuclear materials. As more spent fuel is sent for final disposal, the importance of reliable safeguarding of nuclear materials increases. Using a distributed ledger technology ('blockchain'), information on nuclear materials could be maintained unchanged far into the future.

Earlier this year, Finland's Radiation and Nuclear Safety Authority (Stuk), the US-based Henry L Stimson Centre and the University of New South Wales in Australia outlined the opportunities presented by blockchain technology for keeping nuclear material records and for safeguarding of nuclear materials. "The purpose of the Slafka system, which is currently in the piloting phase, is to investigate whether blockchain is a solution to problems related to the long-term retention and processing of data in nuclear material records," says Stuk.

Pursuant to the NPT, the IAEA supervises states to ensure they have no unreported nuclear materials and that nuclear materials remain in peaceful use. This is assured through audits and

nuclear material records, which are verified through measurements. National authorities (including Stuk) and operators submit the required reports on the use of nuclear materials to the IAEA and the European Commission. "In the existing model, nuclear material records are based on electronic documents that involve common problems: version management, data correctness and information security call for special attention," says Elina Martikka, international cooperation manager at Stuk.

"With blockchain technology, register data could be available to the authorities correct and unchanged. This would also improve the efficiency of international nuclear material supervision processes," she adds. Final disposal of nuclear waste introduces new challenges in the safeguards sphere, Martikka notes.

Slafka is a pilot solution based on Stuk's current nuclear accounting database, Safka. It will test and demonstrate user interactions and development ideas in a DLT-based reporting system. The demonstration will introduce operators and Stuk to the technology without compromising real data and can be employed by Stuk for role-playing, strategy games and training.

Finland is an interesting pilot area for keeping nuclear material records based on blockchain technology, as Posiva is building a final disposal facility for spent nuclear fuel at Eurajoki near the Olkiluoto nuclear power plant. It is expected to be the first facility of its kind in the world.

In 2019, Posiva's final disposal project entered a new stage – implementation – when the Board of Directors took a decision to begin construction of the encapsulation plant and the underground repository for spent fuel. Work progressed to plan and the foundation stone of the encapsulation plant was laid in September 2019. The objective is to start safe final disposal in the repository, to be named Onkalo, in the mid-2020s, Janne Mokka, chief executive of Posiva says in the company's latest annual report, released in April. Spent fuel will be packed inside copper-steel canisters at the encapsulation plant before being transferred into the underground tunnels of the repository at a

depth of 400-450 metres, and placed in deposition holes lined with a bentonite buffer. ...

Source: <https://www.neimagazine.com/features/featurebenefits-of-blockchain-for-safeguards-8092756/>, 20 August 2020.

NUCLEAR WASTE MANAGEMENT

UK

Radioactive Waste Management's John Corderoy on Building the UK's Nuclear Waste Store

Decommissioning some of the UK's oldest nuclear power sites is one of the largest environmental restoration programmes in Europe. The Nuclear Decommissioning Authority (NDA) is tasked with delivering safe and sustainable solutions to the challenge of nuclear clean-up and waste management. One way to do this is to construct a geological disposal facility (GDF) to contain the UK's most radioactive waste in underground vaults and tunnels.

John Corderoy is responsible for delivering this new facility. This means identifying a suitable location and obtaining planning permission, as well as procuring the necessary civil engineering work.

Corderoy is programme director at the NDA's Radioactive Waste Management (RWM) subsidiary. He joined RWM in 2016, after 30 years in the Royal Navy and the Ministry of Defence, where he was involved with nuclear power for the Navy's submarines. The complexities of his naval career have undoubtedly provided a good foundation for him to deliver the GDF.

Storage Versus Disposal: Currently the country's higher activity radioactive waste is contained in surface stores at various sites, including

Sellafield, Magnox and Dounreay. Corderoy explains that these surface-based stores are relatively simple structures, built to contain the waste for at least 100 years. The challenge around the current storage set up is that each store requires its own permissions regime, including the relevant local authority's planning permission as well as independent regulatory approvals. In addition, each store is a relatively short-term and costly solution.

"If we carried on with just storage as a strategy, each future generation would be paying to rebuild stores and packages," explains Corderoy.

"This starts to draw in one of the main reasons for the GDF programme: there's a higher level issue of intergenerational equity and fairness. We're trying to develop a solution that will dispose of the waste and end that liability for future generations." So, while the UK's current storage policy requires active management of radioactive waste, the GDF would allow "passive" management. "Essentially,

with storage there is a requirement to look after the site," Corderoy says. "However, with disposal you build the facility, close it and remediate it. You then remove all of the surface facilities, then seal and close the site forever. "Over thousands of years, [the waste] decays away to harmless material, but it remains locked away for that period."

Engineering Expertise: Corderoy understands that design and construction of the GDF will require close engagement with the civil engineering sector and the wider supply chain. "Probably the greatest area of expertise will be in state-of-the-art underground engineering techniques, bringing in real innovation," he says. "Working in the underground environment is a pretty fast moving area, so I think that's the bit where we will look to the supply chain. "I also think there will be a

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growing role for the supply chain to support us with the overall integration of effort and risk management.”

Corderoy explains that a 1km² site would be ideal for the project, allowing all surface facilities like car parks and admin blocks to be grouped together. “However, it would be possible to develop a GDF with a much smaller surface site than that and, indeed, all of the elements of the surface site don’t need to be co-located on the same plot,” he says. “Unlike other infrastructure, we will build an initial capability for the GDF and then we can start to deposit the waste. “But there’s parallel construction activity that runs alongside this facility for potentially around 100 years. We will be constructing the initial capability and then, like a mine, it evolves underground over a very long period of time.”

The facility will be constructed at a depth of between 200m and 1,000m below surface level. Corderoy explains that the minimum depth of 200m will provide protection against potential changes to the surface level. “We have to think about cycles of glaciation and events that are not predicted to happen for maybe tens of thousands of years,” he says. Constructing the underground facility will require the excavation of around 10M.m³ of material. “Essentially, we’re excavating a series of tunnels and vaults that the radioactive material can then be placed into,” Corderoy says. “Then we backfill it to restore the sealing qualities of the geology.”

The GDF will feature a multi-barrier approach, including engineered barriers and natural barriers. Radioactive waste will be solidified into either a glass, resin or cement-type material, before it is placed in a protective canister. The canisters, typically made of copper, steel or iron, will then be overcoated with concrete. The containers will then be placed in the GDF’s vaults and tunnels and surrounded with a buffer material, which could

be bentonite, and backfilled with bedrock previously excavated from the site.

RWM’s current plans for the GDF would store all the legacy waste the UK has generated to date, and allow for waste from proposed new build power stations. “A broad estimate would be about 750,000m³ of packaged waste that we have to dispose of in a geological sense,” says Corderoy.

Site Considerations: As well as building the underground facility, the project will also involve the construction of vital links to surface infrastructure for utilities and services. “For example, we could need links to the road and rail infrastructure, and if it’s a coastal region we could need links to a port,” Corderoy explains.

While the location and geology of the GDF site remains uncertain, it is difficult for Corderoy to confidently provide an overall project cost. Initial estimates put whole life

cost of the GDF at around £12bn, but it is early days and as with any major infrastructure programme, this figure is likely to be adjusted as work progresses. And until a site has been confirmed, RWM is unable to move on to the detailed design phase of the project. “You can’t do that until you understand the detail of the rock that you’re going to be working in,” Corderoy says. “But with the current phase of community engagement, we’re hoping that we will have a number of communities in the process within the next year or two. “That will then help us narrow down a lot of these big parameters that, currently, are still open.

Source: Nadine Buddoo, <https://www.newcivilengineer.com/uncategorized/big-interview-radioactive-waste-managements-john-corderoy-on-building-the-uks-nuclear-waste-store-18-08-2020/>, 18 August 2020.

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USA

Extreme Chemistry of Nuclear Wastes

For more than 40 years, U.S. DOE sites such as Hanford and Savannah River produced plutonium for our nation’s national defense. These weapons production activities generated massive quantities of highly radioactive wastes that have been stored in large underground tanks for many decades.

As part of its clean-up priorities, DOE is working to process these wastes into waste forms for geologic disposal. At Hanford in Washington State, 177 underground tanks contain the wastes, and each is a complex mixture of liquids, solids, pastes, and radioactivity. DOE currently estimates that it will take several decades to transform those millions of gallons of waste into waste forms for safe disposal. Safely and effectively processing this material poses significant technical challenges and using currently available technologies for the decades-long clean-up will be quite expensive, to the tune of hundreds of billions of taxpayer’s dollars.

The scientific issues underlying waste processing are worthy of a DOE Energy Frontier Research Centre (EFRC), a program that draws together researchers from diverse backgrounds and institutions to tackle complex fundamental science challenges through tightly integrated, multidisciplinary collaborations.

Pacific Northwest National Laboratory (PNNL), along with six partner institutions, comprise the only EFRC that focuses on the staggering chemical complexity of these stored highly radioactive wastes. With continuing support from the DOE Office of Science—funded at \$14 million over four years—the Interfacial Dynamics in Radioactive Environments and Materials (IDREAM) EFRC led by PNNL aims to unravel the complex chemistry of the stored radioactive wastes. The IDREAM team focuses on understanding the behaviour of

metal ions dissolved in caustic solutions and precipitated as mineral solids that makes waste processing problematic.

Complex Chemistry Conundrum: DOE’s legacy waste at Hanford represents some of the most complicated chemistries and materials found on Earth. In the nation’s quest to produce plutonium for nuclear weapons, the waste was generated decades ago in massive quantities—dating back to World War II and the Manhattan Project. The metal-rich waste was stored in million-gallon tanks for future treatment and eventual disposal. Along the way it was treated with large quantities of sodium hydroxide to make the waste compatible with tank structural materials.

The highly alkaline and low-water tank waste environments create conditions where solubilities of solid phases are not well known. Since its launch in 2016, IDREAM research has centered around understanding the chemistry of metals such as aluminium, iron, and chromium that are common in nuclear waste.

Often referred to as “a witch’s brew,” not only are these wastes chemically complex, but they are also highly radioactive. The chemical composition varies from tank to tank, as well as within the layers of solids, sludges, and slurries in each tank. The brew has been aging in Hanford’s

tanks—most of them built between 1943 and 1964. The highly alkaline and low-water tank waste environments create conditions where solubilities of solid phases are not well known. Since its launch in 2016, IDREAM research has centered around understanding the chemistry of metals such as aluminium, iron, and chromium that are common in nuclear waste. The first four years resulted in a new understanding of aluminium solid phase transformations in highly-alkaline radioactive environments. The team also developed new, integrated experimental and computational approaches, along with novel experimental tools to safely simulate radioactive environments.

By better understanding fundamental chemical processes, IDREAM’s goal is to provide a new and robust knowledge base to support the design of large-scale waste processing treatments and provide a scientific basis to help accelerate the clean-up timeline.

A Foundation for New Knowledge: DOE's Basic Energy Sciences (BES) program currently stewards 41 active EFRCs nationwide, with each bringing together creative, multi-disciplinary, multi-institutional scientific teams to tackle the toughest scientific challenges preventing advances in energy technologies.

"IDREAM is revealing new insights into interfacial chemical phenomena in radiation environments, that will provide a technical basis for future waste processing alternatives," said Sue Clark, IDREAM Director and a Battelle Fellow at PNNL.

The interdisciplinary team is resolving knowledge gaps that have perplexed industrial aluminium process chemists for more than a century. The new knowledge of aluminium interfacial chemistry in alkaline, concentrated electrolytes, especially when interfacial radiolysis occurs, can provide a

foundation for innovation.

The IDREAM Team: With PNNL leadership by Clark and new Deputy Director Kevin Rosso, effective with the four-year renewal that launched August 1, the IDREAM institutional partners include Argonne National Laboratory, Oak Ridge National Laboratory, Georgia Institute of Technology, the University of Notre Dame, the University of Washington, and Washington State University. While BES is the sponsor and EFRC steward, IDREAM's science provides a technical foundation for innovation within the DOE Office of Environmental Management's clean-up missions at Hanford and at the Savannah River Site in South Carolina.

Source: Kelsey Adkisson, <https://www.newswise.com/articles/extreme-chemistry-of-nuclear-wastes>, 25 August 2020.



Centre for Air Power Studies

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

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