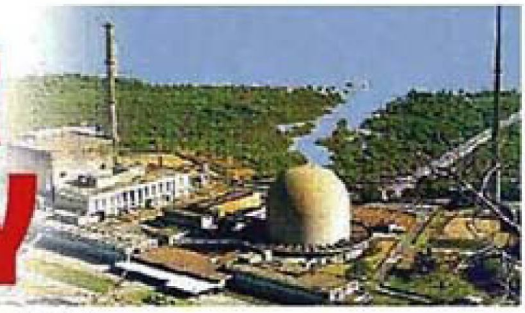
NUCLEAR SECURITY



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

Vol 16, No. 11, 01 APRIL 2022

STATEMENT – Rafael Mariano Grossi

IAEA Director General Statement on Situation in Ukraine

Ukraine informed the IAEA today that a nuclear research facility in the north-eastern city of Kharkiv had suffered additional damage when it came under renewed fire a few days ago, but its small amount of nuclear material remained intact, Director General Rafael Mariano Grossi said.

The facility, which has been hit by shelling previously during the conflict, has been used for research and development and radioisotope production for medical and industrial applications. Its nuclear material is subcritical – there can be no nuclear chain reaction – and the radioactive inventory is low.

Ukraine told the IAEA that the facility had come under fire again but that it was not yet possible to assess the damage. In today's update, Ukraine said the building, its thermal insulation and the experimental hall were damaged, but the neutron source, that contains nuclear material used to generate neutrons for research and isotope production, was not.

The facility had come under fire again but that it was not yet possible to assess the damage. In today's update, Ukraine said the building, its thermal insulation and the experimental hall were damaged, but the neutron source, that contains nuclear material used to generate neutrons for research and isotope production, was not.

Regarding the staffing situation at the Chornobyl NPP, Ukraine said there were no new developments from yesterday's update. The last rotation of technical personnel working at the site of the 1986 accident took place a week ago. Russian forces took control of the site on 24 February.

Out of the country's 15 operational reactors at four sites, the regulator said eight were continuing to operate, including two at the Russian-controlled Zaporizhzhya NPP, three at Rivne, one at Khmelnytskyy, and two at South Ukraine. The other reactors are shut down for regular maintenance, it added.

In relation to safeguards, the Agency said that the situation remained unchanged from that reported previously. The Agency was still not

CONTENTS

receiving remote data transmission from its monitoring systems installed at the Chornobyl NPP, but such data was being transferred to IAEA headquarters from the other NPPs in Ukraine.

In relation to safeguards, the Agency said that the situation remained unchanged from that reported previously. The Agency was still not receiving remote data transmission from its monitoring systems installed at the Chornobyl NPP, but such data was being transferred to IAEA headquarters from the other NPPs in Ukraine.

Source: https://www.iaea.org/newscenter/pressreleases/ update-35-iaea-director-general-statement-on-situation-in-ukraine?s=08#.YkJALoRT5uE.twitter, 28 March 2022.

STATEMENT – G-7

Statement of the G7 Non-Proliferation Directors Group on a Nuclear Safety and Security Framework for Ukraine

G7 leaders and ministers have condemned Russia's military aggression against Ukraine. Profoundly concerned, in this context, by Russian attacks at and in the direct vicinity of nuclear facilities in Ukraine, and condemning any acts compromising the safety of nuclear installations devoted to peaceful purposes. Mindful that the risk to civilians from damage to a nuclear site during armed conflict has the potential to increase dramatically and that the radiological risk to civilians and the environment from a nuclear accident go beyond the borders of any country,

G7 leaders and ministers have condemned Russia's military aggression against Ukraine. Profoundly concerned, in this context, by Russian attacks at and in the direct vicinity of nuclear facilities in Ukraine, and condemning any acts compromising the safety of nuclear installations devoted to peaceful purposes.

Welcoming the IAEA DG's efforts to establish a framework agreement on the safety and security of nuclear installations for peaceful purposes in Ukraine during the current armed conflict. The G-7 strongly endorses the following seven pillars outlined by DG Grossi:

1. The physical integrity of the nuclear facilities, whether it is reactors, fuel ponds, or radioactive waste storage and disposal sites, must be maintained;

2. All safety and security systems and equipment must be fully functional at all times;

3. Operating staff must be able to fulfil their respective safety and security duties, with appropriate staff rotation, and have the capacity to make safety and security-related decisions free of undue pressure;

4. There must be secure off-site power supply from the grid for all nuclear sites;

5. There must be uninterrupted logistical supply chains and transportation to and from the sites;

6. There must be effective on-site and off-site radiation monitoring systems and emergency preparedness and response measures; and

7. There must be reliable communications of the sites with the regulator, as appropriate;

We support the Director General's efforts to conclude an agreed framework for the safety and security of all nuclear installations in Ukraine as a matter of urgency, while respecting full Ukrainian sovereignty over its territory and infrastructure. Further, we urge all countries to make available to the IAEA all necessary resources and equipment to facilitate technical support to Ukraine and provide safety to individuals implementing the seven pillars in areas of armed conflict….

Source: https://www.diplomatie.gouv.fr/en/french-foreign-policy/security-disarmament-and-non-proliferation/news/2022/article/statement-of-the-g7-non-proliferation-directors-group-on-a-nuclear-safety-and, 15 March 2022.

OPINION – Ernest J. Moniz, Richard A. Meserve

What We Learned from Russia's Assaults on Nuclear Plants

Immediate disaster was averted during Russia's military assault on two Ukrainian nuclear facilities, but the events unfolding there have implications for nuclear safety and security both in Ukraine and around the world. Nuclear facilities are designed to ward off a wide range of threats by non-state terrorists, who are generally not capable of marshalling military forces and weapons on par with a nation. While such facilities should not be required to fight off an invading army, governments must now consider how to prepare for their safety and security in such a scenario.

In 2009, the IAEA, General Conference endorsed a statement prohibiting the "armed attack or threat of attack against nuclear installations, during operation or under construction." Additionally, Russia's attacks run contrary to the Geneva Convention, international humanitarian law, and even Russian military doctrine.

National governments and international institutions should begin by strengthening norms against attacks on civilian nuclear facilities. While Russia's invasion is the first full-scale war in a country with a large nuclear infrastructure, nations had envisioned this situation. In 1988, India and Pakistan agreed to a prohibition on "any action aimed at causing the destruction of, or damage to, any nuclear installation or facility in the other country." In 2009, the IAEA, General Conference endorsed a statement prohibiting the "armed attack or threat of attack against nuclear installations, during operation or under construction." Additionally, Russia's attacks run contrary to the Geneva Convention, international humanitarian law, and even Russian military doctrine. Governments should build on these norms and legal precedents and pursue further international agreements that nuclear facilities should be protected in war zones. The agreements should not only cover direct assault from an attacking army, but also incidental damage arising in war zones.

International institutions like the IAEA can also play a critical role in the safety and security of nuclear facilities in a war zone. Director General Rafael Grossi and his staff are working tirelessly to guarantee the safety of nuclear facilities and personnel in war-torn Ukraine and the IAEA is also serving as a crucial conduit for up-to-date information about the safety, security, and safeguards status of the Ukrainian nuclear facilities. Recognizing the IAEA's important roles, four members of Congress have urged President Biden to "take any available action to encourage the IAEA's involvement in monitoring the situation in Ukraine, identifying any necessary action that may be advisable, and recommending all necessary cautionary action required for the utmost safety."

It is important to recognize this is not the first crisis nuclear operators have had to face. Nor will it be the last. The COVID-19 pandemic, increasing risk of wildfires near nuclear facilities, and political instability around the world signal a future where nuclear operators will need to be resilient and adapt to crises.

Nuclear operators and regulators should develop plans to minimize the risk to a nuclear facility during a military crisis and train staff on how to execute those plans. The IAEA should consider preparing guidance on how to confront safety, security, and safeguards challenges at nuclear facilities in these situations. The guidance might include recommendations, for example, on when to shut down reactors, what additional supplies (food, water, fuel, lodging, etc.) might be needed, when additional redundant systems for power are needed, and when and if to distribute potassium iodide. Based on its experience in Ukraine, the IAEA might also consider developing a service to verify basic capabilities that should be in place for nuclear facilities in war zones.

Sadly, even as this tragedy continues to unfold, it is important to recognize this is not the first crisis nuclear operators have had to face. Nor will it be the last. The COVID-19 pandemic, increasing risk of wildfires near nuclear facilities, and political

instability around the world signal a future where nuclear operators will need to be resilient and adapt to crises. While the measures we propose may provide little solace to those currently working at nuclear facilities in Ukraine, they may help save lives in the future.

Source: Ernest J. Moniz served as U.S. Secretary of Energy and is Co-Chair and CEO of the Nuclear Threat Initiative. Richard A. Meserve is a former Chairman of the U.S. Nuclear Regulatory Commission. https://www.defenseone.com/ideas/2022/03/what-we-learned-russias-assaults-nuclear-plants/363487/, 23 March 2022.

OPINION – Minxin Pei

The Ukraine War Could Trigger a Nuclear-Arms Race in Asia

Russian President Putin's endgame in Ukraine remains unclear. But his war there does seem to be sending one clear message: if you have nukes, nobody messes with you. The security risks this poses cannot be overestimated. Just days after launching his invasion of Ukraine, Putin announced that he had placed Russia's nuclear forces on "high alert" – a clear warning to the West not to intervene militarily on Ukraine's behalf. And it seems to have worked. Despite Russia's relentless bombardment, including of civilian areas, the US has flatly refused Ukrainian President Zelensky's repeated requests for a NATO-enforced no-fly zone.

The reason is simple: The West fears the consequences of all-out war with a nuclear-armed power. While this is not unreasonable, it is likely to erode trust in America's nuclear umbrella, the effectiveness of which, as a 2020 study showed, was declining long before Russia began its war against Ukraine. The only way a country can credibly protect itself from attack by a nuclear power, it now seems clear, is to maintain nuclear weapons of its own.

The West fears the consequences of all-out war with a nuclear-armed power. While this is not unreasonable, it is likely to erode trust in America's nuclear umbrella, the effectiveness of which, as a 2020 study showed, was declining long before Russia began its war against Ukraine. The only way a country can credibly protect itself from attack by a nuclear power, it now seems clear, is to maintain nuclear weapons of its own.

For Ukraine, this is particularly frustrating. In 1994, after the end of the Cold War, the country surrendered its nuclear arsenal – then the world's third largest – in exchange for security assurances that turned out to be meaningless. Not surprisingly, some officials have indicated that they regret disarmament. Likewise, the Ukraine war has vindicated those countries that were already pursuing nuclear weapons, and they have redoubled their commitment to doing so. In recent weeks, North Korean dictator Kim has conducted several high-profile missile tests, including a failed test of a new ICBM.

But the nuclear power to watch in Asia is China. Since it tested its first nuclear device in 1964, China has adhered to a doctrine of minimum deterrence – essentially, maintaining just enough nuclear weapons to be able to retaliate against a nuclear attack. That is about 350 warheads today, compared to America's 5,550 and Russia's 6,000. So, while China has long possessed a nuclear deterrent, it has avoided wasting hundreds of billions of dollars building a large arsenal – an effort that probably would have triggered a regional nuclear-arms race. There are of course limits to this approach. In a conflict with another nuclear power, China could be neutralized with a pre-emptive strike and missile defense. But a war between nuclear-armed powers seemed so unlikely that maintaining minimum deterrence seemed like a good bet.

Last December, the US DoD estimated that China was seeking to double its nuclear stockpile by 2027 and amass 1,000 warheads by 2030. Following the Ukraine war, China will surely strengthen these efforts. It certainly has the resources for a massive arms buildup.

The deepening cold war with the US changed China's strategic calculations. Last December, the US DoD estimated that China was seeking to

double its nuclear stockpile by 2027 and amass 1,000 warheads by 2030. Following the Ukraine war, China will surely strengthen these efforts. It certainly has the resources for a massive arms buildup. And, with Putin issuing nuclear threats and tensions over Taiwan intensifying, the strategic imperative is stronger than ever. But the nuclear buildup will not stop with China. Several of Asia's key players are now set to be dragged into a costly and dangerous arms race that will make the entire region less secure. India, China's regional rival, will seek to expand its own arsenal, prompting India's nuclear-armed nemesis, Pakistan, to do the same.

Taiwan might decide to acquire nuclear weapons as insurance against a Chinese invasion. But this would almost certainly precipitate just such an invasion. The resulting conflict, which could well involve the US, could quickly escalate into a nuclear war.

This would place East Asia's non-nuclear states, such as Japan and South Korea, in a quandary. Already, former Japanese PM Abe has called for Japan to consider hosting American nuclear weapons. Though the current PM, Kishida, quickly rejected the idea, the proposal represents a major shift in a country that has abided by the principles of nuclear non-proliferation since World War II.

If an Asian nuclear-arms race takes hold, countries' willingness to challenge taboos will only increase. In both Japan and South Korea, nuclear weapons will become the most divisive domestic political issue, with national-security hawks advocating their development, even if doing so jeopardizes relations with the US, which views nuclear proliferation as an existential threat.

Finally, Taiwan might decide to acquire nuclear weapons as insurance against a Chinese invasion. But this would almost certainly precipitate just such an invasion. The resulting conflict, which could well involve the US, could quickly escalate into a nuclear war.

The world has long depended on the principle of MAD to prevent nuclear war. But, even if MAD deters countries from launching premeditated wars, it cannot protect against accidents or miscalculations. The more nuclear weapons the world has, and the more fearful countries are that their adversaries will launch pre-emptive strikes, the more acute the risks become.

By bolstering the case for more nuclear weapons in Asia, Putin's war in Ukraine could decimate what little is left of the region's strategic stability. This not only poses an existential threat to Asia; it would also deliver yet another blow to the global non-proliferation regime, making it even harder to prevent the spread of such weapons in other regions.

Source: https://www.project-syndicate.org/commentary/russia-war-in-ukraine-could-trigger-nuclear-arms-race-in-asia-by-minxin-pei-2022-03, 22 March 2022.

OPINION – Sarah Bidgood

Would Vladimir Putin Use Tactical Nuclear Weapons in Ukraine?

If Putin's objective is the occupation of at least some parts of Ukraine, it is hard to see how the use of a nuclear weapon on the country serves his interests. The prospect for a limited nuclear strike against the US or Nato seems, relatively, greater. Indeed, Putin has promised that anyone who stands in his way will face consequences "such as you have never seen in your entire history".

With Putin engaged in ominous nuclear sabre rattling since the eve of his unprovoked invasion of Ukraine, a vigorous debate has been raging among nuclear experts over whether and when he might make good on his threats. Some argue that the Russian president may consider using tactical, or nonstrategic, nuclear weapons — which are smaller and can be used over shorter distances — to overcome a difficult combat situation or to bring the conflict to an end on terms he considers favourable. Others see potential for him to launch a limited nuclear strike against the US or a Nato country if they intervene militarily on Kyiv's behalf.

Although most experts agree that the overall risk of nuclear weapons being used in this conflict remains low, one of these scenarios appears more

likely than the other. If Putin's objective is the occupation of at least some parts of Ukraine, it is hard to see how the use of a nuclear weapon on the country serves his interests. The prospect for a limited nuclear strike against the US or Nato seems, relatively, greater. Indeed, Putin has promised that anyone who stands in his way will face consequences "such as you have never seen in your entire history".

It is, therefore, essential to understand the precise red lines the West would need to cross to elicit a nuclear response from Moscow. With few concrete answers available, some analysts have looked to the documents that lay out the circumstances under which Russia says it would or could use nuclear weapons (known as a country's declaratory policy) for clues. Moscow's military doctrine states that Russia "shall reserve the right to use nuclear weapons in response to the use of nuclear and other types of weapons of mass destruction against it and/or its allies". It also indicates that a nuclear strike could follow "in the event of aggression against the Russian Federation with the use of conventional weapons when the very existence of the state is in jeopardy".

Moscow's military doctrine states that Russia "shall reserve the right to use nuclear weapons in response to the use of nuclear and other types of weapons of mass destruction against it and/or its allies". It also indicates that a nuclear strike could follow "in the event of aggression against the Russian Federation with the use of conventional weapons when the very existence of the state is in jeopardy".

A 2020 presidential decree on the "Foundations of State Policy of the Russian Federation in the Area of Nuclear Deterrence" further indicates that Moscow could use nuclear weapons in response to "reliable data on a launch of ballistic missiles attacking the territory of Russia and/or its allies" or following "the use of nuclear weapons against Russia and/or its allies". The decree says that Russia could also bring its vast nuclear arsenal to bear after an attack by an adversary "against critical government or military sites of the Russian Federation, disruption of which would undermine nuclear forces response actions".

On the basis of these documents, some observers are fairly confident that Putin's menacing rhetoric is unlikely to turn into action. They view him as a rational actor and argue that using nuclear weapons against the West absent an existential threat to Russia would go against its doctrine. Yet this interpretation ignores the fact that these statements refer to a different set of circumstances — namely an attack against Russian territory, rather than preventing outside parties from intervening while it invades another country. Given that Putin's war on Ukraine falls outside this scope, the nuclear policies are neither especially helpful nor reassuring in this case.

It is more valuable to look at the composition of Russia's forces overall and the role envisaged for tactical nuclear weapons during a war. Although its conventional capabilities have improved significantly over the last decade, Moscow still relies on its nuclear weapons for flexibility in managing the risk of escalation. Kristin Ven Bruusgaard, a postdoctoral fellow at the University of Oslo who studies Russian nuclear strategy, writes: "The fact that Russia retains a broad range of nonstrategic nuclear capabilities indicates that military and civilian leaders believe such weapons could influence the course of conflict or help terminate it." However, these weapons would only come into play "when Russia had exhausted

The fact that Russia retains a broad range of nonstrategic nuclear capabilities indicates that military and civilian leaders believe such weapons could influence the course of conflict or help terminate it." However, these weapons would only come into play "when Russia had exhausted available conventional escalation tools and was unwilling to back down in the face of existential threat".

available conventional escalation tools and was unwilling to back down in the face of existential threat" ....

Without knowing where Putin's red lines are in this conflict, Western policymakers cannot know how to avoid crossing them. Faced with such perilous ambiguity, the US has so far sought to avoid actions that could give Russia a pretext to escalate the conflict. Joe Biden has consistently rejected requests for direct US military intervention in Ukraine, including a no-fly zone, for instance, which he has claimed could lead to "World War Three".

Given the stakes and the rapidly deteriorating relations between Russia and the West, it is vital that policymakers and defence officials on both sides make every effort to communicate with one another in a deliberate and transparent fashion. This will be particularly important as the fighting comes closer to the borders of Nato members such as Poland.

Even if the US president maintains his current, prudent course there can be no guarantee that Russia won't launch a limited nuclear strike anyway. Indeed, as the Stanford University political scientist Sagan has cautioned, Putin's personalist leadership style means that "external actions" will do little to prevent him from engaging in "reckless nuclear behaviour". The Russian leader has issued apocalyptic pronouncements in recent years, including about being martyred in a nuclear war. As he is fond of repeating, "even death is beautiful when you are among your people".

China's "carrier killers," the DF-21 ballistic MaRV and the newer DF-17 hypersonic glide vehicle, can reach Taipei and the Taiwan Strait in about twenty minutes from those island bases, while their "Guam killer," the DF-26 ballistic MaRV, can reach Guam in under 25 minutes from the Chinese mainland.

Given the stakes and the rapidly deteriorating relations between Russia and the West, it is vital that policymakers and defence officials on both sides make every effort to communicate with one another in a deliberate and transparent fashion. This will be particularly important as the fighting comes closer to the borders of Nato members such as Poland. While Putin may be confident in his ability to control the course of this conflict through veiled threats and signals, this is a dangerous fantasy. Such an approach could have deadly consequences for everyone.

Source: https://www.newstatesman.com/security/2022/03/would-vladimir-putin-use-tactical-nuclear-weapons-in-ukraine? 24 March 2022.

OPINION – Lisa J. Porter, Michael D. Griffin

Rethinking the Hypersonic Debate for Relevancy in the Pacific

While the Russian invasion of Ukraine is currently occupying a significant amount of our attention, we must not lose sight of the escalating threat posed by the increasingly emboldened CCP. While we won't recount here the long list of threatening, bullying behavior displayed by the CCP toward its neighbors in the Western Pacific, or the various publicly antagonistic declarations by President Xi toward the US and our Western values, such words and actions indisputably establish that Chinese leadership harbors menacing ambitions toward the US and our friends and allies, especially in the Western Pacific.

Given this concern, a sobering fact is that the ranges of interest in a Western Pacific conflict are substantially more demanding than what we faced in Europe during the Cold War. The distance from Berlin to St. Petersburg is about 825 miles, and to Moscow is approximately 1000 miles. In contrast, Taipei and the Taiwan Strait are more than 1,700 miles from Andersen AFB on Guam, while the 20 artificial islands in the Paracel's and the seven in the Spratlys that have been built and fortified by the CCP since 2013 are over 2000 miles from Guam. China's "carrier killers," the DF-21 ballistic MaRV and the newer DF-17 hypersonic glide vehicle, can reach Taipei and the Taiwan Strait in about twenty

minutes from those island bases, while their "Guam killer," the DF-26 ballistic MaRV, can reach Guam in under 25 minutes from the Chinese mainland.

Our own conventional strike options are currently far more limited. None of the deployed variants of Tomahawk have a range of more than 1,500 miles, and at that range require about three hours to reach the target. The new Maritime Strike Tomahawk will provide an effective range of about 1,700 miles when launched from an F-35C at its combat radius, with similar timelines. Something more is required. The US will never initiate a conflict in the Western Pacific, but if the CCP does we must be able to respond far more promptly and with higher confidence than we can today.

The INF Treaty had the effect of drawing a bright red line between "ballistic" and "hypersonic" missiles for US conventional strike strategy, because it permitted the development of missiles that flew substantially within the atmosphere. This exemption allowed the US to pursue the development of the Navy's CPS weapon and the Army's LRHW.

What, then, should the US do to ensure that it can project timely conventional power over ranges relevant to the Western Pacific theater? To answer this question, we need to take into account some important historical context. From 1987 to 2019, the US was bound by the INF Treaty, which prohibited the development and deployment of land-based ballistic missiles having ranges between 500-5,500 km. While the treaty was with the then-Soviet Union and China was never a party to it, the US observed the treaty on a global basis, destroying the last of our 276 Pershing II ballistic/MaRV intermediate-range missiles by 1991.

Importantly, the INF Treaty had the effect of drawing a bright red line between "ballistic" and "hypersonic" missiles for US conventional strike strategy, because it permitted the development of missiles that flew substantially within the atmosphere. This exemption allowed the US to pursue the development of the Navy's CPS weapon and the Army's LRHW. While deployed from different launch platforms, these systems employ a Common Hypersonic Glide Body (CHGB), a common two-stage rocket booster, and have a demonstrated range of at least 1725 miles in tests.

In 2019, following years of Russian INF Treaty violations, the US withdrew from the treaty, but — critically — we did not then undertake a comprehensive review of what our conventional strike portfolio could and should be going forward. Instead, we continued to embrace a false choice between "ballistic" and "hypersonic" weapons, a narrative that persists today, where we find ourselves locked up in debates about whether ballistic missiles are superior to hypersonic missiles, how many hypersonic missiles we can afford, whether recent test failures should deter us from further development of hypersonic missiles, and so on. Such debates distract us from where we need to focus.

ny prompt long-range strike asset will necessarily be "hypersonic"; i.e., flying at Mach 5 or above. The terminology of the INF era, where we distinguished between "ballistic" missiles with largely exoatmospheric trajectories and "hypersonic" missiles flying substantially within the atmosphere, is now irrelevant.

Any prompt long-range strike asset will necessarily be "hypersonic"; i.e., flying at Mach 5 or above. The terminology of the INF era, where we distinguished between "ballistic" missiles with largely exoatmospheric trajectories and "hypersonic" missiles flying substantially within the atmosphere, is now irrelevant. Regardless of the specific trajectory, all long-range prompt strike missiles appropriate for the Western Pacific theater will need to fly at Mach 17 or more, will need to deal with atmospheric reentry, should be able to employ MaRV, and will be capable of extreme accuracy. We therefore think that the best way for the US to project timely conventional power in the Western Pacific theater is to invest in a long-range prompt strike portfolio consisting of a mix of weapons from ballistic, to

ballistic with MaRV, to highly maneuverable hypersonic glide vehicles....

Because any intermediate range conventional strike weapon could also carry a nuclear weapon (as several in the Chinese arsenal are designed to do), there is ambiguity about what an adversary might infer about its payload. How we address this ambiguity is ultimately a policy decision; our intent is to re-imagine the potential solutions available for conventional strike in the absence of the INF constraint.

The best way for the US to project timely conventional power in the Western Pacific theater is to invest in a long-range prompt strike portfolio consisting of a mix of weapons from ballistic, to ballistic with MaRV, to highly maneuverable hypersonic glide vehicles....

Whatever we do, we must not let past strategies developed under different conditions for different adversaries and geographies constrain our approach to the Western Pacific theater. We contend that a flexible, robust, resilient conventional strike portfolio that can be affordably scaled to compelling numbers will be an effective deterrent against CCP aggression in the Western Pacific. Updated versions of the same old weapons platforms (e.g., carriers, tanks, bombers, and fighters) will not.

Source: https://breakingdefense.com/2022/03/rethinking-the-hypersonic-debate-for-relevancy-in-the-pacific/, 23 March 2022.

OPINION – Andrew Futter

The Global South: Access to Nuclear Technologies and the Ban Treaty

Conventional wisdom holds that the TPNW (the "ban treaty") is about reinvigorating the push for nuclear disarmament and seeking justice for those adversely impacted by nuclear testing. Yet, there is hardly any indication from the nine current nuclear-armed states that they are serious about nuclear disarmament, and the countries responsible for nuclear weapons tests have failed to offer assistance or compensation to the victims. But by focussing only on frustrations about disarmament and nuclear testing, and by implications a very "Western" view of nuclear politics, both supporters and detractors have overlooked other national interests in states' decisions to sign the ban treaty, especially the interests of states from the global south.

Most conspicuously absent is the issue of access to civilian nuclear technology for domestic energy, scientific research and broader economic development. While much attention has been given to the fact that interest in nuclear energy appears to be waning in parts of Europe (Belgium, Germany, Switzerland) and Japan, as developed societies seek to transition to renewable sources of energy, far less attention has been given to the growing interest in nuclear technology by states in the global south as solutions are sought for "green," "clean," and "sustainable" energy. Indeed, we are already seeing an increased rate of IAEA Integrated Nuclear Infrastructure Reviews (INIR) requested by ban treaty signatories. This is significant for a number of reasons, but not least because it is intrinsically linked with decisions to sign the ban treaty.

The link between nuclear disarmament and access to nuclear energy is of course not new. But over the years the focus of the global nuclear order and its central institutions have come to be characterised much more by the "perpetual menace" of nuclear weapons and nuclear use than "perpetual promise" offered by nuclear technology for development and human emancipation.

The link between nuclear disarmament and access to nuclear energy is of course not new. But over the years the focus of the global nuclear order and its central institutions have come to be characterised much more by the "perpetual menace" of nuclear weapons and nuclear use than "perpetual promise" offered by nuclear

technology for development and human emancipation. Thus, while Article IV of the 1968 NPT enshrines the right of signatories to access nuclear technology, there is a feeling that it has always been subservient to the disarmament and non-proliferation functions of the treaty. Equally, while many developed countries have benefitted enormously from nuclear technology in past, there is a perception that these benefits – in terms of energy production and research – have not been shared with the developing world. This has not gone unnoticed by developing states, particularly the NAM.

NAM is of the firm belief that non-proliferation policies should not undermine the inalienable right of States to acquire, have access to, import or export nuclear material, equipment and technology for peaceful purposes.

For example, in October 2016, Ambassador Krisnamurthi of Indonesia delivered a statement on behalf of the NAM at the UN. In this statement the NAM remained unambiguous and vocal stating that: "NAM is of the firm belief that non-proliferation policies should not undermine the inalienable right of States to acquire, have access to, import or export nuclear material, equipment and technology for peaceful purposes." And this was not a one-off event. As a matter of fact, the NAM have consistently complained about barriers to nuclear technology transfer. Iterations of the above statement have been issued in the 2017 NPT preparatory committee, in the 2019 NAM summit meeting, in the UNGA of 2019, and these are just the most recent statements. (For context, 66 out of the 86 nuclear ban signatories are members of the NAM).

Consequently, and while the nuclear ban treaty reflects a commitment to work towards nuclear disarmament in global politics, for many signatories nuclear disarmament is not an end in itself. The ban treaty in many ways is a continuation of NPT politics, and this includes the continuation of developmental politics highlighted here.

The ban treaty concerns nuclear weapons rather than nuclear energy, but interestingly its preamble acknowledges unambiguously the importance of peaceful uses of nuclear technology as well: "*Nothing in this Treaty shall be interpreted as affecting the inalienable right of its States Parties to develop research, production and use of nuclear energy for peaceful purposes without discrimination*." This language was essential to ensure the support of the majority of states – particularly developing states. These developing states in turn, ensured that the language of the treaty reflected their developmental interests in the pursuit of nuclear energy.

This is not to say that all supporters of the ban treaty also support the use and spread of nuclear energy. Ambassador Launsky indicated Austria's opposition to viewing nuclear energy as a sustainable means of development in his country's most recent statement at the IAEA's general conference last year. Civil society organisations such as the UK based Campaign for Nuclear Disarmament (CND) have also launched campaigns against nuclear energy, and issued a petition calling on the UK government to end all nuclear energy production immediately. Yet, without taking the desire for nuclear energy into account, it is unlikely that the 66 NAM signatories would have supported the treaty.

Consequently, and while the nuclear ban treaty reflects a commitment to work towards nuclear disarmament in global politics, for many signatories nuclear disarmament is not an end in itself. The ban treaty in many ways is a continuation of NPT politics, and this includes the continuation of developmental politics highlighted here. Developing states in particular could not pass on the opportunity to *also* highlight the failure of countries with nuclear technology to share nuclear energy research and infrastructure with non-industrial countries. These developing countries already shun militarised uses

while still hoping to exploit peaceful uses of nuclear technologies. After all, in the developing world, 83 percent of states are already parties to nuclear-weapon-free zones.

In addition, the ban treaty does not warrant its signatories to negotiate *additional* safeguards or commit them to intrusive inspections on their current or future nuclear facilities. This was an issue which was likely to sow division between developed and developing states during the ban treaty's negotiation. But it was clear that many signatories from the global south may not have supported the treaty had it limited their access to nuclear technology, and the 'lower' safeguard standard was accepted.

It is essential to avoid an overly Western nuclear-ethnocentrism when analysing global nuclear politics and give equal attention to voices outside of the US-led nuclear order. The reasons why so many states signed the ban treaty is just one example of how looking properly at the "global south" can help us better understand nuclear politics.

So, what does this mean going forward? First, it is essential to avoid an overly Western nuclear-ethnocentrism when analysing global nuclear politics and give equal attention to voices outside of the US-led nuclear order. The reasons why so many states signed the ban treaty is just one example of how looking properly at the "global south" can help us better understand nuclear politics. Many signatories from the global south realize that nuclear disarmament is a far-off goal and that nuclear-armed states may never sign the ban treaty. Still, they joined for other reasons.

Second, numerous ban treaty signatories will link ongoing nuclear weapons states' willingness to share nuclear expertise and material with their perceived progress on nuclear disarmament. In this regard, the nuclear ban treaty serves as additional leverage for developing states to amplify pressure for nuclear technologies. Understanding the ban treaty in this light may be the necessary motivation for many states (particularly the many in Africa whom have signed but not ratified) to join the treaty. It has been well established that many states join treaties primarily because of economic and developmental interests, and the ban treaty seems to demonstrate this finding

The nuclear ban treaty serves as additional leverage for developing states to amplify pressure for nuclear technologies. Understanding the ban treaty in this light may be the necessary motivation for many states (particularly the many in Africa whom have signed but not ratified) to join the treaty.

Third, the grievances that motivated the emergence of the nuclear ban treaty are multifaceted. They include the lack of progress on nuclear disarmament, the lack of accountability for nuclear weapons testing, and the failure to live up to promises enshrined in article IV of the NPT. More importantly, the fact that the ban treaty accommodates all these varying interests, shows that the accrued grievances in the nuclear order can eventually lead to resistance that manifests in interesting and surprising ways.

Source: https://basicint.org/the-global-south-access-to-nuclear-technologies-and-the-ban-treaty/, 21 March 2022.

NUCLEAR STRATEGY

FRANCE

France Raises its Alert Level and Deploys Three Nuclear Submarines at Sea

This is probably the result or simply the response to the maximum alerting of Russian nuclear forces, announced by the Kremlin almost the day after the outbreak of its war in Ukraine. France in particular, the only European nuclear power with Great Britain, has also just raised its nuclear alert level: three of the four SSBNs available to the French Navy are now at sea. Of course, no one will confirm or deny this deployment: the French Navy and the Armed Forces in general never communicate, in any way, as to the movements of special forces as strategic forces, those on

which French deterrence is based.

Discretion: No wonder: The essence of the strategy of this deterrence is indeed based on discretion. The adversary must be certain that, whatever the moment, France has the means to respond to an attack with a counter-attack, nuclear and devastating, from anywhere, the SSBNs having the ability to blend into the ocean floor for months. As for the movements of these nuclear submarines launching devices, it is therefore generally the local press, and in this case the daily Le Télégramme, which chronicle their movements. In Brest, the Telegram announced the departure on patrol of a second SSBN on March 1, just after the alert of the Russian nuclear forces, a first in a long time.

The essence of the strategy of this deterrence is indeed based on discretion. The adversary must be certain that, whatever the moment, France has the means to respond to an attack with a counter-attack, nuclear and devastating, from anywhere, the SSBNs having the ability to blend into the ocean floor for months.

With its 16 ballistic missiles with a range of 8 to 10,000 km each equipped with six 100 kiloton nuclear warheads, each French nuclear submarine launcher can therefore normally fulfill the main mission of deterrence on its own. The French strike force is able to deter any aggressor from attacking the national territory, unless they want to suffer a devastating response.

Unprecedented Situation in Recent Years: Normally, out of the four French SSBNs there is always at least one at sea, and one in fairing. Each ship is armed by two crews, which makes it possible to multiply patrols and missions. It is probably to avoid leaving more than one SSBN at the dock, that a third departure on patrol was decided in recent weeks…. The combined theoretical firepower of these three SSBNs, each armed with 16 missiles carrying six warheads, is the equivalent of nearly 2,000 times the Hiroshima bomb.

Source: https://www.franceinter.fr/monde/la-france-renforce-son-niveau-d-alerte-et-deploie-trois-sous-marins-nucleaires-en-mer, 23 March 2022.

GERMANY

Germany to Buy F-35 Warplanes for Nuclear Deterrence

Germany will buy up to 35 copies of the U.S.-made F-35 fighter jet, reversing years-long plans that saw the fifth-generation warplane eliminated from consideration, defense leaders announced on 14 March. The planes will take over by 2030 the niche, but crucial, nuclear-weapons mission from the aging fleet of Tornado aircraft, Defense Minister Lambrecht said... The decision means Germany will continue to provide suitable aircraft for carrying U.S. nuclear weapons stored in the country into a hypothetical atomic battle, as prescribed under NATO doctrine. Previously, officials were planning to buy new versions of the the F-18 for that role plus the job of electronic attack and suppressing enemy air defenses.

The decision in favor of the F-35 comes in the context of Germany's defense strategy adjustment following Russia's assault on Ukraine. Berlin's new spending and modernization plans prize off-the-shelf systems that can quickly plug readiness holes in the armed forces.

The Tornado-replacement decision, talk of which has amounted to a parlor game in Berlin policy circles for more than a decade, removes the Super Hornet from the table altogether, instead positioning a modernized Eurofighter aircraft as the weapon of choice for electronic combat. That line of thinking is sure to please manufacturer Airbus, which had all along proposed its plane as a kind of sandbox platform leading to the French-German-Spanish Future Combat Air System by 2040.

The decision in favor of the F-35 comes in the context of Germany's defense strategy adjustment following Russia's assault on Ukraine. Berlin's new spending and modernization plans prize off-the-shelf systems that can quickly plug

readiness holes in the armed forces. "There is only one response to Russian President Putin's aggression: unity within NATO and a credible deterrent," Gerhartz said. "That's why there is no alternative to the decision in favor of the F-35." Meanwhile, Germany remains committed to the FCAS program.... Lambrecht said she had told her French counterpart, Parly, about the F-35 decision during at March 9 visit to Evreux Air Base in northern France, where the two countries are operating a joint air-transportation unit built around C-130J aircraft.... The FCAS program is at a critical juncture, as key contractors Dassault and Airbus Defence and Space are unable to reach an agreement covering workshare and intellectual property rights for the futuristic program's central fighter jet....

Source: https://www. defensenews.com/global/europe/2022/03/14/germany-to-buy-f-35-warplanes-for-nuclear-deterrence/, 15 March 2022.

INDIA

India Successfully Test-Fires BrahMos Supersonic Cruise Missile from Andaman & Nicobar

In what can be termed as yet another significant achievement, India successfully test-fired the BrahMos surface to surface supersonic cruise missile in Andaman & Nicobar Islands on March 23.... Defense Ministry officials informed that the extended range missile was successful in striking its target with pinpoint accuracy. Following the achievement, Air Chief Marshal Chaudhari, who is currently in the Island territory to review operational preparedness expressed his elation on the successful test-firing.

India is aiming to develop a new air-launched version of the supersonic cruise missile in order to further expand its capabilities to destroy the enemy up to a range of 800 kilometres.

The aforementioned test is the newest since the "Inadvertent firing of Missile" by India which transpired on March 9. Besides, this also is an addition to a series of BrahMos tests that the Indian military has been conducting from the Andaman Islands.... India is aiming to develop a new air-launched version of the supersonic cruise missile in order to further expand its capabilities to destroy the enemy up to a range of 800 kilometres. On March 5, the Indian Navy had tested the advanced version of the BrahMos missile from INS Chennai.

The air-launched variant of the indigenous cruise missile developed in collaboration with Russia initially had a range of 300 kilometres when it was tested in 2017 using a Su-30MKI combat aircraft. The BrahMos is also boosting India's defense exports as the Phillippines recently procured the supersonic weapons in a deal worth $375 million. ...

Source: https://www.republicworld.com/india-news/general-news/india-successfully-test-fires-brahmos-supersonic-cruise-missile-from-andaman-and-nicobar-articleshow.html, 23 March 2022.

PAKISTAN

In a First, Pakistan Showcases Nuclear Capable Howitzer

Pakistan's military showcased multi-dimensional capabilities and highlighted key inductions, including the Chinese-made SH-15 self-propelled howitzer, during the Pakistan Day parade... The modern artillery is fully capable to hit at a greater distance and is mounted on 6x6 Shaanxi truck chassis with an armoured cabin at the front and one 155 mm gun-howitzer mounted at the rear of the vehicle.... SH-15 is said to be a supreme 'shoot and scoot' artillery weapon for the use of nuclear shells... Pakistan Army acquired the wheeled self-propelled howitzer amid a major programme to modernise its artillery forces, as it is lighter than a tracked howitzer and can be more easily deployed in the

SH-15 is said to be a supreme 'shoot and scoot' artillery weapon for the use of nuclear shells... Pakistan Army acquired the wheeled self-propelled howitzer amid a major programme to modernise its artillery forces, as it is lighter than a tracked howitzer and can be more easily deployed in the mountainous region.

mountainous region.

The weapon system has a maximum firing range of 20 km with standard ammunition and 53 km with a rocket-assisted artillery projectile. Pakistani armed forces have nearly 500 tracked self-propelled howitzers including 200 American-made M109A2, 115 M109A5, 123 M109L, and 203mm 60 M110/M110A2 mounted on tracked chassis. "Analysts say this cutting-edge weapon system was delivered by Beijing to Pakistan as part of Sino-Pak strategy to counter Indian K-9 Vajra howitzers"... Besides the Chinese state-of-the-art howitzer, the Pakistan Day parade also featured a fly-past by newly inducted Chinese Chengdu J-10 (J-10C) fighter jets for the first time.

Source: https://www. indiatvnews.com/news/world/pakistan-day-parade-nuclear-capable-howitzer-showcased-first-time-2022-03-24-765774, 24 March 2022.

RUSSIA

Russia Refuses to Rule Out Nuclear Weapons in Face of 'Existential Threat'

Nuclear weapons are not off limits, said a leading voice from the Kremlin as Russia continues to wage its war in Ukraine. Peskov, the chief spokesman of President Putin, said on 22 March that an "existential threat" to Russia is what would make it consider the most extreme form of escalation. When pressed to explain under what conditions Russia would use its nuclear capability... he replied, "If it is an existential threat for our country, then it can be."

Putin already placed his nuclear deterrent forces on a higher alert status on 27 February. He said at the time that these forces will undergo a "special regime of combat duty" and that the decision was driven by economic sanctions and "aggressive statements" made by NATO countries. Ukrainian President Zelensky said...on March 10 that he thinks "the threat of nuclear war is a bluff" and that the use of nuclear weapons means "the end for all sides, not just for the person using them."

Peskov, the chief spokesman of President Putin, said on 22 March that an "existential threat" to Russia is what would make it consider the most extreme form of escalation. When pressed to explain under what conditions Russia would use its nuclear capability... he replied, "If it is an existential threat for our country, then it can be."

Peskov claimed Russia's so-called special military operation in Ukraine was "going on strictly in accordance with the plans and the purposes that were established beforehand." However, his statement contradicts Western intelligence assessing that four week into the invasion, Russia's progress has been slower than it expected in the face of strong Ukrainian resistance. Secretary of Defense Austin said on 19 March that Russia's military has not performed up to expectations and that its forces have "struggled with logistics."

Source: https://www.washingtonexaminer.com/policy/defense-national-security/russia-refuses-to-rule-out-nuclear-weapons-in-face-of-existential-threat, 22 March 2022.

The decision made earlier this week under pressure from allies holds that the "fundamental role" of the US nuclear arsenal will be to deter nuclear attacks. However, this leaves the possibility that nuclear weapons could also be used in "extreme circumstances" to deter enemy conventional, biological, chemical, and possibly cyberattacks.

USA

Biden Sticks with US Policy on Nuclear Weapons Amid Pressure from Allies

US President Biden stepped away from his vow toward a campaign, embracing a longstanding US approach of using a potential nuclear threat in response to conventional and non-nuclear dangers in addition to nuclear ones.... Biden vowed during a 2020 campaign toward a policy in which the purpose of the US nuclear arsenal would focus on deterring an enemy nuclear attack.

The decision made earlier this week under pressure from allies holds that the "fundamental role" of the US nuclear arsenal will be to deter nuclear attacks. However, this leaves the possibility that nuclear weapons could also be used in "extreme circumstances" to deter enemy

conventional, biological, chemical, and possibly cyberattacks.... After Biden met with his allies in Europe, the decision was made to maintain a unified Western stance against Putin's operation in Ukraine....

The administration's study is also expected to result in cuts to two nuclear systems that Trump's administration supported. If Congress agrees, the program to create a nuclear sea-launched cruise missile would be canceled, and the B83 thermonuclear bomb would be retired. The review, on the other hand, favors the massive upgrade of the US' nuclear triad of land-based missiles, submarine-based missiles, and bombers, which is expected to cost more than a trillion dollars.

During the Cold War, the US reserved the right to use nuclear weapons in response to a conventional strike to compensate for the Soviet bloc's numerical advantage in conventional troops. After handing up its chemical and biological weapons following arms-control accords, the US later stated that it would reserve the right to deploy nuclear weapons in certain circumstances to prevent attacks with poison gas and germ weapons.

During the Cold War, the US reserved the right to use nuclear weapons in response to a conventional strike to compensate for the Soviet bloc's numerical advantage in conventional troops. After handing up its chemical and biological weapons following arms-control accords, the US later stated that it would reserve the right to deploy nuclear weapons in certain circumstances to prevent attacks with poison gas and germ weapons. NATO allies have been particularly concerned about transitioning to a "single-purpose" doctrine, fearing that it may weaken deterrence against Russia in the face of the alliance.

The United States has imposed sanctions on several entities it says are involved in obtaining supplies for Iran's ballistic missile programme. In a statement, the US Treasury Department said the sanctions target an Iran-based procurement agent, Mohammad Ali Hosseini, and his network of companies that it accused of procuring "ballistic missile propellant-related materials".

Nuclear Doctrine: In January, the ranking Republican members of the Senate and House Armed Services Committees, Sen. Inhofe of Oklahoma and Rep. Mike Rogers of Alabama urged Mr. Biden to stick with the US nuclear doctrine, which they said had deterred major wars and the use of nuclear weapons for more than 70 years. Several Democratic arms-control proponents, on the other hand, pushed Biden to downplay the role of nuclear weapons in the Pentagon's policy and to state unequivocally that the US would never deploy nuclear weapons first in a battle... According to some Biden administration insiders, his decision does not affect his long-term goal of reducing the US' reliance on nuclear weapons and reflects the necessity to unite alliance support in the face of Russian threats and a growing China....

Deterrence; US Sole Purpose: During the 2020 campaign, Biden wrote in *Foreign Affairs* magazine that he believed "the sole purpose of the US nuclear arsenal should be deterring—and, if necessary, retaliating against—a nuclear attack." Biden went on to say that if elected president, he would work "to put that philosophy into practice, in consultation with the US military and US allies." Before stepping down as Vice President in 2017, Biden had staked out a similar position.

"Given our non-nuclear capabilities and the nature of today's threats, it's hard to envision a plausible scenario in which the first use of nuclear weapons by the US would be necessary," Biden said at the time. His "sole purpose" plan was intended to limit the circumstances under which the US would consider using nuclear weapons by removing the prospect that they may be used in response to a conventional attack or other non-nuclear threats.... The phrase "fundamental role" used by the Biden administration is reminiscent of the NPR done by the Obama administration in 2010.... But it differs somewhat from the more specific language in the Trump administration's NPR, which underscored the role of nuclear weapons to "hedge against an uncertain future."

Source: https://english.almayadeen.net/news/politics/wsj:-biden-sticks-with-us-policy-on-nuclear-weapons-amid-pre, 25 March 2022.

BALLISTIC MISSILE DEFENCE

IRAN

US Imposes Sanctions over Iran's Ballistic Missile Programme

The United States has imposed sanctions on several entities it says are involved in obtaining supplies for Iran's ballistic missile programme. In a statement, the US Treasury Department said the sanctions target an Iran-based procurement agent, Mohammad Ali Hosseini, and his network of companies that it accused of procuring "ballistic missile propellant-related materials". The Iranian mission to the United Nations did not immediately respond to a request for comment from Reuters.

The move comes as the US and Iran are in negotiations to return to the 2015 multilateral nuclear deal, formally known as the JCPOA, which saw Tehran scale back its nuclear programme in exchange for the lifting of international sanctions.

Former US President Donald Trump unilaterally withdrew from the agreement in 2018, instead pursuing a "maximum pressure" strategy against Iran, which in turn escalated its nuclear programme beyond the limits set by the pact. The Biden administration has said it is privileging the path of diplomacy with the Iranian government and wants to get all the parties back into mutual compliance with the JCPOA.

...The companies hit with sanctions in Wednesday's (30 March) action include Iran-based Jestar Sanat Delijan and Sina Composite Delijan Co, as well as P.B. Sadr Co. The curbs freeze any US assets of those targeted and generally bar Americans from dealing with them. Those that engage in certain transactions with them also risk being hit with sanctions, the Treasury said.

The department also said the curbs come after recent attacks in the Middle East claimed by Iranian and Iran-linked groups, including IRGC ballistic missile attacks in Erbil in northern Iraq in mid-March, and rocket and drone attacks on Saudi Arabia carried out by Yemen's Houthi rebels last week.

...Meanwhile, indirect negotiations between the US and Iran, which have been under way in Vienna for nearly a year, have overcome repeated disagreements but outstanding issues remain. Among them is an Iranian demand that the IRGC be removed from a US "terror" blacklist, which Washington has resisted. Speaking at the Doha Form, the US special envoy for Iran, Robert Malley, said the nuclear deal is not intended to address Iran's regional policies or the behaviour of the IRGC. But he declined to address the specifics of the negotiations or whether the US is considering de-listing the Iranian force. ...

Russia's invasion of Ukraine has prompted the alliance to bolster its defences. The Patriot system will be part of a new NATO battlegroup in Slovakia, which neighbours Ukraine.... The Patriot system will be a complement and not a replacement of the Soviet-era S-300 system that Slovakia operates.

Source: https://www.aljazeera.com/news/2022/3/30/us-imposes-sanctions-over-irans-ballistic-missile-programme, 30 March 2022.

SLOVAKIA

Slovakia Starts Deploying Patriot Air Defence System

The Patriot air defence system has started arriving in Slovakia from NATO partner countries and the deployment will continue in the coming days.... The system will be operated by German and Dutch troops and will initially be deployed at the Sliac airport in central Slovakia to help reinforce the defence of NATO's eastern flank. Russia's invasion of Ukraine has prompted the alliance to bolster its defences. The Patriot system will be part of a new NATO battlegroup in Slovakia, which neighbours Ukraine.... The Patriot system will be a complement and not a replacement of the Soviet-era S-300 system that Slovakia operates.

The minister said that Slovakia is willing to give the S-300 to Ukraine if and when it gets a proper replacement. He reiterated that Slovakia was looking for its own replacement of S-300 due to its age, capabilities and dependence on Russia.

Russia has warned against any shipments of advanced air defences to Ukraine and has warned it may target Western arms supplies.

Source: https://www.reuters.com/world/europe/slovakia-starts-deploying-patriot-air-defence-system-minister-2022-03-20/, 20 March 2022.

EMERGING TECHNOLOGIES AND DETERRENCE

CHINA

China's 'Nuclear Train' – As US Flexes Muscles in Asia, Beijing Eyes to Launch Its ICBMs Via High-Speed Railways

The Chinese government is exploring options for the deployment of rail-borne ICBM and high-speed rail is being considered as a potential launch platform for nuclear strikes after a new study by Chinese researchers suggested it was more suitable than previously thought.

The Chinese government is exploring options for the deployment of rail-borne ICBM and high-speed rail is being considered as a potential launch platform for nuclear strikes after a new study by Chinese researchers suggested it was more suitable than previously thought.

Yin Zihong, associate professor of civil engineering with Southwest Jiaotong University in Chengdu, Sichuan province, is leading the team of scientists on the national research project funded by the central government. Yin and his colleagues' findings published last week suggest that in certain cases, a high-speed railway could perform better than a heavy-duty industrial railway, which was generally considered more suitable for the job.

A modern ICBM fitted inside a carriage when blasting off, its weight would generate thrust 2-4 times the maximum load-bearing capacity of the train and while a high-speed train can be modified to withstand a launch, the stress caused would primarily pass down to the rail and its foundations, thereby damaging the infrastructure and rendering it unsafe and unusable.

"Compared with heavy-haul railways, high-speed railways operate faster and more smoothly. This means that on high-speed rails, the mobility, safety and concealment of military vehicles would be greater," said the researchers.

Powerful Shock Wave: A normal railway uses ballast, such as small rocks and gravel, to absorb shocks. A heavy haul line built to transport ore and coal requires more ballast. According to a study in 2020 by Yin's team, an ICBM launch would produce a powerful shock wave that could go as deep as 8 meters (26 feet) underground, far beyond the thickness of most rail lines' base structure and even heavy-duty rail would need a better fortified underlying structure to survive the launch. The high-speed trains in China travel up to 350km/h (217mph). They are slim having up to 16 carriages with each weighing about 60 tonnes.

Yin and his colleagues simulated the operation of a high-speed rail launch system by using data from previous test launches conducted by the Chinese military and computer modeling. Their study said it would not be necessary to provide extra strength for a high-speed railway as its rails are laid and fixed on concrete with no need for ballast as a buffer zone.

A Beijing-based rail engineering researcher who asked not to be named said that the conclusion should not come as a total surprise because the extremely high operational speed needs the rail line to have foundations much stronger than ordinary rail. The publicly available information suggests that the supporting structure of some high-speed railway foundations in China is as deep as 60 meters. The simulation of the researchers showed that most of the disturbances caused by firing off a missile would be limited to shallow areas of the rail infrastructure, where damage was more easily detected and repaired.

Some Dangers Exist: However, researchers cautioned that some extremely low-frequency vibrations produced by the launcher could pose a risk to surface components, such as the rail and concrete slab. According to Yin, a modern ICBM fitted inside a carriage when blasting off, its weight would generate thrust 2-4 times the maximum load-bearing capacity of the train and while a high-speed train can be modified to

withstand a launch, the stress caused would primarily pass down to the rail and its foundations, thereby damaging the infrastructure and rendering it unsafe and unusable.

According to military experts, a rail-borne ICBM launch system has a higher likelihood of surviving the first wave of nuclear attack compared to other land-based systems, such as silos and trucks. Also, according to some estimates, a train could carry as many missiles as a nuclear submarine.

The concept of railway mobile nukes goes back several decades. In the 1980s, the Soviet Union became the first power to acquire the operational capability of a train-based ballistic missile launch system by developing the RT-23 Molodets ICBM that could fit inside a standard train wagon.

That said, it remains unclear if or when the Chinese military would deploy a nuclear launch platform based on high-speed rail. In 2016, China tested the tube launch system for the rail-mobile version of its DF-41 ICBM. The test involved a 'cold launch' of a DF-41 from a canister with a gas charge without the engine of the missile being ignited.

Russia's military has fired a hypersonic ballistic missile and destroyed a big underground arms depot in western Ukraine…. If confirmed it would be Russia's first use in this war of the Kinzhal, or Dagger, ballistic missile launched from the air, most likely by a MiG-31 warplane.

Decades-Old Concept: The concept of railway mobile nukes goes back several decades. In the 1980s, the Soviet Union became the first power to acquire the operational capability of a train-based ballistic missile launch system by developing the RT-23 Molodets ICBM that could fit inside a standard train wagon.

The missile was 2.4-meters in diameter and used solid fuel for relatively rapid launch, and could strike targets at a range of 6,800 miles. It was packed with ten 550-kiloton nuclear warheads which separated to hit different targets on re-entry.

Of late, the US' global missile defense system and Conventional prompt global strike (C-PGS) program of hypersonic missiles have prompted countries like Russia, China and North Korea to diversify and add to the mobility and flexibility of their nuclear deterrent forces.

In 2012, Russia began developing a successor to the RT-23 called the RS-27 that would use a much lighter RS-24 Yars missile weighing only 54 tons and carrying only 4 nuclear warheads. Less weight would allow the system to use standard train wagons with regular wheels and mount 6 ballistic missiles instead.

The Yars is claimed to travel at 20 times the speed of sound and perform evasive maneuvers and deploy decoys to evade ballistic missile interceptors. However, due to international sanctions following Russia's annexation of Crimea and dwindling oil prices the work on RS-27 had to be stopped. In January, North Korea test-launched its KN-23 SRBM from a rail car. This was a second test after September 2021 when Pyongyang for the first time demonstrated the capability to launch SRBMs from a rail-borne launcher.

Source: https://eurasiantimes.com/chinas-nuclear-train-beijing-eyes-to-launch-its-icbms-railways/, 30 March 2022.

RUSSIA

Russia Claims First Use of Hypersonic Kinzhal Missile in Ukraine

Russia's military has fired a hypersonic ballistic missile and destroyed a big underground arms depot in western Ukraine…. If confirmed it would be Russia's first use in this war of the Kinzhal, or Dagger, ballistic missile launched from the air, most likely by a MiG-31 warplane.

What are Hypersonic Missiles? President Putin has repeatedly highlighted Russia's investment in hypersonic missiles, which can travel at more than five times the speed of sound, or Mach 5. The statistics are impressive: the Kinzhal can hit a target up to 2,000km (1,240 miles) away and can fly faster than 6,000 km/h. But does that make

them any more dangerous than other missiles or even artillery which can cause just as much death and destruction?

...President Putin boasted last December that Russia was leading the world in hypersonic missiles, which are hard to track because they can change direction while mid-flight. Russia posted a video of what it said was its missile strike on the arms depot in Deliatyn, a village in south-western Ukraine only 100km from the border with Romania....

'Not a Game-Changer': The Russian leader unveiled the Kinzhal four years ago as one of a series of "invincible" weapons that he said would evade enemy defences. The other hypersonic missiles are the Zirkon and the Avangard, which is both faster and has a far greater range. The Kinzhal can carry a nuclear warhead as well as a conventional one and recent reports said MiG-31 fighters had been sent to Kaliningrad, bringing numerous European capitals within reach. There is no indication from where the attack on the arms depot was launched....

The Kinzhal was thought to be an Iskander missile that had been modified for fighter jets, and Iskander-M missiles have already been fired by Russian ground launchers since the start of the war. Although the Iskander-M has a far shorter range than the air-launched missile, Ukraine's defence ministry claimed that Russia had fired almost all its Iskander missiles during the first 20 days of the war.

James Acton said the Kinzhal was thought to be an Iskander missile that had been modified for fighter jets, and Iskander-M missiles have already been fired by Russian ground launchers since the start of the war. Although the Iskander-M has a far shorter range than the air-launched missile, Ukraine's defence ministry claimed that Russia had fired almost all its Iskander missiles during the first 20 days of the war. ...

Source: https://www.bbc.com/news/world-europe-60806151, 19 March 2022.

The Problem with 'Hypersonic' and Russia's Attack Claim

Let's take a moment to discuss two important issues: An alleged Russian hypersonic missile attack on Ukraine and why we in the media should be careful about reporting "hypersonic" as a noun. On 19 March, CNN cited U.S. officials confirming what Russia's Defense Ministry claimed: That Moscow launched Kh-47M2 Kinzhal "hypersonic missiles" at a military munitions warehouse in western Ukraine — the first known use of this kind of weapon in Combat. But, Increasingly, It's Not What It Seems.

First off, the Kremlin might be lying. Rogoway and Payne of the War Zone used commercial satellite imagery to locate the supposed target at a "heavily bombarded rural area in the far eastern area of Ukraine." In other words, not near where Russian officials said. It's also unclear if the U.S. detected any kind of hypersonic missile strike. "We're not able to refute [the claim], but we can't independently confirm it, either," a senior U.S. defense official said.... "It's certainly possible" the weapon was used..."but it's a bit of a head-scratcher" if it was. Even if the target was a weapons depot in Ukraine's west — near Poland — there's simply no need to deploy such an advanced weapon to hit it. A less-valuable missile would have sufficed.

Theories abound for why Russia would assert such a bold and aggressive claim if, indeed, it turned out to be false. Jeffrey Lewis...told...that Russia might have fibbed to change the narrative about its bumbling invasion. Tom Karako of the CSIS said it could serve as a warning to NATO allies.... We'll have to wait for more information about what did or didn't happen, and the "Why?" either way. In the meantime, what we all can do is be careful about how we report the supposed use of these weapons.

"Hypersonic" *as a noun* in this context isn't a thing, as Karako and Dahlgren explained... it's an attribute.... Hypersonic missile (note the word is an adjective here) earns that distinction by surviving a series of conditions over an extended period of time. There are weapons that at some

point in their flight go faster than hypersonic missiles, but speed isn't the only factor at play in the naming — manoeuvrability and propulsion system play a part, too.

"This nonsense has gone on long enough. It's high time we stop calling everything 'a hypersonic.' Talking about hypersonics as a thing rather than an attribute is imprecise, misleading and ungrammatical. Other than that, it's great," Karako said…. What's more, we media types risk doing Russia's propaganda work for it by inflating the significance of this supposed launch. Again, even if it is true, experts say that the Kinzhal is basically an Iskander-M 9M723 quasi-ballistic missile, but in this instance shot from a plane. That's noteworthy, sure, but not the main takeaway….

There are weapons that at some point in their flight go faster than hypersonic missiles, but speed isn't the only factor at play in the naming — manoeuvrability and propulsion system play a part, too. "This nonsense has gone on long enough. It's high time we stop calling everything 'a hypersonic.' Talking about hypersonics as a thing rather than an attribute is imprecise, misleading and ungrammatical.

Source: https://www.politico.com/newsletters/national-security-daily/2022/03/21/the-problem-with-hypersonic-and-russias-attack-claim-00018946, 21 March 2022.

NUCLEAR ENERGY

CANADA

Canadian Government Invests in Third SMR Technology

The Canadian government is to invest USD21.6 million in Westinghouse Electric Canada Inc to support its next-generation eVinci microreactor. This is the third investment in SMR technology to be made through Innovation, Science and Economic Development Canada's (ISED) Strategic Innovation Fund. According to ISED, the eVinci project supports the government's *Innovation and Skills Plan* by helping build a highly skilled workforce and advancing research in new foundational technology, and also supports Canada's *SMR Action Plan*, which outlines a long-term vision for the development and deployment of this technology in Canada and worldwide. The government is supporting the CAD57 million eVinci project so the reactor can be successfully licensed in Canada….

The eVinci reactor would be a "feasible alternative" to diesel generation at mines and in remote communities, with its reduced cost electricity and heating providing opportunities for economic growth. The government contribution to eVinci is being made through the Strategic Innovation Fund's Net Zero Accelerator initiative.

"As our government moves swiftly with our green economic recovery, we are laying the foundation for a better and more prosperous climate-oriented future. Westinghouse's innovative technology will help deliver cleaner energy sources across Canada, especially in remote communities. This investment will play a critical role in fighting climate change, building on Canada's global leadership in SMRs and securing jobs in Ontario's energy sector," Minister of Innovation, Science and Industry Champagne said.

The eVinci microreactor is a heatpipe reactor able to deliver combined heat and power (5 MWe and up to 13MWt). Fully factory built, fuelled and assembled, Westinghouse says the transportable reactor can bring clean energy to off-grid sites, remote communities and islands, decentralized generation, industrial sites, mining operations, data centres, universities, marine propulsion, hydrogen generation, and water purification. It can be used as a primary energy source, or in tandem with other sources such as renewables….

A feasibility study prepared by Westinghouse and Bruce Power last year found that the eVinci reactor would be a "feasible alternative" to diesel generation at mines and in remote communities, with its reduced cost electricity and heating providing opportunities for economic growth. The government contribution to eVinci is being made through the Strategic Innovation Fund's Net Zero Accelerator initiative,

which specifically supports Canada's net-zero goals of transforming the economy for clean and long-term growth and achieving a net-zero economy by 2050. The fund has previously made grants to two SMR projects: a CAD20 million investment in Terrestrial Energy to accelerate development of its Integral Molten Salt Reactor, announced in October 2020; and an award to Moltex Energy Ltd of CAD47.5 million to help develop its 300 MW Stable Salt Reactor-Wasteburner (SSR-W) technology, announced in March 2021.

Source: https://www.world-nuclear-news.org/Articles/Canadian-government-invests-in-third-SMR-technolog, 18 March 2022.

CHINA

China Aims to Expand Nuclear Power Programme Amid Threat of Global Energy Crisis Following Ukraine Invasion

China is doubling down on nuclear power and promoting advanced technologies under its energy plan for 2025 as the world faces an energy crisis triggered by Russia's invasion of Ukraine. The plan calls for more demonstration projects of advanced reactors and early-stage research into nuclear fusion reactors.

China is doubling down on nuclear power and promoting advanced technologies under its energy plan for 2025 as the world faces an energy crisis triggered by Russia's invasion of Ukraine. The plan calls for more demonstration projects of advanced reactors and early-stage research into nuclear fusion reactors.

In January China said it had made a breakthrough with the technology, raising hopes that it will one day be able to build reactors that mimic the fusion reactions that power the sun and produce clean energy that leaves little radioactive waste. The joint guidelines, issued by the National Development and Reform Commission and the National Energy Administration on 22 March, said China would maintain a steady construction pace and ensure that the new coastal power projects are safe.

The country aims to have 70 GW of installed nuclear capacity by 2025, up from 51GW at the end of 2020, after failing to meet its previous target of having 58GW installed capacity by 2020. The announcement comes as more countries around the world are rekindling their interest in nuclear power after the invasion in Ukraine led to a spike in oil and gas prices that threatens a global energy crisis.

The British PM Johnson told nuclear industry bosses on 21 March that the government wanted the UK to get 25 per cent of its electricity from nuclear power, which will signal a significant shift in the country's energy mix. Earlier this year, France announced a plan to build up to 14 nuclear reactors and a fleet of smaller nuclear plants as it seeks to slash greenhouse gas emissions and cut its reliance on foreign energy.

China's energy plan highlights the need for energy supply chain security and the role of nuclear in China's green, low-carbon energy transition, which aims to hit peak carbon emissions by 2030 and become carbon neutral by 2060…. The plan said that two third-generation reactors in Shidaowan in Shandong – built according to the CAP1400 design which is intended to reduce greenhouse gas emissions – are now expected to be connected to the power grid before 2025.

China's energy plan highlights the need for energy supply chain security and the role of nuclear in China's green, low-carbon energy transition, which aims to hit peak carbon emissions by 2030 and become carbon neutral by 2060….

Shidaowan also hosts the world's first fourth generation reactor to enter commercial operations and the plan calls for more demonstration projects to promote this high-temperature, gas-cooled reactor design as well as other advanced technologies such as fast reactors, small modular reactors and floating nuclear plants. A second high-temperature, gas-cooled reactor at Shidaowan is also ready to start operations…. The plan also calls for wider promotion of the use of nuclear energy to heat residential and industrial areas and desalinate seawater. Two cities – Haiyang in Shandong and

Haiyan in Zhejiang – already have commercial nuclear heating, with the former providing heat to around 200,000 people by 2020. Last December, the country's first nuclear power plant Qinshan launched a district heating project, providing nuclear-generated central heating to some 4,000 households.

Source: https://www.thestar.com.my/aseanplus/aseanplus-news/2022/03/26/china-aims-to-expand-nuclear-power-programme-amid-threat-of-global-energy-crisis-following-ukraine-invasion, 26 March 2022.

INDIA

India to Build Nuclear Power Plants in "Fleet Mode" From 2023

With the first pour of concrete for a 700 MW atomic power plant in Karnataka's Kaiga scheduled in 2023, India is set to put in motion construction activities for 10 'fleet mode' nuclear reactors over the next three years. The first pour of concrete (FPC) signals the beginning of construction of nuclear power reactors from the pre-project stage which includes excavation activities at the project site.

With the first pour of concrete for a 700 MW atomic power plant in Karnataka's Kaiga scheduled in 2023, India is set to put in motion construction activities for 10 'fleet mode' nuclear reactors over the next three years.

"The FPC of Kaiga units 5&6 is expected in 2023; FPC of Gorakhpur Haryana Anu Vidyut Praiyonjan units 3 & 4 and Mahi Banswara Rajasthan Atomic Power Projects units 1 to 4 is expected in 2024; and that of Chutka Madhya Pradesh Atomic Power Project units 1 & 2 in 2025," officials of the DAE told the Parliamentary panel on science and technology. The Centre had approved construction of 10 indigenously developed PHWR of 700 MW each in June 2017. The ten PHWRs will be built at a cost of [1] 1.05 lakh crore. It was for the first time that the government had approved building 10 nuclear power reactors in one go with an aim to reduce costs and speed up construction time...

The FPC of Kaiga units 5&6 is expected in 2023; FPC of Gorakhpur Haryana Anu Vidyut Praiyonjan units 3 & 4 and Mahi Banswara Rajasthan Atomic Power Projects units 1 to 4 is expected in 2024; and that of Chutka Madhya Pradesh Atomic Power Project units 1 & 2 in 2025.

Under the fleet mode, a nuclear power plant is expected to be built over a period of five years from the first pour of concrete. Currently, India operates 22 reactors with a total capacity of 6780 MW in operation. One 700 MW reactor at Kakrapar in Gujarat was connected to the grid on January 10 last year, but it is yet to start commercial operations. The PHWRs, which use natural uranium as fuel and heavy water as moderator, have emerged as the mainstay of India's nuclear power programme. India's first pair of PHWRs of 220 MW each were set up at Rawatbhata in Rajasthan in the 1960s with Canadian support. The second reactor had to be built with significant domestic components as Canada withdrew support following India's peaceful nuclear tests in 1974.

As many as 14 PHWRS of 220 MW each with standardised design and improved safety measures were built by India over the years. Indian engineers further improvised the design to increase the power generation capacity to 540 MWe, and two such reactors were made operational at Tarapur in Maharashtra. Further optimisations were carried out to upgrade the capacity to 700 MWe.

Source: https://www.ndtv.com/india-news/beginning-2023-india-to-start-building-nuclear-power-plants-in-fleet-mode-2845650, 27 March 2022.

UAE

Second Barakah Unit Begins Commercial Operation

The Emirates Nuclear Energy Corporation (ENEC) has announced the start of commercial operation for the UAE's second nuclear unit. Barakah 2 achieved first criticality in August 2021 and began supplying electricity to the grid on 14 September. Together with Barakah unit 1, which began commercial operation in April 2021, the output from Barakah 2 means that nuclear energy is now supplying 2800 MW to the UAE's grid and represents the half-way mark towards ENEC's commitment to supply up to a quarter of the

country's electricity needs.

"Less than a year after starting commercial operations for unit 1 back in April 2021, we have now successfully commenced commercial operations for unit 2 of the Barakah Nuclear Energy Plant, in accordance with UAE regulatory requirements and the highest international standards of safety and quality," Al Hammadi, ENEC's managing director and CEO said.... ENEC has taken the lessons learnt from unit 1 and applied them to unit 2, helping it to achieve this latest major milestone in a more efficient way while ensuring all standards continue to be met, he said. "Given that the four APR-1400 Units at the Barakah Plant are built in pairs, this milestone marks the commercial delivery of the first two Units. This is only the second such occurrence in global history, after Shin Kori reactors 3 and 4 achieved commercial operations in 2016 and 2019 in South Korea," he said.

Together with Barakah unit 1, which began commercial operation in April 2021, the output from Barakah 2 means that nuclear energy is now supplying 2800 MW to the UAE's grid and represents the half-way mark towards ENEC's commitment to supply up to a quarter of the country's electricity needs.

"Through the delivery of this milestone, we have further reinforced the UAE's energy security and our drive towards rapid decarbonisation of the UAE's power sector, significantly contributing to the UAE Net Zero by 2050 target. The Barakah plant is a sustainable powerhouse for the nation, generating clean electricity to power the UAE's economy and creating the foundation for new energy technologies such as hydrogen and synthetic fuels."

Through the delivery of this milestone, we have further reinforced the UAE's energy security and our drive towards rapid decarbonisation of the UAE's power sector, significantly contributing to the UAE Net Zero by 2050 target. The Barakah plant is a sustainable powerhouse for the nation, generating clean electricity to power the UAE's economy and creating the foundation for new energy technologies such as hydrogen and synthetic fuels.

UAE Minister of Climate Change and Environment Almheiri said the beginning of commercial operations for Barakah 2 was a "landmark milestone" for the UAE as it continues with the rapid decarbonisation of its power sector. "The Barakah Plant is a powerhouse of sustainability and a key enabler for our ambitious Net Zero agenda," she said. "With further units due to come online, the significance of the Barakah plant in achieving Net Zero becomes ever more apparent, with all four units due to supply 25% of the UAE's electricity, while preventing 22.4 million tons of carbon emissions annually"....

Construction of the first of four Korean-designed APR-1400 units at Barakah, in the Al Dhafra region of the Emirate of Abu Dhabi, began in 2012. When complete, it will be one of the largest nuclear power plants in the world. Units 3 and 4 are in the final stages of commissioning: unit 3 is undergoing operational readiness preparations following the completion of construction in November 2021, and Unit 4 in the final stages of construction. Barakah as a whole is now more than 96% complete, ENEC said. The reactors are being built by a consortium led by the Korea Electric Power Corporation.

Source: https://www.world-nuclear-news.org/Articles/Second-Barakah-unit-begins-commercial-operation, 24 March 2022.

NUCLEAR COOPERATION

BULGARIA–GREECE

Bulgaria Planning for Nuclear Cooperation with Greece

Bulgarian PM Petkov says he hopes to put "concrete proposals" to Greece within 12 months. It is believed that the plan would be for Greece to sign a long-term supply contract for energy from a new nuclear reactor in Bulgaria. In an interview...Petkov was asked about the discussions between the two countries cooperating on nuclear power. He said: "Cheaper electricity is needed. We have nuclear energy, you don't. Putting these things together we could work

together as good neighbours, building a long-term relationship by building nuclear power to produce energy for common benefits in a sector that is a significant alternative to energy shortages in our region."

Petkov, who became PM at the end of last year leading a broad multi-party coalition, said he wanted to make swift progress on the issue. "We are considering the candidate suppliers and are preparing a rapid study of the feasibility of the site. Immediately after that we will come up with concrete proposals to Greece. I want to believe that in 12 months we will have a clear picture of what exactly and how we will do it" ....

Bulgaria currently has two nuclear reactors, generating about one-third of its electricity, but has had plans for more, notably at Belene, near the Danube border with Romania. Site works began in 1980 before being abandoned in 1991 due to lack of funds, when it was about 40% built.

The two countries are already cooperating on wider energy issues including through the IGB gas pipeline which would give Bulgaira access to Azerbaijan's gas and the liquified gas terminal at Alexandroupoulis. Bulgaria currently has two nuclear reactors, generating about one-third of its electricity, but has had plans for more, notably at Belene, near the Danube border with Romania. Site works began in 1980 before being abandoned in 1991 due to lack of funds, when it was about 40% built. There have been various attempts to restart the project since then, most recently in June 2020 when Famatome, Rosatom and General Electric agreed in principle to form a consortium to bid for the project.

Russia enriches more uranium for use in nuclear plants than any other country in the world. Its increasing economic isolation following its attack on Ukraine—and talk of potential added sanctions on Russian uranium—have exposed the fragility of global nuclear-fuel supplies, which are controlled by a handful of countries....

According to reports earlier this month, the general cooperation plan would see Greece committing to buying electricity from a new nuclear reactor in Bulgaria for at least 20 years. Bulgarian Deputy PM Vasilev said...that having guaranteed buyers meant they could "act extremely fast". Greece does not have any nuclear power plants, with PM Kyriakos Mitsotakis saying in October 2021 the country has no plans to build any because of the risk of earthquakes in the region.

Source: https://www.world-nuclear-news.org/Articles/Bulgaria-planning-for-nuclear-cooperation-with-Gre, 22 March 2022.

URANIUM PRODUCTION

USA

U.S. Rethinks Uranium Supply for Nuclear Plants After Russia's Invasion of Ukraine

Russia's invasion of Ukraine has shaken the global market for uranium, a critical fuel for nuclear-power plants, prompting some in the U.S. to propose reviving domestic production. Russia enriches more uranium for use in nuclear plants than any other country in the world. Its increasing economic isolation following its attack on Ukraine—and talk of potential added sanctions on Russian uranium—have exposed the fragility of global nuclear-fuel supplies, which are controlled by a handful of countries....

Uranium prices have jumped more than 30% since the start of the war as a price hike hits commodities broadly and utilities try to lock down supplies on fears that sanctions could pinch some part of the specialized fuel cycle. A trade agreement limits U.S. dependence on Russian uranium to no more than around 20% of what domestic reactors need, but no other country could quickly fill Russia's role in a complex supply chain that could take years to rejigger...

The Nuclear Energy Institute, a Washington, D.C.-based trade group, said it was assessing "the potential impacts of fuel disruption on the U.S. nuclear fleet." But U.S. plants typically refuel every

18 to 24 months and plan refueling at least two to three years in advance, so there is little immediate concern of a short-term fuel shortage for existing plants, according to the group... Still, uncertainty over securing future nuclear-fuel supplies raises questions for developers designing small modular reactors, or SMRs. Though none are under construction yet in the U.S., many proponents of nuclear generation consider SMRs the future of the industry. Russia was considered the chief supplier for those projects before the war.

While uranium can be mined in many parts of the world, the multistep processing that turns the heavy metal into a fuel is concentrated in a handful of places globally. Uranium must be mined and milled, converted into a gas, and enriched to increase the percentage of the isotope needed for nuclear reactors before fuel fabrication.

The U.S. has met Russia's assault on Ukraine with economic penalties targeting Russia's financial sector and a ban on oil imports into the U.S., but so far, uranium has avoided sanctions. The U.S. relied on Russia and its allies Kazakhstan and Uzbekistan for about 46% of its needs in 2020... Nuclear power provides about 20% of U.S. electricity generation and 10% of the global total... While uranium can be mined in many parts of the world, the multistep processing that turns the heavy metal into a fuel is concentrated in a handful of places globally. Uranium must be mined and milled, converted into a gas, and enriched to increase the percentage of the isotope needed for nuclear reactors before fuel fabrication.

Source: https://columbusdailytimes.com/2022/03/22/u-s-rethinks-uranium-supply-for-nuclear-plants-after-russias-invasion-of/, 22 March 2022.

NUCLEAR PROLIFERATION

NORTH KOREA

Korea Fires Apparent ICBM Toward East Sea

North Korea fired what seems to be a long-range missile toward the East Sea on 24 March, South Korea's military said. Pyongyang's show of force, the 12th this year, effectively means an end to its self-imposed moratorium on nuclear and ICBM testing. The JCS said that it detected the launch from the Sunan airfield in Pyongyang at 2:34 p.m. and the missile flew some 1,080 kilometers at a top altitude of over 6,200 km. The North appears to have launched the projectile at a lofted angle, the JCS said.

The Pyongyang airfield is where the North is presumed to have tested the Hwasong-17 ICBM on Feb. 27 and March 5. Dubbed a "monster" missile for its size, the new ICBM is thought to carry multiple warheads and have a range exceeding 13,000 km. The North's latest launch came four days after it fired four artillery shots into the Yellow Sea, apparently using multiple rocket launchers, from Sukchon, north of Pyongyang. Last week, the North unsuccessfully fired an apparent long-range rocket system. In January, Pyongyang made a veiled threat to lift its voluntary moratorium on strategic weapons tests that it declared in April 2018 amid nuclear diplomacy with Seoul and Washington.

Dubbed a "monster" missile for its size, the new ICBM is thought to carry multiple warheads and have a range exceeding 13,000 km. The North's latest launch came four days after it fired four artillery shots into the Yellow Sea, apparently using multiple rocket launchers, from Sukchon, north of Pyongyang.

Source: https://en.yna.co.kr/view/AEN20220324007452325?input=tw, 24 March 2022.

Suspected N. Korea Missile 'Explodes in Mid-Air' After Launch Near Pyongyang

North Korea launched a suspected missile that appeared to explode shortly after lift-off in the skies over Pyongyang on 16 March, South Korea's military said, amid reports that the nuclear-armed North was seeking to test-fire its largest missile yet. The US and South Korea have warned that North Korea may be preparing to launch an ICBM at full range for the first time since 2017, in violation of UNSC resolutions. The projectile was fired from the international airport in Sunan, outside the North Korean capital of Pyongyang, South Korea's JCS said...

It was presumed to be a ballistic missile and seemed to explode in mid-air while still in its booster phase, at an altitude below 20 kilometres (12 miles) .... A U.S. Department of State spokesperson said it was a "ballistic missile launch" and condemned it as a violation of UNSC resolutions, but declined to comment when asked about the reported failure. Debris fell in or near Pyongyang after the failed test, Seoul-based NK News reported, citing unnamed witnesses and a photograph of the test showing a red-tinted ball of smoke at the end of a zig-zagging plume that traced the rocket's launch trajectory in the sky above the city.

Debris fell in or near Pyongyang after the failed test, Seoul-based NK News reported, citing unnamed witnesses and a photograph of the test showing a red-tinted ball of smoke at the end of a zig-zagging plume that traced the rocket's launch trajectory in the sky above the city. The failed launch underscored the danger behind North Korea's decision to use an airport so close to heavily populated civilian areas as a site for test firing large missiles...

The failed launch underscored the danger behind North Korea's decision to use an airport so close to heavily populated civilian areas as a site for test firing large missiles.... In 2017, an intermediate-range ballistic missile launched from another location in North Korea failed shortly after lift-off and crashed into an industrial or agriculture complex in the city of Tokchon....

Source: https://www.reuters.com/world/china/north-korea-fires-what-could-be-missile-nhk-citing-defmin-source-2022-03-16/, 17 March 2022.

NUCLEAR NON-PROLIFERATION

IRAN

Iran & World Powers 'Closer Than Ever' to Reviving 2015 Nuclear Deal, Says Iranian FM

Iranian Foreign Minister Amirabdollahian on 23 March stated that they are closer than ever to renewing a 2015 nuclear agreement.... He said that if the US acts pragmatically, they are ready to have foreign ministers from the nuclear deal's joint committee meeting in Vienna to finalise the accord. He claimed that they believe that they are closer to a deal in Vienna today "than we have ever been".

Amirabdollahian stated that to reach a final agreement, they have sent their most recent proposals to the US via the European Union's Coordinator. He also claimed that they would not break any of their red lines... The discussions were on the verge of reaching an agreement earlier until Russia sought guarantees regarding trade with Iran that would undermine the West's response to invasion of Ukraine.

If a deal is reached, it will be the end of nearly a year of tense negotiations between Tehran and Western countries, despite repeated declarations from both sides implying that a deal was on the verge of being reached only to be derailed by new obstacles.

Year of Tense Negotiations between Tehran and Western Countries: If a deal is reached, it will be the end of nearly a year of tense negotiations between Tehran and Western countries, despite repeated declarations from both sides implying that a deal was on the verge of being reached only to be derailed by new obstacles. However, despite Amirabdollahian's statement, Iran's chief nuclear negotiator Kani earlier cautioned that being "near the finish line" doesn't guarantee to cross it...

Iran has Continuously Denied that it is Pursuing Nuclear Weapons: Meanwhile, Iran has continuously dismissed that it is pursuing nuclear weapons, claiming that the programme is for civilian purposes, and it has denied supporting extremists. Since Washington's withdrawal, Iran has broken the deal's terms and demanded that the US eliminate its sanctions before it re-joins the agreement.

Source: https://www.republicworld.com/india-news/general-news/iran-and-world-powers-closer-than-ever-to-reviving-2015-nuclear-deal-says-iranian-fm-articleshow.html, 24 March 2022.

NUCLEAR SAFETY

PAKISTAN

Pakistan's Nuclear-Regulatory Body Effective, Says IAEA Mission

The IAEA has said that new and updated nuclear safety regulations in Pakistan have significantly updated and strengthened nuclear and radiation safety in the country. The agency's Integrated Regulatory Review Service (IRRS) team, which recently completed its mission in Pakistan, however noted a few areas where challenges remain, including a continued focus on decommissioning, spent fuel management and radioactive waste disposal....

The IAEA has said that new and updated nuclear safety regulations in Pakistan have significantly updated and strengthened nuclear and radiation safety in the country. The agency's Integrated Regulatory Review Service (IRRS) team, which recently completed its mission in Pakistan, however noted a few areas where challenges remain, including a continued focus on decommissioning, spent fuel management and radioactive waste disposal....

The team visited Pakistan at the government's request and concluded an eight-day follow-up mission earlier this month to review the country's implementation of recommendations and suggestions made during an initial IRRS mission in 2014. The follow-up mission was hosted by the Pakistan Nuclear Regulatory Authority (PNRA). The team found that improvements in Pakistan's regulatory functions and activities had improved nuclear safety by enhancing the development of regulations and strengthening arrangements for regulatory inspections, authorisations, emergency preparedness and response, occupational radiation protection and environmental radiation monitoring.

The team found that Pakistan has successfully implemented all 13 recommendations from the 2014 mission and had adequately addressed 29 out of 31 suggestions. "The team saw how Pakistan has taken major steps to meet all recommendations from the initial mission.

However, they noted that while a national policy is in place for the safe management of radioactive waste and spent fuel, decommissioning and waste disposal, Pakistan would benefit from more active involvement in international cooperation in this area to gain from the shared experiences of other countries. The mission reviewed the regulatory framework for all civilian facilities and activities using radiation in Pakistan. The country has five operating nuclear power reactors, providing over seven per cent of its electricity, with one additional reactor due to become operational this year. It also has two research reactors and uses sealed radiation sources in medical and industrial applications.

The team found that Pakistan has successfully implemented all 13 recommendations from the 2014 mission and had adequately addressed 29 out of 31 suggestions. "The team saw how Pakistan has taken major steps to meet all recommendations from the initial mission. The team's technical discussions with the PNRA were frank and wide-ranging," said Bradford, Director of the IAEA Nuclear Installation Safety Division.... "Pakistan has made clear improvements to make its regulatory infrastructure more efficient and effective." ...

The mission team also offered observations about how the regulatory framework for nuclear safety in Pakistan might be further enhanced in the coming years. They said that Pakistan should consider joining the joint convention on the Safety of Spent Fuel Management and Safety of Radioactive Waste Management, and to invite an IAEA Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation mission.

Source: https://www.dawn.com/news/1680877, 20 March 2022.

UKRAINE

IAEA Head Travels to Ukraine to Start Delivery of Nuclear Safety and Security Assistance

The Director General of the IAEA, Rafael Mariano Grossi, is in Ukraine for talks with senior government officials on the IAEA's planned delivery of urgent technical assistance to ensure the safety and security of the country's nuclear facilities and help avert the risk of an accident that could endanger people and the environment.

The military conflict is putting Ukraine's nuclear power plants and other facilities with radioactive material in unprecedented danger. We must take urgent action to make sure that they can continue to operate safely and securely and reduce the risk of a nuclear accident that could have a severe health and environmental impact both in Ukraine and beyond.

The aim of the Director General's visit is to initiate prompt safety and security support to Ukraine's nuclear facilities. It will include sending IAEA experts to prioritized facilities and the shipment of vital safety and security supplies including monitoring and emergency equipment.

"The military conflict is putting Ukraine's nuclear power plants and other facilities with radioactive material in unprecedented danger. We must take urgent action to make sure that they can continue to operate safely and securely and reduce the risk of a nuclear accident that could have a severe health and environmental impact both in Ukraine and beyond" Director General Grossi said. During this visit, the Director General will travel to one of Ukraine's nuclear power plants.

The IAEA has drawn up concrete and detailed plans for safety and security assistance to Ukraine's nuclear sites, which include fifteen nuclear power reactors at four plants as well as the Chornobyl NPP, where radioactive waste management facilities are located following the 1986 accident.

The IAEA has drawn up concrete and detailed plans for safety and security assistance to Ukraine's nuclear sites, which include fifteen nuclear power reactors at four plants as well as the Chornobyl NPP, where radioactive waste management facilities are located following the 1986 accident. The IAEA's technical assistance will also facilitate conditions for the IAEA to continue carrying out its safeguards activities in Ukraine in line with its non-proliferation mandate.

"Ukraine has requested our assistance for safety and security. We will now start delivering it. Ukraine has one of Europe's largest nuclear power programmes. The IAEA's presence, where needed to ensure safety and security, is of paramount importance. We are ready to provide the necessary support now," he said.

Since the start of the conflict, Director General Grossi has expressed his grave concern about the deteriorating safety and security situation for Ukraine's nuclear facilities. He has stressed the IAEA's commitment and readiness to help ensure that the seven indispensable pillars for ensuring safety and security are adhered to. In recent weeks, several of them – including the physical integrity of facilities, the ability of operational staff to work without undue pressure, and the access to off-site power – have been seriously compromised.

"There have already been several close calls. We can't afford to lose any more time. This conflict is already causing unimaginable human suffering and destruction. The IAEA's expertise and capabilities are needed to prevent it from also leading to a nuclear accident," he said....

Source: https://www.iaea.org/newscenter/pressreleases/iaea-head-travels-to-ukraine-to-start-delivery-of-nuclear-safety-and-security-assistance, 29 March 2022.

Deal on Ukrainian Nuclear Safety to Come 'Soon,' Says IAEA Chief

The IAEA is closing in on a deal to guarantee the safety and security of nuclear facilities in Ukraine, according to its chief Grossi. "We are negotiating, we are approaching what we want to be the final

stages of our consultations," Grossi told European lawmakers, adding he hoped to reach a deal "very soon." The discussions, which started on March 10, are "very delicate" diplomatically.

The future framework will make "no political references to the situation in the plants or no connection that could be construed as legitimizing the presence of anybody in a foreign territory," according to Grossi, responding to concerns that it could be used by Moscow to legitimize control over parts of Ukraine's territory. He added that it will require Russia and Ukraine to "observe some of the rules...that have been repeatedly violated with enormous risk for the population, local, regional, European populations" since Russia's invasion of Ukraine in late February.

Russian troops have taken control of the decommissioned Chernobyl nuclear power plant and the active nuclear power station at Zaporizhzhia, prompting fears of potential nuclear disaster and large-scale environmental damage. Grossi has repeatedly expressed his concerns about nuclear safety as the conflict unfolds, but at no point has the IAEA warned of explicit and immediate danger outside Ukraine....

It will require Russia and Ukraine to "observe some of the rules...that have been repeatedly violated with enormous risk for the population, local, regional, European populations" since Russia's invasion of Ukraine in late February.

Once the framework is agreed, Grossi said he hopes to send IAEA experts to Ukraine "to facilitate the situation there, also as a deterrent to new, complicated, dangerous occurrences taking places." Experts will also look to gather "credible, objective information" about the situation on the ground, he said, noting that it is becoming "increasingly difficult" to ascertain the facts of the situation "because there are conflicting narratives about what is happening."

Source: https://www.politico.eu/article/deal-ukraine-nuclear-safety-iaea-chief-russia-war, 21 March 2022.

Russia Denies Nuclear Security Threat in Ukraine; 'all NPPs Working in Normal Mode'

Dismissing reports of nuclear security threat to Ukraine, Russia said all operating units of NPPs in the country are working in normal mode. Antonov was commenting on a recent statement by US Secretary of State for Arms Control and International Security, Bonnie Jenkins.

IAEA Director-General Rafael Mariano Grossi said Ukraine's nuclear regulator has informed that Russian forces had seized Slavutychit and that it is closely monitoring the situation in a Ukrainian city where many people live, who work at the Chornobyl NPP. The IAEA chief said he was concerned over the Chornobyl NPP staff's ability to regularly rotate and return to their homes in the nearby city of Slavutych to rest. "There has been no staff rotation at the NPP for nearly a week now," the regulator said.

Grossi has reached Ukraine for holding discussions on the agency's planned delivery of technical assistance to Ukraine for ensuring the security of the country's nuclear facilities. The Director-General of the UN watchdog will be talking with senior government officials and will further discuss the plans for averting the risk of an accident that could endanger people and the environment, the agency said. ...

Source: https://www.republicworld.com/world-news/russia-ukraine-crisis/russia-denies-nuclear-security-threat-in-ukraine-all-npps-working-in-normal-mode-articleshow.html, 30 March 2022.

Russian Forces have Begun to Pull Out of Chernobyl Nuclear Site, Says US

Russian forces have begun to pull out of the defunct Chernobyl nuclear power site after seizing control of the facility on February 24, a senior US defense official said on 30 March 2022. "Chernobyl is (an) area where they are beginning to reposition some of their troops – leaving, walking away from the Chernobyl facility and moving into Belarus," the official said. "We think that they are leaving, I can't tell you that they're all gone."

Source: https://www.ndtv.com/world-news/russian-forces-have-begun-to-pull-out-of-chernobyl-nuclear-site-says-us-2853545, 31 March 2022.

NUCLEAR WASTE MANAGEMENT

UK–AUSTRALIA

UK Repatriates Australian Nuclear Waste

A consignment of intermediate-level radioactive waste has been safely returned to Australia from the Sellafield plant in the UK. A single TN-81 transport and storage cask containing intermediate-level waste in the form of vitrified residues was transported to an Australian port by the specialist vessel *Pacific Grebe*. It was then transported overland to the Australian Nuclear Science and Technology's (ANSTO's) Lucas Heights facility near Sydney, arriving on 13 March.

A consignment of intermediate-level radioactive waste has been safely returned to Australia from the Sellafield plant in the UK. A single TN-81 transport and storage cask containing intermediate-level waste in the form of vitrified residues was transported to an Australian port by the specialist vessel *Pacific Grebe*.

The waste resulted from the reprocessing and recycling of used nuclear fuel, which had previously been used for medicine and scientific research in Australia. The flask contained waste that is radiologically equivalent to the 114 used fuel rods from ANSTO's Hifar reactor received by the UK in 1996.

The waste will be stored at the Lucas Heights facility until the planned national radioactive waste management facility near Kimba, South Australia, is operational. Nuclear Transport Solutions, part of the UK's Nuclear Decommissioning Authority (NDA), said it performed the shipment in full compliance with all UK, Australian and international regulations. The Vitrified Residue Returns Programme - a partnership between Sellafield Limited and Nuclear Transport Solutions - is a key component of the NDA's strategy to repatriate waste from the UK, fulfil overseas contracts and deliver UK government policy. This is the second time radioactive waste has been repatriated to Australia. The first was in December 2015 from France and the next is not anticipated until the mid-2030s.

Source: https://www.world-nuclear-news.org/Articles/UK-repatriates-Australian-nuclear-waste, 15 March 2022.

USA

New US Programme to Investigate Recycling of Used Fuel

The US DOE has announced funding of up to USD48 million for a new programme to recycle used nuclear fuel to produce feedstocks for advanced reactor fuel. Converting UNF Radioisotopes Into Energy (CURIE) will be run under the auspices of the Advanced Research Projects Agency-Energy (ARPA-E). ...

The US DOE has announced funding of up to USD48 million for a new programme to recycle used nuclear fuel to produce feedstocks for advanced reactor fuel. Converting UNF Radioisotopes Into Energy (CURIE) will be run under the auspices of the Advanced Research Projects Agency-Energy (ARPA-E).

According to ARPA-E's funding opportunity announcement, CURIE's goal is to enable commercially viable reprocessing of used nuclear fuel - or UNF - from the current light water reactor fleet by resolving key gaps/barriers in reprocessing technologies, process monitoring, and facility design. The actinides in the used fuel would ideally be reprocessed into feedstock that would be used to fuel advanced nuclear reactors, while other commercially valuable materials would be harvested for industrial and medical uses.

Projects funded under the programme will develop innovative separations technologies, process monitoring techniques for special nuclear

material, and/or equipment designs that will significantly improve the economics and process monitoring of reprocessing technologies while dramatically reducing the volume of high-level waste from used fuel requiring disposal. Recyling used nuclear fuel for use in advanced reactors would improve resource utilisation as well as reducing the volume of nuclear waste that requires permanent disposal, the agency said. The technologies could also substantially reduce the heat load and radiotoxicity of waste requiring permanent disposal while providing a valuable and sustainable fuel feedstock for advanced fast reactors....

Source: https://www.world-nuclear-news.org/Articles/New-US-programme-to-investigate-used-fuel-recycle, 16 March 2022.

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 Anil Chopra, PVSM AVSM VM VSM (Retd).

Centre for Air Power Studies
P-284
Arjan Path, Subroto Park,
New Delhi - 110010
Tel.: +91 - 11 - 25699131/32
Fax: +91 - 11 - 25682533
Email: capsnetdroff@gmail.com
Website: www.capsindia.org

Edited by: Director General, CAPS

Editorial Team: **Dr. Sitakanta Mishra, Dr. Poonam Mann, Dr. Silky Kaur, Abhishek Saxena, Anubhav S. Goswami,Prachi Lokhande, Dhrub Tara Singh**

Composed by: CAPS