



INTERVIEW of Ronald Hoffmann – KS Parthasarathy

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Some of AERB’s Earlier Activities

KS Parthasarathy (KSP): Professor Hoffmann, in USA, over 100 nuclear power plants are operating. The estimates by the US Nuclear Energy Institute indicate that there is appreciable increase in the capacity factor of nuclear power stations on an average during the past several years. There is also a claim that these improvements are achieved by the measures taken by the nuclear industry after the accident at the Three Mile Island Nuclear Power station. Still there is a feeling that nuclear power is on the decline in US. Is it true?

Lack of Growth of Nuclear Power

Ronald Hoffmann (RH): It is true that there is no further growth of nuclear power in USA. Some people mistrust nuclear power. Rightly or wrongly, many people perceive that nuclear power production is not under control. However, I do not think that any of these are the real reasons for the lack of growth of nuclear power. In my view, the main reason is economic. The petroleum lobby exerts tremendous pressure. Because of this lobbying, the price of petroleum products is unrealistically low. Nuclear energy cannot compete in the open market in that sort of

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atmosphere.

The academic community is divided on their views on nuclear power. Most of them know that nuclear power is safe. They also know that the fear of environmental degradation due to nuclear power is misplaced, though they have some concern about nuclear waste management. By and large, scientists are pretty well happy with the environmental aspects of nuclear power, but are not so much aware of the economic aspects.

Need to Correct Public Perception

KSP: You mentioned that there is a notion among public that nuclear industry is not under control. In what way this perception can be corrected?

RH: People are not aware of the strict training programmes instituted by those who operate nuclear power reactors. They are also not aware of the quality control procedures in place. The nuclear industry should strive hard to publicize the information about these activities.

I feel that in a way the perception problem is somewhat insoluble. Though accidents are very rare, the public concern is genuine, as the risk involved is immense in case an accident occurs. Risk perception is not the same thing as risk assessment.

KSP: Is it true that opposition to nuclear power is partly due to the anti-establishment attitude of section of the public?

RH: Yes, there is some truth in it. When people are well off as in some of the European countries they find some new things to worry about!

KSP: It is said that giving public all the information is probably the best way to correct the imbalance, is that really so? There is also a feeling that giving more information by itself may not help. Though the informed person may be little more informed. It may probably sensitize groups of individuals and also make them more concerned.

RH: I am for a very open system. In this respect, NASA did a very good job. They were very sensitive to public opinion. The public will accept risky activities. If they are told openly of the risks. A very open system is always better. I am in favour of talking to people and informing them. This is precisely what NASA did. Still, Space has a romance of its own, not like nuclear power.

Ways and Means Communicate

KSP: Generally, scientists are not good communicators. Nuclear scientists are not different. Do you have any views on the way scientists should communicate?

RH: Television is a good medium. I feel that there should be good TV programmes on basic science.

KSP: The staff of the AERB participated in some TV programmes, mainly in form of discussions. Don't you agree that science programme have great disadvantage?

RH: Well, they cannot obviously compete with entertainment programmes!

KSP: In the Kyoto conference a few pro-nuclear industrial fora promoted the virtues of nuclear power as a clean source of power which does not emit green house gases. Do you think this approach

is appropriate?

Environmental Advantages of Nuclear Power

RH: I feel that the information on environmental advantages of nuclear power is new. The enhanced greenhouse effect due to fuel combustion is established. Exhaust from automobiles and gas emission from fossil fuel plants are clearly visible. People are used to burning things, so the notion of emission of carbon dioxide is accepted. People relate drought, flood and climatic disasters to green house effect. People can be easily sensitized to issues of climatic changes. So nuclear power protagonists can have a natural alliance with informed environmentalists.

Nuclear Waste Management

KSP: What do you think are the other concerns of people in regard to nuclear power?

RH: Waste management is an important issue.

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The public is concerned about waster. I am concerned about waster, both industrial and nuclear. Of course, it is the military nuclear wastes, accumulated over the past few decades which create the greatest problem. There should be a long term programme for waste management. This is one area in USA, where the local, state level influences matter. NIMBY is currently the prevalent policy.

As for industrial wastes, heavy metal pollution is very important; Organics and plastics are biodegradable over a period of a few hundreds of years.

KSP: In the case of nuclear wastes also, barring some transuranics, the major part of the radioactivity comes from radio-nuclides such as Cesium-137 and Strontium-90. Just as plastics are biodegradable over a few centuries, these fission products decay to negligible values in a few hundred years. As a matter of fact, you will agree that much of the industrial wastes including heavy metals remain toxic forever and as such should belong to a different class of waste materials. For instance, enormous quantities of mercury are released from coal power stations. What do you think is the ultimate solution of radioactive waste management?

RH: In may view, vitrification, followed by storage in geological formations is the solution for radioactive waste. One has to find out geological formations where the vitrified waste can be stored indefinitely. There are many, uncertainties in regard to such geological sites.

KSP: Any general comments about nuclear industry in US?

Private Nuclear Power Industry, a Mistake

RH: I personally believe that we made a mistake in US. We allowed the nuclear industry to go private. People mistrust private industry.

KSP: Is it because of profit motive?

RH: Yes, in a way, private industry may cut corners to make profit. I prefer that the operation of nuclear power plants to be totally in public hands.

KSP: Post Three Mile Island and Chernobyl, the regulatory mechanisms got strengthened. Don't you think that self regulation is better than the imposed regulation?

RH: Yes, self regulation has merits, but in my view, there should be separate regulatory control, totally independent, even when the Government operates nuclear power plants. Regulation and control should be separated from operation. I also strongly feel that in regulatory organizations there is a need to involve well informed environmental scientists.

Renewable Sources of Power

KSP: What is your view about the renewable sources of power?

RH: I am convinced that renewable have vital role to play. Hundred years from

now, petroleum will be exhausted. Eventually, we will have to come back to solar and nuclear energy sources. They are cleaner. Solar is already used significantly in passive heating. There is also scope for large area solar energy collectors. Solar photovoltaic technology and technological developments in electronics are related. In my opinion, solar energy development will come supported or not as an unplanned fringe benefit of the development of electronics industry!

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KSP: Do you agree that the renewable excluding hydropower is unlikely to make a significant contribution to electric power generation due to various reasons?

RH: Solar is already making its contribution in small ways, say for instance, passive methods, hot water heaters, solar calculators. Solar power is currently expensive. But I believe that in a few years from now solar and nuclear will become competitive. ...

Source: Dr. KS Parthasarathy is former Secretary, AERB. Excerpted from the full article available at: <https://www.eurasiareview.com/29042023-some-of-aerbs-earlier-activities-interview-with-nobel-laureate-professor-roald-hoffmann/>. April 29, 2023.

OPINION—Maximilian Terhalle, Kees Klompenhouwer

Facing Europe's Nuclear Necessities

Deterrence can no longer be seen as just a bipolar equation — and it's time NATO addresses this fact. The euphoria in NATO surrounding Finland's new membership demonstrates a grim reality: Russia's brutal invasion of Ukraine has searingly exposed Europe's strategic vulnerability. It is clear now that the West's war efforts thus far would have been inconceivable without the USA, and Russia's shrill nuclear rhetoric has been slowly degrading the Continent's long-standing political unwillingness to address the nuclear elephant in the room.

With only a handful of strategic thinkers engaged with the nuclear problem, for years this issue has gone largely unnoticed, and curiously, former U.S. President Trump's departure from power has faded his threats to leave NATO from European memory. As the 2024 U.S. presidential election may once again result in an isolationist Republican

victor, however, doubts regarding Washington's nuclear defense commitment to Europe may well soon return. Meanwhile, China's revisionist ambitions — a bipartisan concern for the U.S. — are stretching America's role of security guardianship to an extent that the U.S. could eventually be obliged to make some hard choices. And as intimated by former Defense Secretary Mattis's succinct response of "No, Sir!" when asked whether America could fight two major wars simultaneously, these choices wouldn't be to the advantage of European security.

As such, deterrence can no longer be seen as just a bipolar equation — and it's time NATO addresses this fact. In 2011, as part of the "New START" nuclear arms reduction treaty — which imposed limits on deployed long-range nuclear weapons — both Russia and the U.S. had agreed on an equal number of said strategic arms. However, not only is this treaty set to expire by 2026, but Russian President Putin recently suspended it.

In addition, China is currently aiming to increase the total number of nuclear warheads at its disposal from 400 to 1,000 in the next few years, it's nuclear rise thus starting to shape a tripolar set of deterrence equations. This isn't only undermining the notion of nuclear strategic parity and making U.S. deterrence much more difficult to manage, but it's also contributed to the demise of the Intermediate-Range Nuclear Forces Treaty, which had limited the number of short- and intermediate-range — or sub-strategic — nuclear weapons in Europe, and a similar fate may now await the New START treaty too.

At the same time, Russia has been modernizing its sub-strategic nuclear arsenal as well, and consolidating its nuclear superiority when it comes to Europe. While Moscow now has 2,000 TNWs targeting the Continent; Europe has at its disposal merely 100 U.S. free-fall bombs that can

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be delivered by so-called dual-capable aircrafts (DCA) — i.e. fighter jets that could carry nuclear bombs into Russia. Otherwise, the UK has some 225 strategic nuclear warheads carried by submarines, while France has 290 strategic nuclear warheads of which approximately 50 are medium-range ASM — but that's it. Moreover, Russia has now developed a hypersonic glide missile that's nuclear capable and with a range of 2,000 kilometers, against which there is apparently no current effective defense.

Crucially, this combination of China's aggressive nuclear weapons program, Russia's growing sub-strategic nuclear superiority over Europe, and possible renewed American isolationism would spell the erosion of the U.S. nuclear umbrella's global credibility, pushing nations in East Asia and Europe to come up with national solutions — something that would effectively spell the end of the Nuclear Non-Proliferation Treaty, which is the cornerstone of nuclear arms control. This means that China is essentially changing the strategic calculations that NATO allies have to make.

As U.S. and Chinese political rhetoric have escalated, diplomatic relations between the two great powers have dangerously deteriorated. China now also appears determined to exercise sovereign control over Taiwan and the Western Pacific — something that will be difficult to deter. And though neither side is yet militarily ready for a direct confrontation, if diplomacy and statecraft fail, a military confrontation over Taiwan will become more likely — not least since the U.S. president has pledged to intervene directly in such a case, despite formally recognizing China's sovereignty over Taiwan. In such a scenario the U.S. would

then have to withdraw military assets from Europe, and European allies would be called upon to provide the bulk of the conventional force in the European theater to defend and deter against Russia. Thus, NATO now needs to think much harder about how to prepare the alliance prior to such a worst-case scenario, and this reevaluation needs to include the question of what the alliance should do in the nuclear realm — a question so far left untouched.

And critically, rethinking NATO's nuclear strategy in this way will likely lead to the alliance abandoning some of the axioms it now holds. For instance, based on global American strategic supremacy, the very idea of autonomous European defense has long been considered detrimental to the vital transatlantic link. However, with global strategic challenges growing fast, this principle is no longer tenable. And while addressing this will be a major political challenge, there's an undeniable need for a new approach that strengthens NATO by compensating for foreseeable gaps in the transatlantic nuclear deterrence posture.

While Moscow now has 2,000 TNWs targeting the Continent; Europe has at its disposal merely 100 U.S. free-fall bombs that can be delivered by so-called dual-capable aircrafts (DCA) — i.e. fighter jets that could carry nuclear bombs into Russia. Otherwise, the UK has some 225 strategic nuclear warheads carried by submarines, while France has 290 strategic nuclear warheads of which approximately 50 are medium-range ASM — but that's it. Moreover, Russia has now developed a hypersonic glide missile that's nuclear capable and with a range of 2,000 kilometers, against which there is apparently no current effective defense.

Three mutually reinforcing paths could provide a way forward here: First, upgrading the U.S. contribution to European sub-strategic nuclear deterrence, modernizing weapons and enlarging the number of DCA-capable nations in Europe. Second, starting a new dialogue on how the independent French and British deterrents could fit into this strategy. And third, nonnuclear European allies' strengthening their conventional forces to support NATO's overall deterrence strategy, including the link to U.S. nuclear deterrence. Given today's growing challenges, now is the time for NATO to adapt its concept of "peace through strength." And in order

to do so, it must rethink its nuclear deterrence strategy — there is no time to waste.

Source: <https://www.politico.eu/article/facing-europe-nuclear-necessities-strategy-vulnerability-war-weapon/>. April 22, 2023.

OPINION – World Nuclear News

A Guide: The End of Germany's Nuclear Power

This weekend sees the end of an era as Germany's long journey away from generating power from nuclear takes place with the closure of its last three operating reactors.

What is Happening? The last three operating nuclear power reactors in Germany are being permanently shut down on 15 April. Isar 2, Emsland and Neckarwestheim 2, all pressurised water reactors, had been due to end their lives by the end of last year, but were allowed an extension for the winter following energy capacity concerns as a result of the Russia-Ukraine war.

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How We Got Here - A Timeline: This weekend's final closures have been more than 20 years in the making and are the results of decisions taken by various coalition governments in the country.

1960s/70s: Germany was for many years a world leader in nuclear energy, with the Kahl experimental NPP the first to generate electricity when it went into operation in 1960 with more than 30 power and experimental reactors up and running in the following three decades. As World Nuclear Association's Information Paper on Germany says: "German support for nuclear energy was very strong in the 1970s following the oil price shock of 1974, and as in France, there was a perception of vulnerability regarding energy supplies."

1980s/90s: The Chernobyl accident led to a change in public and political attitudes to nuclear

energy and the last new NPP was commissioned in 1989. When the country was unified in 1990, all the Soviet-designed reactors in the former East Germany were decommissioned - five VVER-440 units at Greifswald, plus unit 6, which was completed but not operated, and construction of a four-unit VVER-1000/V-320 power station at Stendal was halted.

1998: A coalition government was formed between the Social Democratic Party and the Green Party, which had partly grown out of the anti-nuclear movement. At the time, there were 19 operating nuclear reactors in Germany. The political parties' agreement included a commitment to change the law to phase out nuclear power.

2001: After more than two years of talks and negotiations, the German government and the main energy companies signed a compromise deal putting a cap of 2623 billion kWh on lifetime production by all 19 operating reactors, limiting the operating lives of reactors to an average of 32

years. It also prohibited the construction of new NPPs and introduced the principle of on-site storage for used fuel.

2009: The new Christian Democrat (CDU) and Liberal Democrat (FDP) coalition government was committed to rescind the phase-out policy. The following year an agreement was reached to give eight-year extensions from the 2001-agreed dates for reactors built before 1980 and 14-year extensions to the later ones. The agreement included new tax measures and subsidies for renewables in return.

2011: Events at Fukushima led to the German government announcing an immediate three-month moratorium on nuclear power plans and then Chancellor Merkel decided all pre-1980 NPPs should be shut immediately - together with one unit already in long-term shutdown this amounted to 8336 MWe, about 6.4% of the country's

capacity. Although there was a safety assurance from the Reaktor-Sicherheitskommission review of the 17 reactors, the government decided to revive the previous government's phase-out policy and close all reactors by the end of 2022. The Bunderstag passed the measures by 513 votes to 79 in June 2011 and approved construction of new coal and gas-fired plants as well as a rapid expansion of renewables - a policy package known as Energiewende.

2022: Russia's war with Ukraine led to pressure to rethink, or at least delay, the phasing out of nuclear power with soaring energy prices and the end of gas supplies from Russia prompting fears of blackouts and energy security questions. Following a 'stress test' of the grid in September 2022, the coalition government - which includes the Green Party - agreed to keep Emsland, Isar 2 and Neckarwestheim 2 on standby until mid-April 2023.

What has the German Government Said? Lemke, Federal Minister for the Environment and Nuclear Safety said the phase-out made the country "safer" saying "with the shutdown of the last three NPPs, we are entering a new era of energy production. So let's continue to work on solutions for a nuclear repository and put all our energy into expanding renewable energies". Habeck, Federal Minister of Economics and Climate Protection, said that the phase-out was implementing the 2011 government's decision and said "security of energy supply in Germany is and will remain guaranteed...the massive expansion of renewable energies in particular

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provides additional security. In 2030 we want to generate 80% of the electricity here in Germany from renewable energies". The priority now was to "complete the phase-out safely, including dismantling, and to advance the search for a repository for high-level radioactive waste and permanent solutions for low- and intermediate-level radioactive waste".

What do Opinion Polls Suggest the German Public Think? According to an opinion poll for broadcaster ARD, six out of ten people in the DeutschlandTrend survey oppose the nuclear phase-out with 34% in favour of it. That compares with the from June 2011 when 54% thought the policy was correct and 43% opposed it, ARD said.

How Much Electricity could the Nuclear Plants Produce? To take just one example, Isar 2, its operator Preussen Elektra said that each year it generates roughly 11 billion kWh of electricity,

enough to supply 3.5 million households for a year, and in doing saving almost 10 million tonnes of CO2. Between the three of the reactors being shut this weekend, over their less-than 35-year lifetimes, according to World Nuclear Association, they have had load factors above 90% and generated 32.6 TWh of electricity.

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In Quotes: Reaction to the Phase-out: The Swiss Nuclear Forum's President, Bigler: "It is unfortunate that Germany, one of the world's leading nuclear energy nations, is abandoning this technology due to a government decision in the midst of an international energy and climate crisis. The workforce of the German NPPs can be proud.

With their work, they have reliably supplied Germany and its neighbouring countries with electricity over the past few decades, while preventing several billion tons of CO2 emissions." He added: "Last year we were already able to see that the gradual phase-out of nuclear energy and the loss of gas capacities were also compensated for by more climate-damaging electricity production from coal. This is not a good sign for climate protection in Europe." ...

The subcontinent currently has 22 reactors in operation with a total net capacity of around 6780 MW and is hoping to increase this almost threefold to a total capacity of 22,480 MW by 2031. It is not only considering expanding its large NPPs fleet but also developing SMRs.

Source: <https://www.world-nuclear-news.org/Articles/A-guide-The-end-of-Germany%E2%80%99s-nuclear-power>. April 14, 2023.

OPINION – Daniel Garton, et al.

Nuclear Energy Disputes: What Can India Learn from Global Trends?

India is one of the top energy-consuming countries in the world and is expected to surpass the EU by 2030. To meet its growing energy demand, India plans on growing its nuclear sector at pace over the next decade. The subcontinent currently has 22 reactors in operation with a total net capacity of around 6780 MW and is hoping to increase this almost threefold to a total capacity of 22,480 MW by 2031. It is not only considering expanding its large NPPs fleet but also developing SMRs. With such ambitious plans, what learnings should India take from previous trends in nuclear energy?

Development of India's Nuclear Energy Sector: In the 1960s, India made its first foray into the nuclear sector by building two small GE boiling water reactors. However, international collaboration quickly stopped when India carried

out its first nuclear weapon test in May 1974 while refusing to sign the NPT. Various international sanctions were imposed, which excluded India from nuclear trade. Over consequent decades, India relied mainly on Russia. But since the 2005 the Civil Nuclear Cooperation Initiative between India and the USA, India has been reinstated in the international nuclear community. At present, India has signed Agreements on Co-operation and Peaceful uses of Nuclear Energy with 13 countries.

As per India's 2006 Integrated Energy Policy, the country aims to achieve energy security for all of its citizens irrespective of their ability to pay for it. For this policy to be a reality, India needs to reduce its dependence on the import of fossil fuels. Yet, based on its current policies, India's combined import bill for fossil fuels is projected to triple over the next two decades, with oil the largest component by far. In meeting its growing demand for energy, India's policymakers are keen to adopt

Today, India is second in the world, after China, in terms of the number of reactors being constructed. One of India's primary goals for 2031 is to ensure the energy needed to sustain a growth rate of 8-9% becomes available. This opens opportunities for large-scale investment in the nuclear energy sector. Despite this momentum, steps towards increasing India's nuclear energy capacity will continue to meet delays arising from several factors.

"safe, clean and convenient forms of energy" at the lowest cost and in a technically efficient, economically viable, and environmentally sustainable manner. Currently, the nation devotes nearly 3% of its GDP to energy investment, and an increasing share of this investment is going into clean energy. Looking beyond 2050, policymakers view nuclear energy as the

most potent means to attaining long-term energy security and energy-independent status.

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large-scale investment in the nuclear energy sector. Despite this momentum, steps towards increasing India's nuclear energy capacity will continue to meet delays arising from several factors. First, the civil liability for nuclear damage law has been a source of concern to foreign suppliers. Second, there are inherent challenges in developing and building NPPs on budget and on time. Third, several nuclear power projects have met with protests from the local population owing to the nature of nuclear energy. Fourth and finally, there may be delays due to Russia-related sanctions, as Russia is currently the only foreign partner active in the Indian nuclear sector. Taking these considerations into account, it is important that all parties; whether local or foreign, are well-informed about the legal pitfalls they may face while working their way along the delicate path needed for the growth of nuclear energy in India.

Mitigating Legal Risks: Learnings from India and Abroad: NPP projects have a long history of disputes. The Olkiluoto 3 power plant in Finland, being designed and constructed by the French-German supplier consortium of Areva-Siemens for the owner Teollisuuden Voima Oyj (TVO), was due to have been completed in 2009 but has still not achieved Takeover. This had led to ICC arbitrations running for a decade. More recently, EDF made a EUR1.5bn claim from Areva in 2021 for Flamanville 3's operating losses.

The stringent process unique to the nuclear industry can lead to delays in the issuance of licensing approvals, which can then delay the planned construction schedule. Moreover, if the applicable regulations change during the construction period, the contractor may have to adapt its work to the new standards. For example, after the 9/11 terrorist attacks, regulators required design changes to consider the possibility of a plane crashing into

an NPP. Likewise, after the Fukushima Daiichi nuclear accident in 2011, regulators required design changes to address similar NPP vulnerabilities.

India is no different, and delays have already occurred in the construction of some NPPs such as the Kundankulam plant. Disputes in the nuclear sector can be mitigated if there is proper understanding and management of the associated risks from an early stage. First, risks can be managed during the procurement and contract drafting stage. The construction contract must specify and define the objectives in the order of their priority, such as scope of work and performance requirements, price, and time of completion, as well as the circumstances giving rise to extension of time and additional costs. Second, the stage of contract management is important for risk management. The parties should have clear and rigorous project management

procedures in place that would help identify and mitigate risks arising from misunderstanding between the parties. Third, risk management can be addressed at the stage of handling disagreements and disputes between the parties. When a claim arises in the project, it should be fairly and efficiently addressed in the manner provided in the dispute resolution clause in the contract. Claims should not

be allowed to accumulate, and a proper system must be in place for presenting and responding to claims by the parties.

Disputes are likely to arise due to the expected rate of involvement and investment by foreign entities, related to the construction of NPPs or otherwise. Given the international nature of these projects, and the risk of potential delays in resolving these disputes in the domestic courts in India, international dispute resolution (such as mediation or international arbitration) is likely to be a preferred choice. International construction

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contracts typically include an arbitration clause for resolution of disputes that arise during the project. The regulations in force in different jurisdictions associated with the construction of NPPs to guarantee certain standards are of utmost importance here.

Another avenue that can be adopted by investors for dispute resolution is to initiate investment treaty arbitrations under the Bilateral Investment Treaty (BIT) in force between the country of the investor and the home State of the owner. Even disputes arising out of delays and cost overruns in the construction of an NPP can potentially be the subject of investment arbitration in certain circumstances. The nuclear energy sector has also proven to be a fertile ground for commercial disputes, giving rise to some of the most high-profile arbitration cases worldwide in recent years. In 2013, US-utility company Southern California Edison (SCE) initiated an ICC

arbitration against Japan's Mitsubishi, alleging that Mitsubishi delivered faulty steam generators for Edison's San Onofre NPP in San Diego, USA. While in 2014, German energy group E.ON and its subsidiary PreussenElektra commenced an ICC arbitration against Belgian-based Electrabel over nuclear power tax payments arising from reciprocal electricity supply agreements entered into by the parties in 2009.

Disputes arising from a commercial relationship between different entities can range from non-supply of nuclear fuel, or supply of faulty plant equipment, to protection of intellectual property rights. Given the size of the nuclear supply chain related to the construction of all of the large NPPs and SMRs India wishes to build in the coming years, numerous commercial disputes are likely to arise in the future.

Legal Framework Governing the Sector: The Atomic Energy Act (1962) of India is the foundational legislation that governs all

regulations on the civil use of nuclear energy. But the 2010 Civil Liability for Nuclear Damage Act has had considerable implications for the development of the nuclear energy programme in India. The 2010 Act aims "to provide a civil liability for nuclear damage and prompt compensation to victims of a nuclear incident through a no-fault liability to the operator." The legislation allows the operator to have a right of recourse against the supplier for the compensation paid for a nuclear accident, if the accident results from the supplier's action.

This approach is partly a consequence of the 1984 chemical accident that occurred in Bhopal, the capital of the Indian state Madhya Pradesh. It was the worst industrial accident to date. The release of a toxic gas from a factory during the night caused, over several years, the death of 15,000 to 20,000 persons, and injured between 150,000 and 800,000 persons. An important legal

battle to compensate the victims ensued, and in October 2022, the Indian Government was still considering pursuing further action before the Supreme Court.

The 2010 Act is controversial because under the international nuclear liability conventions, the operator is strictly and solely liable and the operator would have a right of recourse against a supplier "only if this is expressly provided by a contract in writing". India's provision has been met with criticism from the nuclear industry, both domestic and international. The agreements already in place between India and foreign countries assumed that India would "create a civil nuclear liability regime based upon established international principles", which is not considered to be the case by the foreign suppliers.

The Indian government took some steps to address these concerns, with no success, such as: the adoption of the Civil Liability for Nuclear

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Damage Rules (2011), FAQs on the Act, and the establishment of the Indian Nuclear Insurance Pool, which provides nuclear liability insurance policies for the nuclear operators and suppliers respectively. However, the Nuclear Supplier's Insurance Policy (NSIP) has also given rise to a number of concerns. Firstly, the NSIP will only be effective as long as the one provided to the operator of the NPP, for which the suppliers have taken insurance, remains in full force and effect. Secondly, the NSIP only addresses the operator's right of recourse under Section 17(a) and Section 17(b) of the 2010 Act, and no other liability a supplier may incur for nuclear damage under any other laws, in India or abroad, is covered.

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In addition, at the time of writing, two public interest litigation petitions are currently pending before the Supreme Court. These petitions challenge the validity of the Act. Given India's present advancement in the nuclear energy sector and its increasing needs for energy, as well as its need to engage foreign suppliers and investors, it is important for the government, operators, and suppliers to find a way forward that will overcome these concerns.

Future Nuclear Development in India:

NPPs in India often attract protests, as well as resistance from the local population and civil rights groups. The Supreme Court's current role in balancing the general public's concerns with the government's vision to develop the nuclear energy sector in India appears to be a step in the right direction. The nuclear power sector has

NPPs in India often attract protests, as well as resistance from the local population and civil rights groups. The Supreme Court's current role in balancing the general public's concerns with the government's vision to develop the nuclear energy sector in India appears to be a step in the right direction. The nuclear power sector has immense potential to serve global targets for decarbonised energy.

immense potential to serve global targets for decarbonised energy. The situation in India is consistent with this, as India aims to increase the share of nuclear in its energy mix to meet its already known and anticipated energy needs and strategic security goals.

It is, however, conceivable that disputes may arise at an increasing rate in India and around the world, with the increased focus on nuclear energy. Should any such dispute arise in relation to an international project in the nuclear energy sector in India, international arbitration is likely to be the preferred choice of dispute resolution due to the

involvement of foreign players and the requirement of particular expertise in the field.

Indeed, examples from around the world indicate that there is a wide range of disputes in connection with the construction of NPPs and the commercial relationship between parties all through the supply chain that may end up as disputes in

construction, investment, or commercial arbitration. In this regard, it is important for the concerned parties to focus on early risk management, which must be followed diligently throughout the life of the project or contract. Often, parties can avoid or at least mitigate such disputes by adopting a proactive and well-informed approach from

the start. While India appears to be taking steps in the right direction in this regard, it does not mean that projects in the nuclear sector can be dealt with in an easy manner. A great deal of care and planning by all relevant players is essential for projects and contracts in a sector regulated like no other.

Source: <https://www.neimagazine.com/features/feature-nuclear-energy-disputes-what-can-india-learn-from-global-trends-10770472/>. April 18, 2023.

NUCLEAR STRATEGY

NATO

NATO's Nuclear Deterrence Policy and Forces

Nuclear weapons are a core component of NATO's overall capabilities for deterrence and defence, alongside conventional and missile defence forces. NATO is committed to arms control, disarmament and non-proliferation, but as long as nuclear weapons exist, it will remain a nuclear alliance.

NATO's Nuclear Deterrence Policy:

The fundamental purpose of NATO's nuclear capability is to preserve peace, prevent coercion and deter aggression. As long as nuclear weapons exist, NATO will remain a nuclear alliance. NATO's goal is a safer world for all; the Alliance seeks to create the security environment for a world without nuclear weapons.

NATO's current nuclear policy is based on two public documents agreed by all Allies:

- The 2022 Strategic Concept
- The 2012 Deterrence and Defence Posture Review

The 2022 Strategic Concept, adopted by Allied Heads of State and Government at the NATO Summit in Madrid sets out the Alliance's core tasks and principles, including deterrence. It states that NATO's deterrence and defence posture is based on an appropriate mix of nuclear, conventional and missile defence capabilities, complemented by space and cyber capabilities. The Alliance

reaffirms the imperative to ensure the broadest possible participation by Allies concerned in the agreed nuclear burden-sharing arrangements to demonstrate Alliance unity and resolve.

The Deterrence and Defence Posture Review (DDPR) was endorsed by Allied Heads of State and Government at the NATO Chicago Summit in May 2012. The DDPR stressed that the fundamental purpose of Alliance nuclear forces is deterrence, which is essentially a political function. While the Alliance focuses on the

maintenance of effective deterrence, political control of nuclear weapons will be kept under all circumstances and nuclear planning and consultation within the Alliance will be in accordance with political guidance.

NATO continues to affirm the importance of nuclear deterrence in light of evolving challenges. Allies have reiterated this principle at successive summit meetings since 2014 (the 2014 Wales Summit, the 2016 Warsaw Summit, and the 2018 and

2021 Brussels Summits), including the Madrid Summit in 2022, where Heads of State and Government agreed the Strategic Concept, which states that: "NATO will take all necessary steps to ensure the credibility, effectiveness, safety and security of the nuclear deterrent mission. The Alliance is committed to ensuring greater integration and coherence of capabilities and activities across all domains and the spectrum of conflict, while reaffirming the unique and distinct role of nuclear deterrence. NATO will continue to maintain credible deterrence, strengthen its strategic communications, enhance the effectiveness of its exercises and reduce strategic risks."

Nuclear Consultation: The key principles of NATO's nuclear policy are established by the

The 2022 Strategic Concept, adopted by Allied Heads of State and Government at the NATO Summit in Madrid sets out the Alliance's core tasks and principles, including deterrence. It states that NATO's deterrence and defence posture is based on an appropriate mix of nuclear, conventional and missile defence capabilities, complemented by space and cyber capabilities. The Alliance reaffirms the imperative to ensure the broadest possible participation by Allies concerned in the agreed nuclear burden-sharing arrangements to demonstrate Alliance unity and resolve.

Heads of State and Government of the 31 NATO member countries. The development and implementation of NATO's nuclear policy are the responsibility of the Nuclear Planning Group (NPG). The NPG provides the forum for consultation on all issues that relate to NATO nuclear deterrence. All Allies, with the exception of France, which has decided not to participate, are members of the NPG.

The Role of NATO's Nuclear Forces: The fundamental purpose of NATO's nuclear forces is for deterrence. Nuclear weapons are unique and the circumstances under which NATO might have to use nuclear weapons are extremely remote. Furthermore, any employment of nuclear weapons against NATO would fundamentally alter the nature of a conflict. Should the fundamental security of any NATO Ally be threatened, NATO has the capabilities and the resolve to impose costs on the adversary that would be unacceptable and far outweigh the benefits that any adversary could hope to achieve.

Strategic Nuclear Forces:

The strategic forces of the Alliance, and particularly those of the United States, are the supreme guarantee of the security of the Alliance. The independent strategic nuclear forces of the United Kingdom and France have a deterrent role of their own and contribute significantly to the overall security of the Alliance. These Allies' separate centres of decision-making contribute to deterrence by complicating the calculations of any potential adversaries. In other words, should an adversary decide to attack NATO, they must not only contend with NATO's decision-making, but also make a judgment about decision-making from the leaders of the United States, the United Kingdom and France.

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Dual-capable Aircraft: NATO's nuclear deterrence posture also relies on the United States' nuclear weapons forward-deployed in Europe, as well as on the capabilities and infrastructure provided by Allies concerned. A number of NATO member countries contribute a dual-capable aircraft (DCA) capability to the Alliance. These aircraft are central to NATO's nuclear deterrence mission and are available for nuclear roles at various levels of readiness. In their nuclear role, the aircraft are equipped to carry nuclear bombs in a conflict and personnel are trained accordingly.

The United States maintains absolute control and custody of their nuclear weapons forward deployed in Europe, while Allies provide military support for the DCA mission with conventional forces and capabilities. Nuclear sharing arrangements play a vital role in the interconnection of the Alliance and remain one of the main components of security guarantees and the indivisibility of security of the whole Euro-Atlantic area.

Evolution of NATO's Nuclear Policy:

Nuclear deterrence has been at the core of NATO's mutual security guarantee and collective defence since its inception in 1949. The very first NATO Strategic Concept (1949) referenced the requirement to "ensure the ability to carry out strategic bombing promptly by all means possible with all types of weapons without exception." The United States subsequently committed nuclear weapons to NATO in July 1953, with the first American theatre nuclear weapons arriving in Europe in September 1954. NATO's nuclear sharing arrangements, which were already in place by the time negotiations for the NPT began in the 1960s, were codified by the United States and the Soviet Union as a precursor for the final agreed NPT text. The United Kingdom has also assigned its nuclear forces, including its

current single submarine-based system and Continuous At-Sea Deterrent, to the protection of NATO Allies since 1962.

NATO seeks its security at the lowest possible level of forces and is fully committed to arms control, disarmament and non-proliferation. Since the height of the Cold War, it has reduced the size of its land-based nuclear weapons stockpile by over 90 per cent, reducing the number of nuclear weapons stationed in Europe and its reliance on nuclear weapons in strategy.

In response to Russia's unprovoked and unlawful war against Ukraine, at the extraordinary Summit on 24 March 2022, NATO Heads of State and Government affirmed that NATO will significantly strengthen its longer-term deterrence and defence posture and develop the full range of ready forces and capabilities necessary to maintain credible deterrence and defence. They further committed to enhancing preparedness and readiness for chemical, biological, radiological and nuclear threats. These decisions were reflected in the 2022 NATO Strategic Concept, which was adopted in June at the Madrid Summit.

Source: https://www.nato.int/cps/en/natohq/topics_50068.htm. April 11, 2023.

USA

U.S. Resumes Production of Nuclear Warheads after 32 Years

The United States has resumed the production of

nuclear warheads after a 32-year hiatus, according to Anton Gerashchenko, an advisor to the head of Ukraine's Ministry of Internal Affairs. Gerashchenko cited a report by the NNSA to Congress. The Ukrainian politician highlighted this change in U.S. policy on his Telegram channel,

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stating that the production of nuclear warheads in the U.S. had been "frozen" since the dissolution of the Soviet Union, which occurred 32 years ago. The production of plutonium cores for warheads was halted in 1989, even before the signing of the START I between the U.S. and the Soviet Union in 1991, as a reminder by the Ukrainian

official. This year, the United States plans to produce dozens of new nuclear missiles. Additionally, preventive measures are planned to

This year, the United States plans to produce dozens of new nuclear missiles. Additionally, preventive measures are planned to extend the operational life of the B61-12 nuclear bombs deployed in Europe and to modernize the Trident II ballistic missiles carried by submarines. The resumption of the U.S. nuclear program has been approved by President Joe Biden and is estimated to cost Washington USD 634 bn by 2031, according to the NNSA report cited by Gerashchenko.

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that the change in U.S. nuclear weapons policy is a response to Russia's actions. Russia deviated from its previous doctrine, which allowed for a nuclear response to a similar move by an adversary, in December 2022. At the end of last year, Vladimir Putin announced that Moscow could also consider a "preemptive strike." Source: <https://tvpworld.com/69497023/us-resumes-production-of-nuclear-warheads-after-32-years>, April 28, 2023.

USA–SOUTH KOREA

US to Dock Nuclear Subs in South Korea for 1st Time in 40 Years

Presidents Joe Biden and Yoon Suk Yeol sign an agreement that includes plans to have US nuclear-armed submarines dock in South Korea for the first time in more than 40 years, a conspicuous show of support to Seoul amid growing concern about nuclear threats by North Korea, according to senior Biden administration officials. The planned dock visits are a key element of what’s being dubbed the “Washington Declaration,” aimed at deterring North Korea from carrying out an attack on its neighbor. It is being unveiled as Biden is hosting Yoon for a state visit during a moment of heightened anxiety for both leaders over an increased pace of ballistic missile tests by North Korea over the last several months.

The three senior Biden administration officials, who briefed reporters on the condition of anonymity ahead of the official announcement, said that Biden and Yoon aides have been working on details of the plan for months and agreed that “occasional” and “very clear demonstrations of the strength” of US extended deterrence capabilities needed to be an essential aspect of the agreement. The agreement seeks to allay South Korean fears over the North’s aggressive nuclear weapons program and to keep the country from restarting its own nuclear program, which it gave up nearly 50 years ago when it signed the NPT. Yoon earlier this year said his country was weighing developing its own nuclear weapons or asking the US to redeploy them on the Korean Peninsula.

The US and South Korea also would coordinate more deeply on nuclear response strategy in the event of the North attacking the South — but operational control of such weapons would remain in US control, and no nuclear weapons are being deployed onto South Korean shores. Biden and Yoon did not directly address the agreement during their remarks

at a pomp-filled arrival ceremony before nearly 7,000 guests on the White House lawn nor during a brief appearance before reporters at the start of their Oval Office talks. Biden stressed that both nations are committed to “doubling down on our cooperation as allies” as North Korea “ramps up its challenges.” “We’re taking on the challenges of the world, and we’re taking them on together,” Biden said.

The state visit comes as the US and South Korea mark the 70th year of the countries’ alliance that began at the end of the Korean War and committed the United States to help South Korea defend itself, particularly from North Korea. Approximately 28,500 US troops are currently based in South Korea. “Why did they sacrifice their lives for this faraway country and for the people that you’ve never met?” Yoon said of the US troops who served during the war.

“That was for one noble cause: to defend freedom.”

The agreement also calls for the US and South Korean militaries to strengthen joint training and better integrate South Korean military assets into the joint strategic deterrence effort. As part of the declaration, South Korea will reaffirm its commitment to the NPT, an agreement signed by several major nuclear and non-nuclear powers that pledged their cooperation to stem the spread of nuclear technology, the officials said. As a candidate for the presidency last year, Yoon said he would call for the increased deployment of US bombers, aircraft carriers and nuclear submarines to South Korea as he looked to offer a firmer response to the North’s threats than his predecessor Moon Jae-in. ...

One Biden administration official cautioned it is “crystal clear” that there are no plans by the administration for “returning tactical or any other kind of nuclear weapon to the Korean Peninsula.” Instead, administration officials said they

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envision that the visit of ballistic missile submarines will be followed by the US military more regularly deploying assets such as bombers or aircraft carriers to South Korea. North Korea's increasing nuclear threats, along with concerns about China's military and economic assertiveness in the region, have pushed the Biden administration to expand its Asian alliance. To that end, Biden has thrown plenty of attention at Yoon as well as Japanese Prime Minister Fumio Kishida. Next week, Biden will host Philippine President Ferdinand Marcos Jr. for Oval Office talks.

In the past year, North Korea has been steadily expanding its nuclear arsenal, while China and Russia repeatedly block US-led efforts to toughen sanctions on the North over its barrage of banned missile tests. The stepped-up testing by North Korea includes the flight-testing of a solid-fuel intercontinental ballistic missile for the first time earlier this month. The recent test is seen as a possible breakthrough in the North's efforts to acquire a more powerful, harder-to-detect weapon targeting the continental United States. ...

Source: <https://timesofindia.indiatimes.com/world/us/us-to-dock-nuclear-subs-in-south-korea-for-1st-time-in-40-years/articleshow/99795506.cms?from=mdr>. April 26, 2023.

US and South Korea Agree Key Nuclear Weapons Deal

The US and South Korea have secured a landmark deal to counter the North Korean nuclear threat. Washington has agreed to periodically deploy US nuclear-armed submarines to South Korea and involve Seoul in its nuclear planning operations. In return, South Korea has agreed to not develop its own nuclear weapons. The Washington Declaration will strengthen the allies' co-operation in deterring a North Korean attack, US President Joe Biden said.

The US and South Korea have secured a landmark deal to counter the North Korean nuclear threat. Washington has agreed to periodically deploy US nuclear-armed submarines to South Korea and involve Seoul in its nuclear planning operations. In return, South Korea has agreed to not develop its own nuclear weapons. The Washington Declaration will strengthen the allies' co-operation in deterring a North Korean attack, US President Joe Biden said.

Concern has been rising on both sides about the nuclear threat posed by North Korea. Pyongyang is developing tactical nuclear weapons that can target South Korea, and refining its long-range weapons that can reach the US mainland. The US already has a treaty obligation to defend South Korea, and has previously pledged to use nuclear weapons if necessary. But some in South Korea have started to doubt that commitment and call for the country to pursue its own nuclear programme. The South Korean President, Yoon Suk-yeol, who was at the White House for a state visit,

said the Washington Declaration marked an "unprecedented" commitment by the US to enhance defence, deter attacks and protect US allies by using nuclear weapons. China - clearly not pleased with the US stance - warned against "deliberately stirring up tensions, provoking confrontation and playing up threats". The new agreement is a result of negotiations that took

place over the course of several months, according to a senior administration official.

Under the new deal, the US will make its defence commitments more visible by sending a nuclear-armed submarine to South Korea for the first time in 40 years, along with other strategic assets, including nuclear-capable bombers. The two sides will also develop a Nuclear Consultative Group to discuss nuclear planning issues. Politicians in Seoul have long been pushing Washington to involve them more in planning for how and when to use nuclear weapons against North Korea. As North Korea's nuclear arsenal has grown in size and sophistication, South Koreans have grown wary of being kept in the dark over what would trigger Mr Biden to push the nuclear button on their behalf.

A fear that Washington might abandon Seoul has led to calls for South Korea to develop its own nuclear weapons. But in January, Mr Yoon alarmed

policymakers in Washington when he became the first South Korean president to put this idea back on the table in decades. It suddenly became clear to the US that reassuring words and gestures would no longer work and if it was to dissuade South Korea from wanting to build its own bombs, it would have to offer something concrete. Furthermore, Mr Yoon had made it clear that he expected to return home having made "tangible" progress. Duyeon Kim, from the Centre for a New American Security, said it was a "big win" for South Korea to be involved in nuclear planning. "Until now, tabletop exercises would end before Washington's decision to use nuclear weapons," said Ms Kim. "The US had considered such information to be too classified to share, but it is important to practice and train for this scenario given the types of nuclear weapons North Korea is producing."

This new Nuclear Consultative Group ticks the box, providing the increased involvement the South Korean government has been asking for. But the bigger question is whether it will quell the public's anxieties. It does not ink a total commitment from the US that it would use nuclear weapons to defend South Korea if North Korea were to attack. However, Mr Biden said: "A nuclear attack by North Korea against the United States or its allies and partners is unacceptable and will result in the end of whatever regime were to take such an action."

In return, the US has demanded that South Korea remain a non-nuclear state and a faithful advocate of the non-proliferation of nuclear weapons. The US sees dissuading South Korea from going nuclear as essential, fearful that if it fails, other countries may follow in its footsteps. But these US commitments are unlikely to fully satisfy the influential, and increasingly vocal, group of academics, scientists and members of South

Korea's ruling party who have been pushing for Seoul to arm itself. ...President Biden said the US was continuing efforts to get North Korea back to the negotiating table. Washington says Pyongyang has ignored numerous requests to talk without preconditions. The US hopes to convince North Korea to give up its nuclear weapons, but last year the North Korean leader Kim Jong Un declared the country's nuclear status "irreversible". Some experts say it now makes more sense to discuss arms control rather than denuclearisation.

Source: Jean Mackenzie & Barbara Plett Usher, <https://www.bbc.com/news/world-us-canada-65404805>. April 28, 2023.

BALLISTIC MISSILE DEFENCE

INDIA

India Successfully Carries Out Maiden Flight Test of Sea-Based Ballistic Missile Defence Interceptor

The defence ministry said the purpose of the trial of the sea-based missile was to engage and neutralise a hostile ballistic missile threat, thereby elevating India into an elite club of nations having such a capability.

The purpose of the trial of the sea-based missile was to engage and neutralise a hostile ballistic missile threat, thereby elevating India into an elite club of nations having such a capability. India has successfully carried out the

maiden flight trial of an endo-atmospheric interceptor missile from a ship off the coast of Odisha in the Bay of Bengal as part of its ambitious ballistic missile defence programme. The defence ministry said the purpose of the trial of the sea-based missile was to engage and neutralise a hostile ballistic missile threat, thereby elevating India into an elite club of nations having such a capability.

The BMDs are capable of intercepting incoming long-range nuclear missiles and hostile aircraft including AWACS (airborne warning and control

systems). Defence Minister Singh congratulated the Indian Navy and the DRDO for the successful demonstration of the capabilities of the ship-based ballistic BMD system. It said the DRDO has already successfully demonstrated the capabilities of land-based BMD system to neutralise ballistic missile threats, emerging from adversaries. India has been developing capabilities to intercept hostile ballistic missiles both inside and outside the earth's atmospheric limits. The endo-atmospheric missiles are the ones that operate within the earth's atmosphere that covers an altitude below 100 kms. The exo-atmospheric missiles are capable of completing missions in the upper-most region of the earth's atmosphere, according to experts. The range of the missile defence system tested on 21 April is not immediately known.

Source: <https://zeenews.india.com/india/india-successfully-carries-out- maiden-flight-test-of-sea-based-ballistic-missile-defence-interceptor-2598110.html>. April 23, 2023.

JAPAN

Japan Gets Ready to Shoot Down N. Korea Spy Satellite Debris

Japan's defence chief ordered troops to activate missile interceptors and get ready to shoot down fragments from a North Korean satellite that may fall on the Japanese territory. North Korea's leader Un said earlier this week that its first military spy satellite that will be launched at an unspecified date. North Korea has test-fired about 100 missiles since early last year, saying it was responding to joint U.S.-South Korean military drills that it calls an invasion rehearsal. Several of the missiles flew over Japan or landed off the northern Japanese coast. North Korea test-launched a solid-fueled intercontinental ballistic missile for the first time. Defense Minister Hamada instructed troops to ready PAC-3 surface-to-air missiles in southwestern Japan, including Okinawa and nearby islands, in an area believed

to be under a flight path of a North Korean rocket that will carry the satellite.

He also ordered the deployment of destroyers equipped with SM-3 ship-to-air missiles to coastal waters, according to a ministry statement. An order to fire missiles has to be approved by the PM. North Korea is expected to carry out more weapons tests as the USA and South Korea continue their joint air exercise into next week.

Source: https://www.washingtonpost.com/world/2023/04/22/japan-missile-defense-north-korea-satellite/d2b3d8d0-e0f0-11ed-a78e-9a7c2418b00c_story.html. April 22, 2023.

Missile-Defence Units Arrive on Japan's Westernmost Island Ahead of the North Korean Launch

Equipment and personnel arrived on 23 April at Yonaguni, Japan's westernmost inhabited island, a day after the country's defense minister ordered the Patriot Advanced Capability-3, or PAC-3, missile-defense system to be deployed there. The move follows North Korea's

announcement of its final preparations to launch a "military surveillance satellite," according to a Japan Defense Ministry statement. North Korean leader Un has issued an order to launch multiple satellites once the preparations are finished, the statement said. A launch date has not been specified.

Hamada ordered the Air Self-Defense Force to prepare for the possibility of a ballistic missile flying over Japan, and the Maritime Self-Defense Force to deploy destroyers equipped with SM-3 missiles. The Standard Missile 3 is used by Japan and the USA as part of the Aegis system to destroy short- to intermediate-range ballistic missiles, according to Raytheon, its U.S. manufacturer. An Air Self-Defense Force C-2 transport aircraft arrived at Yonaguni Airport with

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the PAC-3 launcher units. The island is about 70 miles east of Taiwan. Multiple PAC-3 units have been permanently deployed on Okinawa since April 2013. The PAC-3 missile has a range of just over 18 miles and is designed to shoot down ballistic missiles.

Source: https://www.stripes.com/theaters/asia_pacific/2023-04-24/japan-missile-defense-north-korea-launch-9901197.html. April 24, 2023.

NORTH KOREA

North Korea Says it Tested New Solid-Fuel Long-Range Missile

North Korea said it has successfully test-launched a new intercontinental ballistic missile powered by solid propellants, a development that if confirmed could provide the country with a harder-to-detect weapon targeting the continental USA. North Korea's official Korean Central News Agency issued the report a day after the country's neighbors detected a launch of a long-range missile from near Pyongyang, which extended a run of weapons displays involving more than 100 missiles fired into sea since the start of 2022.

KCNA said the launch was supervised on site by North Korean leader Un, who described the missile — named Hwasong-18 — as the most powerful weapon of his nuclear forces that would enhance its counterattack abilities in the face of external threats created by the military activities of the USA and its regional allies. North Korea has justified its weapons demonstrations as a response to the expanding military exercises between the USA and South Korea, which the North condemns as invasion rehearsals while

using them as a pretext to push further its own weapons development.

Source: <https://www.defensenews.com/flashpoints/2023/04/14/north-korea-says-it-tested-new-solid-fuel-long-range-missile/>. April 14, 2023.

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UKRAINE

Raytheon's Patriot Missiles Arrive in Ukraine

Ukraine's defense minister said his country has received U.S-made Patriot surface-to-air guided missile systems it has long craved and which Kyiv hopes will help shield it from Russian strikes during the war. Ukrainian officials have previously said the arrival of Patriot systems, which Washington agreed to send last October, would be a major boost and a milestone in the war against Moscow's full-scale invasion. The Patriot can target aircraft, cruise missiles and shorter-range ballistic missiles. Russia has used that weaponry to bombard Ukraine, including residential areas and civilian infrastructure, especially the power supply over the winter. Ukrainian air force spokesman Ihnat said that delivery of the system would be a landmark event, allowing Ukrainians to knock out Russian targets at a greater distance.

Reznikov thanked the people of the USA, Germany and the Netherlands, without saying how many systems had been

delivered nor when. Germany's federal government website listed a Patriot system as among the military items delivered within the past week to Ukraine, and German Foreign Minister Baerbock confirmed that to lawmakers in Berlin.

Source: <https://www.defensenews.com/battlefield-tech/2023/04/19/raytheons-patriot-missiles-arrive-in-ukraine/>. April 19, 2023.

Ukraine's defense minister said his country has received U.S-made Patriot surface-to-air guided missile systems it has long craved and which Kyiv hopes will help shield it from Russian strikes during the war. Ukrainian officials have previously said the arrival of Patriot systems, which Washington agreed to send last October, would be a major boost and a milestone in the war against Moscow's full-scale invasion.

USA

US Air Force, Navy Conduct ICBM Test Aboard Nuclear Command Aircraft

The U.S. Air Force and Navy morning conducted a test launch of an unarmed Minuteman III intercontinental ballistic missile in California using an airborne control center. The weapon, which contained a test reentry vehicle, was controlled from an Airborne Launch Control System in a Navy E-6B Mercury aircraft, the Air Force said. Airmen from the 625th Strategic Operations Squadron from Offutt Air Force Base in Nebraska and Navy aircrew were aboard the E-6. Airmen from the 341st Missile Wing at Malmstrom Air Force Base in Montana also served on the task force supporting the test launch, which took place at Vandenberg Space Force Base in California.

The Air Force said the Minuteman's reentry vehicle traveled about 4,200 miles to the Kwajalein Atoll in the Marshall Islands. This was the first Minuteman test since Feb. 9, and the first time a test involved the use of the airborne control center since Aug. 16. The Air Force regularly conducts unarmed ICBM tests to ensure the missiles are functioning properly, and the service said this test was not in response to current world events. The Air Force said Wednesday's test verified the ICBM's accuracy and reliability, and produced data that the Defense Department, Energy Department and U.S. Strategic Command will use to ensure the military's nuclear missile enterprise is safe and secure.

Source: <https://www.defensenews.com/air/2023/04/19/us-air-force-navy-conduct-icbm-test->

aboard-nuclear-command-aircraft/. April 19, 2023.

**EMERGING TECHNOLOGIES AND DETERRENCE
RUSSIA**

Russia Develops New Decontamination Technology

Rosatom fuel company TVEL and the Troitsk Institute of Innovative & Thermonuclear Research (TRINITI) have developed a technology to decontaminate radiation-contaminated metal equipment using ozone baths. TVEL says it is much more efficient than foreign counterparts, and makes it possible to significantly

reduce time needed to treat secondary liquid radwaste. NPP equipment made of corrosion-resistant steels is usually decontaminated by chemical methods. Elements that require the removal of residual radioactivity are washed for a long time using special solutions including potassium permanganate as an alkali, then acid. The process takes 6-8 hours to eight hours, is costly, and results in the formation of a large volume of secondary liquid radioactive waste (LRW).

TRINITI specialists, commissioned by TVEL, have developed an alternative method. Instead of using a solution of potassium permanganate, water saturated with ozone bubbles in a very high concentration poured into the equipment cavity or into a decontamination bath and is heated to 95°C. Ozone is a non-aggressive, environmentally friendly and strong oxidising agent. Cleaning with this water-gas mixture takes only 20 minutes, says Vtorushin, project manager from TRINITI. This not only saves time and resources, but is also safer – the faster the cleaning process, the lower the

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Rosatom fuel company TVEL and the Troitsk Institute of Innovative & Thermonuclear Research (TRINITI) have developed a technology to decontaminate radiation-contaminated metal equipment using ozone baths. TVEL says it is much more efficient than foreign counterparts, and makes it possible to significantly reduce time needed to treat secondary liquid radwaste.

radiation dose.

Source: <https://www.neimagazine.com/news/newsrussia-develops-new-decontamination-technology-10770017>. April 18, 2023.

USA

NRC Starts Work on Regulatory Framework for Fusion

The US NRC will base its regulatory framework for fusion energy systems on its existing process for licensing the use of byproduct materials. "Dozens" of companies are developing pilot-scale commercial fusion designs, NRC Chair Hanson said. While the "precise future" for fusion in the USA is uncertain, the agency should provide "as much regulatory certainty as possible given what we know today," he added...

Fusion systems - described by the NRC as devices that contain nuclear fusion reactions as well as associated radioactive materials and supporting structures, systems and components - would generate electricity from the energy released when hydrogen atoms are combined to form helium, rather than the splitting, or fission, of uranium atoms. This means that such systems fall outside the requirements to be regulated by NRC as nuclear reactors, as they do not involve special nuclear material and cannot produce the self-sustained neutron chain reaction that defines nuclear fission reactors under NRC regulations. The US DOE last year announced up to USD 50M of federal funding to support experimental research in fusion energy science as part of the administration's "decadal

vision" to accelerate fusion energy. Some commercial fusion systems are now expected to reach design proof-of-concept, and even net power production, as soon as the mid-to-late 2020s, with deployment projected to follow in the 2030s, according to the NRC.

Source: <https://www.world-nuclear-news.org/Articles/NRC-starts-work-on-regulatory-framework-for-fusion>. April 18, 2023.

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Progress in Production of Isotopes from US Legacy Waste

Some 75-100 times more doses of next generation alpha targeted therapy treatments will be available annually worldwide, compared with today, through a project to produce isotopes from legacy nuclear material at the US DOE's Oak Ridge National Laboratory (ORNL), the project partners say. Since 2003, Isotek has been responsible for safely and securely overseeing the inventory of uranium-233 and preparing its removal from ORNL. Since then, employees have transferred and dispositioned about half of the inventory. The remaining inventory requires processing and down blending prior to disposal, which began in October 2019. Isotek Systems, TerraPower and the DOE entered a public-private partnership in 2018. Through this partnership, Isotek is extracting the rare medical isotope thorium-

229 for TerraPower Isotopes, a subsidiary of TerraPower, to advance promising cancer treatment research.

In 2021, TerraPower signed a collaboration agreement with Cardinal Health NPHS to produce

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and distribute TerraPower's actinium-225 product, which is generated using the thorium-229 extracted in ORNL. Actinium-225 will be used in drug trials involving targeted therapy for diseases such as breast, prostate, colon and neuroendocrine cancers as well as melanoma and lymphoma.

Isotek reinvested funds it received from TerraPower into the project, helping accelerate the work and begin processing uranium-233 sooner. Isotek purchased gloveboxes that allowed workers to begin processing canisters with lower levels of radiation. That approach enabled the extraction and delivery of rare isotopes quicker. This processing campaign, known as the Thorium Express Project, ran from 2019-2021. The project provides the capacity to produce 500,000 cancer treatment doses per year. Currently there are only 4000 doses of these lifesaving therapies, known as targeted alpha therapy, available worldwide. ORNL's uranium-233 inventory is a legacy of Cold War-era operations and its disposition is the DOE Office of Environmental Management's highest priority at the Tennessee site. It is stored in Building 3019, which has been described as the oldest operating nuclear facility in the world.

Source: <https://www.world-nuclear-news.org/Articles/Progress-in-production-of-isotopes-from-US-legacy>. April 14, 2023.

NUCLEAR ENERGY

CHINA

Construction Begins at Unit 2 of China's Lianjiang NPP

Drilling of the foundation pit has begun for unit 2 of China's Lianjiang NPP in Guangdong, marking the first phase of the Lianjiang Nuclear Power Project, which is in the pre-construction phase. Foundation work at unit 1 began in September 2022 after the State Council approved Phase I (units 1&2). Phase I will comprise two 1,250 MWe CAP-1000 units with an investment of CNY38.9bn (\$5.6bn). Six units are planned for the site. At the end of 2022, China National Nuclear Corporation (CNNC) subsidiary China Nuclear Construction signed two nuclear power engineering contracts for the project. Construction is expected to take 56 months for each unit.

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Source: <https://www.neimagazine.com/news/newsconstruction-begins-at-unit-2-of-chinas-lianjiang-npp-10779693>. April 21, 2023.

China Building 24 Nuclear Power Units, Ranking No.1 in World: Industry Report

Construction is in progress on 24 nuclear power units in China, with a total installed capacity of about 26.81 million kW, ranking the first in the world, an industry report showed. Since 2022, China has approved 10 new nuclear power units, put three new commercial units into operation and started construction on six new units, read a report titled

China Nuclear Energy Development Report 2023 released by the China Nuclear Energy Association (CNEA).

China now has 54 commercial nuclear power units with a total installed capacity of 56.82 million kW, ranking third in the world, the report said, noting that China's nuclear power units have maintained safe and stable operation for a long time, and the construction of new units has steadily advanced. In 2022, China's nuclear power units generated 417.78 billion kilowatt-hours (kWh) of electricity, up 2.5 percent year-on-year, accounting for about 4.7 percent of the country's total electricity generation. Nuclear power generation in China ranks second in the world, the report revealed. Compared with coal-fired power stations, China's nuclear power generation in 2022 was equivalent to reducing the burning of standard coal by nearly 120 million tons and reducing carbon dioxide emissions by nearly 310 million tons, it noted.

The safety performance of China's nuclear power is also at an advanced level globally, the report showed. Last year, 37 units in China scored full marks on the World Nuclear Power Operators Association's comprehensive index, accounting for 50 percent of the full score units in the world, Zhang Tingke, secretary-general of the CNEA, said in an interview with the China Media Group. The report also showed that China's independent innovation capacity in the field of nuclear power has been significantly enhanced.

Construction work started on the first nuclear power station this year on March 22 in Sanmen County, East China's Zhejiang Province. The annual power generation of the Sanmen No.4 unit is expected to reach 10 billion kWh, according to domestic news site chinanews.com. The Sanmen No.4 unit was primarily designed and

manufactured by domestic institutions, and domestic companies will build and operate it independently, with a localization rate of nearly 70 percent, chinanews.com reported.

Source: <https://www.globaltimes.cn/page/202304/1289882.shtml>. April 26, 2023.

FINLAND

TVO Accepts Olkiluoto EPR Ahead of Commercial Operation

Finnish utility Teollisuuden Voima Oyj (TVO) has issued an acceptance certificate to the Areva-Siemens consortium for the Olkiluoto 3 (OL3) EPR, which began regular electricity production on 16 April. It said the 1600 MWe reactor is scheduled to enter commercial operation on 1 May. The Areva-Siemens consortium constructed the OL3 plant under a fixed-price turnkey contract. They have joint liability for the

contractual obligations until the end of the guarantee period of the unit. Construction of Olkiluoto 3 began in 2005, with the completion of the reactor originally scheduled for 2009, but the project has had various delays and setbacks. OL3 attained the first criticality on 21 December 2021 and was connected to the grid on 12 March 2022. The EPR, a 1600 MWe pressurised water reactor, then entered a phase of test production during which some 3300 tests were conducted and more than 9000 test reports collated.

Source: <https://www.world-nuclear-news.org/Articles/TVO-accepts-Olkiluoto-EPR-ahead-of-commercial-oper>. April 20, 2023.

GERMANY

Tributes Paid as Germany's Last Nuclear Plants Close

The operators of the last three NPPs in Germany have marked their closures by saluting their operational records and contribution to providing

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low-carbon energy in the country for more than three decades. Neckarwestheim II: It was finally disconnected from the electricity grid on Saturday (15 April) at 11:59 pm German time, complying with the deadline of the Atomic Energy Act. Neckarwestheim II is a 1400 MW pressurised water reactor which fed electricity to the grid for the first time in January 1989 and has generated more than 375 billion kilowatt-hours of electricity over 34 years, supplying about one-sixth of total electricity demand, and two-thirds of household electricity demand, in the state of Baden-Wuttemberg. The dismantling plan, including licences, has already been obtained by EnBW for the plant and the company, which is working on dismantling four other reactors, says dismantling of Neckarwestheim II will take between 10 to 15 years.

Emsland: The 1400 MW pressurised water reactor was disconnected from the power grid in Lower Saxony on Saturday (15 April) at 10:37 pm local time, bringing an end to 35 years of operation during which its reliability has meant its overall availability has been around 94% and it supplied around 3.5 mn households with electricity each year, with operator RWE saying this meant 10 mn fewer tonnes of CO2 being released into the atmosphere.

Isar II: The Isar II NPP produced about 12 bn KWh a year, about 12% of total electricity consumption in Bavaria, enough for 3.5 mn households, The 1400 Mwe pressurised water reactor was commissioned in 1988, with operator PreussenElektra saying that power was gradually

reduced from 10:00 pm local time on Saturday (15 April), with the generator automatically disconnected from the power grid at 11:52 pm, marking the end of 35 years of power generation.

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Political Disagreement over the Closures: Even as the three reactors were being shut down for a final time, the Bavarian PM Söder was reported as asking the federal government to change the nuclear exit law to allow the state to operate plants under its own jurisdiction.

Source: <https://www.world-nuclear-news.org/Articles/Tributes-paid-as-Germany-s-last-nuclear-plants-clo.> April 17, 2023.

JAPAN

Japan Adopts National Strategy on Nuclear Fusion

Japan has adopted its first-ever national strategy on nuclear fusion reflecting the need to create a domestic fusion industry. The strategy calls for the wider participation of the private sector in fusion energy research & development. "We will...opportunities," said a report, compiled by the Cabinet Office. Japan has been a major contributor to ITER, under construction in France, which aims for first plasma in 2035. However, fusion research has been changing rapidly in recent years, with investors funding private-sector projects that have ambitions to get commercial reactors operating much sooner than ITER.

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In view of these developments, the report says Japan should take a "multifaceted approach" that includes creating and supporting homegrown fusion energy industries, not just participating in ITER. The government will establish a fusion industry council by March 2024 to develop the related industries, as well as draw up guidelines for ensuring the safety of fusion technology.

includes creating and supporting homegrown fusion energy industries, not just participating in ITER. The government will establish a fusion industry council by March 2024 to develop the related industries, as well as draw up guidelines for ensuring the safety of fusion technology. Japan will also accelerate industry-academia collaboration, with the National Institutes for Quantum Science & Technology (QST), playing a central role. The government will also prioritise fusion energy education at domestic universities to develop specialists in the field and seek to attract talent from institutions overseas and from other academic disciplines.

Japan's two main fusion research facilities are the JT-60SA at the QST Naka Fusion Institute in Naka, Ibaraki and the Large Helical Device (LHD) installed at the National Institute for Fusion Science (NIFS) in Toki, Gifu Prefecture. JT-60SA is an upgrade of the JT-60 (Japan Torus-60) previously run by the Japan Atomic Energy Research Institute (JAERI). JT-60 began operations in 1985. Following several modifications, in 2020, JT60 was upgraded to JT-60SA. In 2021 and 2022, a poloidal field coil short circuit was investigated, and repairs were done.

Source: <https://www.neimagazine.com/news/newsjapan-adopts-national-strategy-on-nuclear-fusion-10779676>. April 21, 2023.

NETHERLANDS

The Netherlands Considers Nuclear to Reduce Emissions

Many countries around the world are considering how nuclear energy could play a role in reducing CO2 emissions and enhancing energy security. In

the Netherlands, decision makers have been searching for ways to diversify and decarbonise their energy supply since the adoption of the 2019 national Climate Agreement, which has led to a transition in their nuclear energy policies.

A Nuclear Energy Agency delegation led by Director-General William D. Magwood, IV visited the Netherlands to meet with government and industry representatives on the future of the Dutch nuclear industry. The discussions covered topics including advancements in nuclear technology, development of skills and

industrial infrastructure and the preparations required by regulators for a transition in nuclear energy policies.

During the mission, Director-General Magwood met with Minister for Climate and Energy Policy Rob Jetten to discuss the development and impact of SMRs, with a special overview of the NEA SMR Dashboard, a new report that helps assess the progress of various SMR technologies. They also delved into the financing of, and government support for, nuclear new build.

Director-General Magwood and NEA Nuclear Strategic Policy Advisor Michel Berthélemy visited the TU Delft Reactor Institute (RID), which has been the Dutch knowledge centre for radiation-related research and education for over 50 years. During the visit, they met with Theun Baller, Director of RID at the Technical University of Delft, to discuss the ongoing joint TCOFF projects and the NEA's work in nuclear education, skills and technology capacity building within the NEST Framework. Director-General Magwood was invited to deliver a lecture to a group of PhD students at the institute on the opportunities and

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challenges of the nuclear sector's resurgence.

Nuclear safety and regulation, a key area of research for the NEA, was the focus of a meeting between Director-General Magwood and the Authority for Nuclear Safety and Radiation Protection (ANVS) Chair, Annemiek Van Bolhuis, and Vice-Chair, Marco Brugmans. As part of the exchange, they reviewed the benefits ANVS has gained from participating in NEA training programs and discussed the nuclear regulatory preparations required for planned developments in the Dutch nuclear sector. ...

The Netherlands has targets to reduce its carbon emissions by 49% by 2030 and by 95% by 2050. There is one nuclear reactor generating approximately 3% of the country's electricity, and an earlier decision reversed an initial plan to phase out nuclear power plants. The Netherlands has plans to build two new power plants by 2035 that could supply up to 13% of the country's electricity. The NEA looks forward to further supporting the Netherlands as it explores the role that nuclear energy could play in providing energy security while helping to mitigate climate change.

Source: https://www.oecd-nea.org/jcms/pl_80866/the-netherlands-considers-nuclear-to-reduce-emissions. April 26, 2023.

POLAND

Joint Venture Established for Second Polish Plant

A joint special purpose vehicle – named PGE PAK Energia J'drowa SA – has now officially been

formed by Polish companies ZE PAK and Polska Grupa Energetyczna (PGE) to implement the project to construct a NPP in Płtnów in central Poland. The plant will comprise two APR1400 reactors supplied by Korea Hydro & Nuclear Power (KHNP). The joint company will represent the Polish side at all stages of the project, including the execution of the siting and environmental studies, acquiring financing, and the preparation of a detailed

investment schedule together with the Korean side, but also, in the subsequent stages, obtaining permits and administrative decisions.

PGE and ZE PAK – which is wholly-owned by the State Treasury – will each hold 50% of the shares in PGE PAK Energia J'drowa SA, which will be based in Konin.

On October 28, 2022, Poland's PM Morawiecki announced that the US firm Westinghouse had been selected for the first part of the country's six-reactor plan to build up to 9 Gwe of capacity by 2040. The letter of intent about the Płtnów plant says the Korean agreement "is a new project to supplement the existing

Polish government-led NPP plan".

Source: <https://www.world-nuclear-news.org/Articles/Joint-venture-established-for-second-Polish-plant>. April 13, 2023.

SOUTH KOREA

Partnership Formed to Deploy Seaborg's Power Barge

Korea Hydro & Nuclear Power (KHNP), Samsung Heavy Industries (SHI) and Seaborg Technologies have established a consortium to develop floating NPPs featuring Seaborg's compact molten salt

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reactor (CMSR) technology. Seaborg's design is for modular CMSR power barges equipped with two to eight 100 MWe CMSRs, with an operational life of 24 years. Instead of having solid fuel rods that need constant cooling, the CMSR's fuel is mixed in a liquid salt that acts as a coolant, which means that it will simply shut down and solidify in case of emergency. The timeline for Seaborg, which was founded in 2014, is for commercial prototypes to be built in 2026 with commercial production of Power Barges beginning from 2028.

Source: <https://www.world-nuclear-news.org/Articles/Partnership-formed-to-deploy-Seaborg-s-Power-Barge>. April 21, 2023.

TURKEY

Progress at Akkuyu NPP Unit 2

The fourth tier of the internal containment (VZO) has been installed at unit 2 of the Akkuyu NPP under construction in Turkiye, which is one of the main elements of the safety system. The VZO, made of a special concrete mix with a steel lining, ensures the tightness of the reactor compartment. The internal radius is 22 mts, the height 8 mts, and the weight more than 144 tn. During three months, a longline was assembled near the unit 2 construction site. The installation was carried out using a Liebherr LTM 1300 truck crane and two hydraulic devices.

The reactor buildings at the Akkuyu NPP power units are equipped with double containment. The outer protective shell is formed from reinforced concrete and designed to withstand extreme external influences including earthquakes of up

Korea Hydro & Nuclear Power (KHNP), Samsung Heavy Industries (SHI) and Seaborg Technologies have established a consortium to develop floating NPPs featuring Seaborg's compact molten salt reactor (CMSR) technology. Seaborg's design is for modular CMSR power barges equipped with two to eight 100 MWe CMSRs, with an operational life of 24 years.

to 9 points, tsunamis, hurricanes, as well as their combinations. Akkuyu, Turkiye's first NPP, will eventually host four Russian-designed VVER-1200 reactors. The pouring of first concrete for unit 1 took place in April 2018, for unit 2 in June 2020, for unit 3 in March 2021, and for unit 4 in July 2022. Completion of unit 1 is expected in the third quarter of 2023. Rosatom is constructing the reactors according to a build-own-operate model. To date, the project is fully funded by the Russian side. However, Rosatom has the right to sell a share of up to 49% in the project to other investors.

Construction and installation work on site is underway simultaneously at all the main and auxiliary facilities. These include four power units, onshore hydraulic structures, power distribution system, administrative buildings, training centre, and physical protection facilities. All stages of construction are closely monitored by independent inspection organisations and the Turkish Nuclear Regulatory Agency (NDK).

Source: <https://www.neimagazine.com/news/newsprogress-at-akkuyu-npp-unit-2-10779528>. April 21, 2023.

USA

US DOE Contract Awarded for Hanford Site Work

The US DOE Office of Environmental Management (EM) has awarded the Hanford Integrated Tank Disposition Contract (ITDC) to Hanford Tank Waste Operations & Closure, LLC (H2C) of Lynchburg, Virginia, for work at the Hanford Site in southeastern Washington State. The Hanford Site is home to approximately 56m gl of radioactive tank waste stored in 177 underground tanks, representing one of DOE's largest environmental risks and most

complex challenges. The tank waste is a result of nearly five decades of plutonium production during World War II.

H2C is a newly formed limited liability company comprising BWXT Technical Services Group (BWXT TSG), Amentum Environment & Energy (Amentum), and Fluor Federal Services (FFS). H2C's Teaming Subcontractors include DBD, DSS Sustainable Solutions USA, INTERA Incorporated, and Longenecker & Associates. The \$45bn indefinite-delivery, indefinite-quantity contract over a 10-year ordering period covers a broad scope of work, including The but not be limited to the following:

- Operation of tank farm facilities, including single-shell tank waste retrieval and closure
- Design, construction, and operation of waste receiving facilities and treatment capabilities
- Operation of the Waste Treatment and Immobilisation Plant
- Core functions such as project management; environment, safety, health, and quality; security and emergency services; and business performance requirements.

The contract includes requirements for meaningful work to be performed by small businesses and will promote robust community commitment and engagement, including support to site reindustrialisation by the local community. Submission of a community commitment plan to DOE is also required. For more than 30 years, EM has focused on addressing the environmental legacy of nuclear weapons development and nuclear energy research. EM said it delivering results that are protecting the environment, supporting

communities, and enabling a concerted focus on safely completing the mission sooner and more efficiently.

Source: <https://www.neimagazine.com/news/newsus-doe-contract-awarded-for-hanford-site-work-10779638>. April 21, 2023.

NUCLEAR SECURITY

UKRAINE

Landmine Explosions 'Underline Need for Zaporizhzhia Protection Agreement'

IAEA DG Grossi says that the Zaporizhzhia NPP's reliance on a single functioning external power line, and two landmine explosions near the plant, mean it is "more important than ever to agree" safety measures for the site. The six-unit NPP, Ukraine and Europe's largest, has been under Russian military control since the start of March 2022. It is near the frontline of Russian and Ukrainian forces and has been affected by shelling on a number of occasions over the past year, as well as having had to rely on emergency diesel generators for essential safety functions in periods when it has lost all external power.

In an update on the nuclear energy safety situation in Ukraine, Grossi said it was not clear what had caused the landmine blasts outside the plant's perimeter fence on 8 April and 12 April, but added that IAEA experts at

the site continued to regularly hear shelling in the area. The IAEA DG has held talks in Ukraine and Russia, and visited Zaporizhzhia itself, in the past few weeks, to seek to strengthen nuclear safety and security at the plant - the earlier plan to create a geographical protection zone around the plant has now been modified after failing to get

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agreement on the details of its size and how it would work. Instead, he has said the aim is to get agreement on fundamental principles.

The issue of external energy supply to the nuclear plant - needed for essential safety systems and for cooling - continues to be a concern, with the plant relying on a single 750kV power line for the past six weeks. A back-up 330kV power line was damaged on 1 March on the other side of the Dnipro River in territory controlled by Ukraine and the IAEA reports Ukraine as saying that "military action in the area is preventing its experts from safely accessing the location".

Source: <https://www.world-nuclear-news.org/Articles/Landmine-explosions-underline-need-for-Zaporizhzi>. April 14, 2023.

US Warns Russia not to Touch US Technology at Zaporizhia NPP

The US has sensitive nuclear technology at a NPP inside Ukraine and is warning Russia not to touch it, according to a letter the US DOE sent to Rosatom. The letter, from the director of DOE's Office of Nonproliferation Policy, Ferkile, was dated 17 March 2023. It tells Rosatom's DG that the Zaporizhia NPP in Enerhodar "contains US-origin nuclear technical data that is export-controlled by the US Government".

Since Russia took control of ZNPP in March 2022, the Russian national guard has been protecting the station and in October, Russian President Putin signed a decree formally transferring ZNPP to Russian jurisdiction under nuclear utility Rosenergoatom. A Russian Federal State Unitary Enterprise. Zaporizhia NPP was established by Rosenergoatom to operate the plant. ZNPP has been subjected to repeated shelling and drone attacks as well as several major military operations by Ukrainian forces to take back control of the facility. US technologies at ZNPP largely concern Westinghouse-supplied nuclear fuel, a used fuel dry storage facility built by Holtec and software related to operation of the six units, none

of which is of any interest to Rosatom, according to the large number of Russian scientists and nuclear experts who commented on the DOE letter. In 2015 Energoatom ordered Westinghouse fuel for ZNPP unit 5 as well as for South Ukraine.

Source: <https://www.neimagazine.com/news/newsus-warns-russia-not-to-touch-us-technology-at-zaporizhia-npp-10779550>. April 21, 2023.

US Installing 'Atomic Sensors' Across Ukraine to Detect Use of Nuclear or Dirty Bombs by Russian Military

The US is installing a network of sensors across Ukraine to detect a possible nuclear explosion and bursts of radiation, the New York Times reported.

The sensors will be able to detect radiation from both a dirty bomb and a nuclear weapon activated in Ukraine, the report said. In a statement, the Nuclear Emergency Support Team (NEST) said that the network of atomic sensors was being deployed "throughout the region" and would have the ability "to characterize the size, location, and effects of any

nuclear explosion." The move would allegedly deny Russia any opportunity to use nuclear weapons in Ukraine without attribution, the report said.

The sensors will presumably serve as deterrence because they would make Russian decision-makers aware the United States can expose the use of a nuclear weapon as a false-flag operation, the report cited the statement as saying. "If a nuclear emergency were to occur in Ukraine, whether a radiation release from a nuclear reactor or a nuclear weapon detonation," the statement said. "Scientific analyses would be rapidly provided to US government authorities and decision-making centers in Ukraine and the region to make actionable, technically informed decisions to protect public health and safety."

Earlier, US National Nuclear Security Administration chief Jill Hruby confirmed in congressional testimony that her agency, along with the National Security Agency (NSA), have

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installed sensors in Ukraine to detect radiological activity and has already started training people in Ukraine on how to respond in case of a nuclear blast.

Source: Ashish Dangwal, <https://eurasianimes.com/installing-atomic-sensors-across-ukraine-to-detect-use/>, April 28, 2023.

Russia Says it doesn't Need US Fuel for Zaporizhzhia

Russia will switch the occupied Zaporizhzhia nuclear power plant back from US-made nuclear fuel as soon as possible, according to reported comments from Renat Karchaa, an adviser to Rosenergoatom's CEO. It follows a CNN report that the US Department of Energy had sent a letter saying that the occupied plant in Ukraine "contains US-origin nuclear technical data that is export-controlled by the United States Government".

According to the CNN report the US DOE letter says: "It is unlawful under United States law for non-authorized persons, including, but not limited to, Russian citizens and Russian entities, such as Rosatom and its subsidiaries, to knowingly and willfully access, possess, control, export, store, seize, review, re-export, ship, transfer, copy, manipulate such technology or technical data, or direct, or authorize others to do the same, without such Russian entities becoming authorized recipients by the Secretary of the US Department of Energy."

Russia's Tass news agency reported that a commentary by Rosatom says: "We have informed the Russian Foreign Ministry on our readiness to discuss with the American side the issues it is interested in within the framework of existing agreements between the government of the Russian Federation and the government of the United States on cooperation in the area of peaceful

nuclear development." The document reportedly says that Russia always "observes all international obligations in the field of non-proliferation and export control", and adds, according to the Tass report, that this position "fully covers" the Zaporizhzhia nuclear power plant.

Meanwhile, a report by Reuters, citing Interfax, said that Karchaa had said the plant had about four years' worth of US-made fuel in reserves but would seek to replace it with Russian fuel as quickly as possible. In a report of his comments by Tass, Karchaa is quoted as saying that the USA should negotiate with Russia over the presence of the nuclear fuel at the plant in a "constructive" manner, saying the IAEA could be involved and "all issues are resolved at the negotiating table between equals". It also says "he reiterated that Russia needs neither US nuclear fuel, nor US technologies".

Source: <https://www.world-nuclear-news.org/Articles/Rosatom-ready-to-discuss-non-proliferation-and-exp>. April 20, 2023.

It is unlawful under United States law for non-authorized persons, including, but not limited to, Russian citizens and Russian entities, such as Rosatom and its subsidiaries, to knowingly and willfully access, possess, control, export, store, seize, review, re-export, ship, transfer, copy, manipulate such technology or technical data, or direct, or authorize others to do the same, without such Russian entities becoming authorized recipients by the Secretary of the US Department of Energy.

Korea Atomic Energy Research Institute (KAERI) has signed a MoU with the Government of Alberta to collaborate on the deployment of SMR technology - including the Korean-designed SMART reactor - in the Canadian province.

SMALL MODULAR REACTORS

SOUTH KOREA-CANADA

MoU Sees KAERI, Alberta Cooperation on SMRs

Korea Atomic Energy Research Institute (KAERI) has signed a MoU with the Government of Alberta to collaborate on the deployment of SMR technology - including the Korean-designed SMART reactor - in the Canadian province. The MoU was signed on 19 April by KAERI President Gyu, Alberta Minister of Jobs, Economy and Northern Development Jean and Alberta Minister of Trade, Immigration and Multiculturalism Sawhney.

KAERI said that since Alberta took an "ambitious

initiative” to deploy SMR technology along with other Canadian provinces, KAERI and Alberta have discussed clean energy cooperation based on KAERI’s SMR technology, particularly the SMART (System-integrated Modular Advanced Reactor). SMART is a 330 MWe pressurised water reactor with integral steam generators and advanced safety features. The unit is designed for electricity generation (up to 100 MWe) as well as thermal applications, such as seawater desalination, with a 60-year design life and three-year refuelling cycle. While the basic design is complete, development had been stalled by the absence of

any orders for an initial reference unit. Developed by KAERI, SMART received standard design approval from the Korean regulator in mid-2012. KAERI had planned to build a demonstration plant to operate from 2017. Alberta has been considered in the past as a possible location for large-scale NPPs, but a 1000 MWe electricity generation plant proposed for the north of the province was shelved in 2011. The province’s interest in SMRs is centred on their potential as an economically attractive and carbon-free source of steam and process heat to support extractive industries including the production of natural gas from the province’s extensive oil sands deposits.

Source: <https://www.world-nuclear-news.org/Articles/MoU-sees-KAERI,-Alberta-cooperation-on-SMRs>. April 20, 2023.

USA-POLAND

More US Money for Polish SMR Plans

The US Export-Import Bank and US International

Development Finance Corporation (IDFC) may lend up to \$4bn to Orlen Synthos Green Energy’s project to deploy SMRs in Poland. Orlen Synthos Green Energy has signed letters of intent with EXIM Bank

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for up to \$3bn and IDFC for up to \$1bn. The aim is to build and deploy the first two SMRs to be designed by GE Hitachi Nuclear Energy (GEH). The company is hoping to develop around 20 GEH BWRX-300 SMRs. Polish PM Morawiecki told a news conference that the country needed a “cheap, clean and reliable energy source” like the SMRs that will produce emission-free energy and be a driving force for the economy for decades to come.

Orlen Synthos Green Energy named seven shortlisted optimum locations for further geological surveys to site SMRs. The locations are: Ostroleka, Wloclawek, Stawy Monowskie, Dabrowa Górnicza, Nowa Huta, Tarnobrzeg

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Special Economic Zone and Warsaw. The company said these are locations with, among others, “high energy-intensive production plants, as well as locations that are optimal for heating system purposes”. In December 2021, GE Hitachi, BWXT Canada and Synthos Green Energy (SGE) signed a Letter of Intent to cooperate

in deploying BWRX-300 SMRs in Poland. Orlen Synthos Green Energy – a joint venture between chemical producers SGE and PKN Orlen – submitted an application to Poland’s National Atomic Energy Agency on 8 July last year for an assessment of the BWRX-300, for which it holds the exclusive right in Poland.

Source: <https://www.neimagazine.com/news/newsmore-us-money-for-polish-smr-plans-10775624>. April 20, 2023.

USA–SOUTH KOREA

US-Korean Partners to Build SMR-Powered Hydrogen Production Facility

Ultra Safe Nuclear Corporation (USNC) of the USA has signed a MoU with South Korea’s Hyundai Engineering and SK E&C to conduct joint research and development for the commercialisation of Hydrogen Micro Hubs over the next five years. The Hydrogen Micro Hub is a facility that produces hydrogen by applying a high-temperature electrolysis process of solid oxide electrolysis cells (SOEC) to the electricity and high-temperature steam generated by USNC’s Micro-Modular Reactor (MMR). USNC said that, compared with commercial pressurised water reactors, this technology can generate relatively high-temperature steam, enabling the use of SOEC operating at high temperatures, which can maximise hydrogen production efficiency with less energy. Hyundai Engineering will oversee the MMR-related balance of plant and engineering, procurement and construction activities, while USNC will be responsible for the design, manufacturing and supply of the MMR. SK E&C will establish a nuclear power-based hydrogen production system using Bloom Energy’s SOEC and supply hydrogen production equipment.

Source: <https://www.world-nuclear-news.org/Articles/US-Korean-partners-to-build-SMR-powered-hydrogen-p>. April 21, 2023.

NUCLEAR COOPERATION

BANGLADESH–RUSSIA

Bangladesh Pays Russia in Yuan for NPP to Avoid Sanctions

Bangladesh has recently approved payment of \$318m for payment to Russia in the Chinese currency of yuan for construction of the Rooppur NPP. At a recent meeting between the Bangladesh Finance Ministry’s Economic Relations Division and Russian officials, it was decided that the payment will be made in yuan at a Chinese bank account, Karmkar, head of the European affairs of Economic Relations Division (ERD), Ministry of Finance confirmed. He added that the transaction has not yet been completed s payment details need to be clarified and resolved. Last year, Western countries excluded Russia from the Society for Worldwide Interbank Financial Telecommunications, or SWIFT, one of the world’s payment systems, due to its military operation in Ukraine. The \$12.65bn two-unit Rooppur NPP is being built by Rosatom in Bangladesh with a 90% loan from Russia repayable over 28 years, with a 10-year grace period. However, due to sanctions, it has not been not possible to make repayments in US dollars.

The Hydrogen Micro Hub is a facility that produces hydrogen by applying a high-temperature electrolysis process of solid oxide electrolysis cells (SOEC) to the electricity and high-temperature steam generated by USNC’s Micro-Modular Reactor (MMR). USNC said that, compared with commercial pressurised water reactors, this technology can generate relatively high-temperature steam, enabling the use of SOEC operating at high temperatures, which can maximise hydrogen production efficiency with less energy.

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The Bangladesh arrangement comes after several other countries s recently indicated they would opt for yuan payments to circumvent the need to

use dollars. Paying for the nuclear plant in yuan could pave the way for resumption of normal trade between Russia and Bangladesh, which has been blocked by the sanctions.

In September 2022, the Central Bank of Bangladesh opened a window for transactions in the yuan, allowing local banks to open accounts in yuan in their branches abroad for settlements on cross-border transactions in Chinese currency. Bangladeshi exporters were also allowed to keep the yuan in their export quota for settlements in Chinese currency. The Rooppur plant is being built by Rosatom on the eastern bank of the Ganges River in Bangladesh's Pabna district, about 160 km northwest of Dhaka. It will comprise two VVER-1200 reactors. In November 2011, Russia and Bangladesh signed an intergovernmental agreement on cooperation in the construction of the NPP, and in mid-December 2015, a general contract was signed. Construction began in 2021.

Source: <https://www.neimagazine.com/news/newsbangladesh-pays-russia-in-yuan-for-npp-to-avoid-sanctions-10779590>. April 21, 2023.

BULGARIA–CANADA–URENCO

Urenco, Cameco Sign Supply Deals for Bulgaria's Kozloduy

Urenco and Cameco are joining Westinghouse in the supply chain for one of the Kozloduy units in Bulgaria as the country diversifies its nuclear fuel supplies. The long-term agreement will see Urenco's enrichment facilities in Europe - which are in the UK, Netherlands and Germany - receive natural uranium (UF₆) from Cameco and supply enriched uranium product for fabrication into nuclear fuel rods by Westinghouse. Cameco said

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The agreement by Canada, France, Japan, the UK and USA to leverage their civil nuclear power sectors to ensure a stable supply of nuclear fuel for existing and future reactors came as G7 climate, energy and environment ministers concluded a two-day meeting with a promise to accelerate the phase-out of fossil fuels.

that the 10-year supply contract was for it to supply natural uranium hexafluoride to meet the full requirements of Kozloduy unit 5 through to 2033.

The Russian war with Ukraine has led to a number of plants and countries in Europe seeking to switch from Russian-supplied fuel and Bulgaria's National Assembly voted in November for an acceleration of the diversification process. At the end of last year, a separate agreement was signed with France's Framatome relating to the supply of nuclear fuel for the sixth unit at Kozloduy. The Bulgarian Ministry of Energy said at the time that having different nuclear fuel suppliers for the two units at Kozloduy was intended to meet EU requirements to ensure security of supply. The Kozloduy plant is in the northwest of Bulgaria on the Danube River and provides about 34% of the country's electricity. It features two Russian-designed VVER-1000 units currently in operation, which have both been through refurbishment and life extension programmes to enable extension of operation from 30 to 60 years

Source: <https://www.world-nuclear-news.org/Articles/Urenco,-Cameco-sign-10-year-deals-with-Bulgaria-s> April 21, 2023.

CANADA–FRANCE–JAPAN–UK–USA

Five G7 Countries in Nuclear Fuel Agreement

The agreement by Canada, France, Japan, the UK and USA to leverage their civil nuclear power sectors to ensure a stable supply of nuclear fuel for existing and future reactors came as G7 climate, energy and environment ministers concluded a two-day meeting with a promise to accelerate the phase-out of fossil fuels. The five

nations said they have identified “potential areas of collaboration on nuclear fuels to support the stable supply of fuels for the operating reactor fleets of today, enable the development and deployment of fuels for the advanced reactors of tomorrow, and achieve reduced dependence on Russian supply chains”. Collaboration on strategic opportunities in the nuclear fuel cycle supports collective climate, energy security, and economic resilience objectives, the statement notes, and will “establish a level playing field to compete more effectively against predatory suppliers” while strengthening domestic sectors. Supporting international cooperation and the nuclear supply chain is one of the actions commended to G7 leaders in a declaration issued by World Nuclear Association and nuclear trade associations from Canada, Japan, Europe, the UK and the USA during the *Nuclear Energy Forum*.

Fossil Phase-out Supported: The statement issued by G7 ministers after their two-day meeting expressed “deep concern” about the “devastating impacts” of war in Ukraine including on the environment, which they said is “provoking an unprecedented global energy crisis characterised by high-energy prices, market volatility and disruptions to energy supply”. An “ongoing global energy crisis of unprecedented scale” has worsened economic and social disruptions, health threats and environmental damage, including those caused or exacerbated by the war in Ukraine, the ministers said. The consequences of these challenges are already negatively impacting many regions and countries. “Recognising the current global energy crisis and economic disruptions, we reaffirm our commitment to accelerating the clean energy transition to net-zero greenhouse gas emissions by 2050 at the latest and recognise the importance of promoting an efficient diversification of supply sources to enhance energy security and energy affordability,” they said.

The G7 group includes two countries - Italy and now Germany - that have opted to phase out nuclear energy, but the statement recognised the role that nuclear plays: “Those countries that opt to use nuclear energy recognise its potential to provide affordable low-carbon energy that can reduce dependence on fossil fuels, to address the climate crisis and to ensure global energy security as a source of baseload energy and grid flexibility.”

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The statement also notes the commitment of the nuclear-using G7 countries to support the development and construction of nuclear reactors, such as small modular and other advanced reactors with advanced safety systems, in line national and

international safety and security standards and to build “robust and resilient nuclear supply chains”.

Source: <https://www.world-nuclear-news.org/Articles/Five-G7-countries-in-nuclear-fuel-agreement>. April 17, 2023.

HUNGARY–BELARUS

Hungary and Belarus Agree Nuclear Energy Cooperation

Hungary and Belarus have signed a MoU on cooperation relating to the projects in both countries for new Russian VVER-1200 nuclear reactors. The MoU was signed at an intergovernmental committee of economic cooperation held in Budapest, by Hungary’s Foreign Minister Szijjarto, and his Belarusian counterpart Aleinik.

The Hungarian government’s website said the foreign ministers discussed developing cooperation in sectors not affected by sanctions and Szijjarto had noted that 80% of the country’s oil supplies come through the Druzhba pipeline crossing Belarus, which had been “a trustworthy, reliable and fair partner, and has ensured uninterrupted deliveries”. On the issue of nuclear energy and a related agreement they signed at

their meeting, Szijjarto was reported to have said that sharing experiences with Belarus, which is building similar nuclear reactors to those under construction in Hungary, was important: "Nuclear security ...situation." In January, Hungary's Energy Minister Csaba Lantos said the Paks II plant was now expected to be completed in 2032.

In Belarus, its first NPP's unit 2 reached the minimum controllable power level with a self-sustaining controlled nuclear reaction last month. The first power unit was connected to the grid in November 2020 and, the energy ministry says, once both units - Russian VVER-1200 reactors - are commissioned, the plant will produce about 18.5 TWh of electricity per year, equivalent to 4.5 billion cubic metres of natural gas, with an annual effect on the country's economy of about USD550 million.

Source: <https://www.world-nuclear-news.org/Articles/Hungary-and-Belarus-agree-nuclear-energy-cooperati>. April 14, 2023.

KAZAKHSTAN-IAEA

Kazakhstan and IAEA Agreement to Strengthen Nuclear Cooperation

IAEA DG Rafael Mariano Grossi and Kazakhstan's Minister of Energy Satkaliyev signed a 5 year framework designed to "ensure closer interaction between the Agency and Kazakhstan in areas related to the development of nuclear power infrastructure, nuclear and radiation safety, food security and nuclear medicine". The agreement came during Grossi's visit to the country, during which he met Kazakhstan President Tokayev and toured the world's only Low Enriched Uranium Bank, which is a physical stock of 90 metric tn of low-enriched uranium hexafluoride suitable to make fuel for standard light water reactors. The bank exists for IAEA member states in case supply is disrupted due to exceptional circumstances.

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Kazakhstan has 12% of the world's uranium resources and is the world's largest producer. A Russian-designed BN-350 sodium-cooled fast reactor operated near Aktau in Kazakhstan for 26 years until 1999, generating electricity and desalinating water. Kazakhstan currently has plans for a NPP, and in January was reported to be considering four foreign potential suppliers of nuclear technology - CNNC of China, KHNP of South Korea, Rosatom of Russia and EDF of France. It has also been looking into the options for SMRs.

Source: <https://www.world-nuclear-news.org/Articles/Kazakhstan-and-IAEA-agree-to-strengthen-nuclear-co>. April 20, 2023.

RUSSIA-FINLAND

Russia Continues to Supply Fresh Nuclear Fuel Via Finland

Russian nuclear fuel has been transported via Finland by air despite Russia's special military operation in Ukraine. Two planes carrying Russian nuclear fuel recently left Helsinki Airport for an undisclosed destination. The previous such delivery took place in November. Fuel was then loaded onto two planes in Lappeenranta, eastern Finland, bound for Bratislava, Slovakia. Tiippana, DG of Finnish Radiation & Nuclear Safety Authority (STUK - Säteilyturvakeskus), confirmed that two planes loaded with nuclear fuel had left Helsinki Airport but declined to comment on the destination. Similar deliveries pass through Finland a few times each year, he said. During the November fuel delivery to Slovakia, two lorries arrived at Lappeenranta airport with a police convoy in the early evening. The vehicles were loaded with long pipes marked with radiation hazard symbols. YLE reported the presence of personnel from STUK, staff from Fortum's Loviisa NPP as well as police officers from all over southeast Finland. Airport

Russian nuclear fuel has been transported via Finland by air despite Russia's special military operation in Ukraine. Two planes carrying Russian nuclear fuel recently left Helsinki Airport for an undisclosed destination.

crews loaded the cargo onto two Swiftair planes bound for Bratislava.

Source: <https://www.neimagazine.com/news/newsrussia-continues-to-supply-fresh-nuclear-fuel-via-finland-10769989>. April 18, 2023.

URANIUM PRODUCTION

CANADA

ISL Mooted for Second Canadian Uranium Project

Denison Mines Corp plans to carry out additional evaluation work following the completion of a conceptual study of the potential application of in-situ leach (ISL) mining methods at the Midwest project in Saskatchewan. The concept study was prepared during 2022 and was formally issued to the Midwest Joint Venture early this year. The joint venture partners have now given Denison the go-ahead to carry out evaluation activities to support further assessment of the potential application of ISL methods at the project, although the company noted that the studies so far are preliminary in nature.

A 2007 decision to proceed with the development of an open pit operation at Midwest - with ore processing at the McClean Lake mill - was put on hold the following year when economic conditions saw the estimated capital costs of the project increase by 50%, although the joint venture partners continued with the environmental assessment process for the project as an open pit mine. The final version of the Midwest Project Environmental Impact Statement was approved in September 2012.

ISL recovers minerals from ore in the ground by dissolving them in situ, using a mining solution - the lixiviant - which is injected into the ore zone through drill holes called injection wells. The solution is then pumped to the surface, where the minerals are recovered from the uranium-bearing solution, and the reconditioned lixiviant re-used for further production. This causes little surface disturbance and generates no tailings or waste

rock, and without the expenses associated with removing ore from the ground or managing tailings, is a lower cost option than underground or open-pit mining. But it requires suitable geology: the orebody needs to be permeable to the liquids used, and located so that groundwater away from the orebody cannot become contaminated. More than half of the world's uranium production is now produced by ISL, but the technique has not so far been used in Canada.

Source: <https://www.world-nuclear-news.org/Articles/ISL-mooted-for-second-Canadian-uranium-project>. April 14, 2023.

NUCLEAR WASTE MANAGEMENT

USA

Holtec Pauses Plan to Dump Toxic Nuclear Waste Water into Hudson

In New York, Holtec International, the owner of the decommissioned Indian Point nuclear facility, said it has paused plans to dump 1 million gallons of radioactive water into the Hudson River. The plan provoked community outrage from residents and

environmentalists. Tritium, a byproduct of nuclear fission, cannot be filtered out of water and has been linked to cancer.

Source: https://www.democracynow.org/2023/4/19/headlines/holtec_pauses_plan_to_dump_toxic_nuclear_waste_water_into_hudson. April 19, 2023.

\$45 Billion Hanford Nuclear Waste Cleanup Contract Awarded to a New Company

The DOE has awarded a Hanford site contract with an estimated value of up to \$45 billion over a decade to a newly formed limited liability company. The winning bidder is Hanford Tank Waste Operations and Closure of Lynchburg, Va. The company is made up of BWXT Technical Services Group, Amentum Environment and Energy, and Fluor Federal Services. The new contract marks a transition to a new era at the

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Hanford nuclear reservation. The new firm will operate the Hanford vitrification plant, under construction since 2002 to turn radioactive waste into a solid glass form.

It also will manage waste in underground tanks, which now is done under a separate DOE contract. DOE calls the tank waste the nation's largest financial and environmental risk. Bechtel National will continue construction, startup and commissioning of the vit plant, formally named the Waste Treatment and Immobilization Plant.

Contractor Responsibilities:

The new contractor, already nicknamed H2C, will operate the plant as its commissioning is completed to prepare it to start treating the least radioactive waste in underground tanks. H2C also will be responsible for core functions of the plant, including project management, security, emergency services, and safety and quality. The 580-square-mile Hanford

site in Eastern Washington adjacent to Richland was used from World War II through the Cold War to produce nearly two-thirds of the plutonium for

the nation's nuclear weapons program. The work left 56 ml gl of radioactive and hazardous chemical waste stored in underground tanks, many of them prone to leaking. The plant is planned to vitrify much of that waste to turn it into a stable glass form for permanent disposal. After technical issues needed to be resolved on parts of the plant treating high level radioactive waste, DOE switched to a plan to separate out some of the least radioactive

waste, called low activity waste, and start treating it as work continues to prepare to treat high-level waste.

Source: <https://www.spokesman.com/stories/2023/apr/15/45-billion-hanford-nuclear-waste-cleanup-contract/>. April 15, 2023.

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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

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