



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

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OPINION – Ashok Sajjanhar

Will Nuclear Energy Power India's Future?

The total installed electrical capacity of India crossed the 300 GW mark in early 2016. Of this, 210 GW (70 per cent) constituted thermal power from sources such as coal, gas and diesel. As is evident, India is highly reliant on fossil fuels to meet its energy needs. Hydroelectric power too contributes a significant component (13 per cent) with total installed capacity of just over 40 GW. The total installed capacity of grid-interactive renewable power—which consists of wind, solar, biomass and small hydro—is just under 43 GW (14 per cent). Nuclear power accounts for 6.78 GW, a mere 2.3 per cent of the total capacity. In terms of actual energy generation, the total electricity production in India in 2014-15 was 1,278 TWh of which nuclear energy contributed just under 3 percent.

Although India is the fourth largest energy consumer in the world, behind only the US, China and Russia, it is a highly energy deficit country. While it supports 18 per cent of the world's population, it has only 0.6 per cent, 0.4 per cent and 7 per cent of the world's oil, gas and coal reserves, respectively. India's dependence on imported fossil fuels - oil, coal, gas and others - rose to 38 per cent in 2012. India imported 23 per cent of its coal requirements, 71 per cent of its oil needs and 30 per cent of its gas demand in 2012. These

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shares have increased over the last few years. India's oil needs reached a level of 81 per cent import dependency in 2015-16.

India's per capita electricity consumption stood at just over 1,000 kWh in 2014-15. In comparison, developed countries average around 15,000 kWh. China has a per capita consumption of around 4,000 kWh. World average is more than 3,000 kWh. In 2013, India's population without access to electricity was estimated by World Energy Outlook to be a staggering 237 million which accounts for 19 per cent of the entire population.

And it Looks for Worse Going Ahead: IEA World Economic Outlook (WEO) 2015 projection is that

India will see the fastest growth in energy demand by 2040 as China effects structural changes to its economy, such as moving towards services. India's total energy demand will more than double, propelled by an economy that will be more than five times larger in 2040 and a demographic expansion that will make India the world's most populous country. This will happen even after impressive energy efficiency gains—the overall energy intensity of India's economy is expected to reduce from 0.11 toe per \$1,000 of GDP in 2013 to 0.05 toe per \$1,000 of GDP in 2040. India's energy needs will reach 1,900 Mtoe.

Led by coal, the share of fossil fuels in India's energy mix will rise to 81 per cent by 2040 from 72 per cent in 2013. The IEA expects India's oil demand to rise the fastest—by 6.0 million barrels per day to 9.8 mb/d in 2040. It projects that oil production will fall behind demand, pushing oil import dependence above 90 per cent by 2040 although Prime Minister Modi has set a target to bring this down to 67 per cent by 2022.

Over 50 per cent of new generation capacity up to 2040 will come from renewables and nuclear power. Keeping pace with the demand for electricity will require nearly 900 GW of new capacity, the addition of a power system four-fifths the size of that of the United States today. India has the world's fifth largest wind power market and plans to add about 100,000 MW of solar power capacity by 2020. There will be greater reliance on solar and wind power (areas where India has high potential and equally high ambition) to deliver on the pledge to build up a 40 per cent share of non-fossil fuel capacity in the power sector by

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Due to dwindling domestic uranium reserves, nuclear powered electricity generation declined by 12.83 per cent from 2006 to 2008. Since March 2011, large deposits of uranium have been discovered in the Tummalapalle belt in Karnataka. This belt of uranium reserves promises to be one of the top 20 uranium reserves discovery of the world. So far 44,000 tonnes of natural uranium has been discovered in the belt, which is estimated to have three times that amount.

2030. IEA calculations show that renewables will account for 43 per cent of all power generated in India in 2040. Nuclear energy—with its massive potential—can be expected to play a key role in the country's future energy mix.

India's Nuclear Industry:

Since independence, India has strongly endorsed nuclear power for civil use. Today India has 22 operating nuclear reactors at six locations across the

country, their combined capacity totaling 6.8 GW. Till 2008, India's civil nuclear strategy had evolved largely without fuel or technological assistance from other countries for more than 30 years. This was the result of India's PNE in 1974 and refusal to sign the NPT because of its discriminatory nature. This led to India's isolation from

international commerce in nuclear materials and technology. However, scope for civilian nuclear trade increased significantly beginning September 2008 following the NSG unique, India-specific waiver to enable it to trade internationally in nuclear technology, equipment and materials. India was permitted to carry out nuclear commerce with the rest of the world, although

it has not signed the NPT, in recognition of its impeccable non-proliferation record. Following this, India has signed bilateral deals on civilian nuclear energy cooperation with several countries.

India's domestic uranium reserves are small. The country is dependent on uranium imports to fuel its nuclear power industry. Since early 1990s, Russia has been a major supplier of nuclear fuel to India. Due to dwindling domestic uranium reserves, nuclear powered electricity generation declined by 12.83 per cent from 2006 to 2008. Since March 2011, large deposits of

uranium have been discovered in the Tummalapalle belt in Karnataka. This belt of uranium reserves promises to be one of the top 20 uranium reserves discovery of the world. So far 44,000 tonnes of natural uranium has been discovered in the belt, which is estimated to have three times that amount.

Nuclear Agreements with other Nations: As of 2016, India has signed civil nuclear agreements with Argentina, Australia, Canada, France, Japan, Kazakhstan, Mongolia, Namibia, Russia, South Korea, the UK and the US. The latest country to enter into a nuclear deal with India is Japan, the only country to have suffered atom bomb attacks. The bilateral Agreement was signed during PM Modi's visit to Japan on 11 November, 2016.

After the NSG waiver, France was the first country to sign an agreement with India on 30 September 2008. Framework agreements were signed in 2010 for setting up two third-generation EPR (Evolutionary Power Reactor) reactors of 1650 MW each at Jaitapur, Maharashtra by the French company Areva. The deal caters for first set of two of six planned reactors and supply of nuclear fuel for 25 years. Electricite de France (EDF) which took over Areva signed a memorandum of understanding on 26 January 2016 with NPCIL to build six reactors. Some regulatory issues persist as also difficulty in sourcing major components from Japan due to India not being a signatory to the NPT. This position could undergo a significant change after the recent India-Japan nuclear agreement.

India and Kazakhstan signed an inter-governmental agreement for Cooperation in Peaceful Uses of Atomic Energy in April 2011. This envisages a legal framework for supply of fuel, construction and operation of atomic power plants, exploration and joint mining of uranium,

exchange of scientific and research information, reactor safety mechanisms and use of radiation technologies for healthcare. India and Kazakhstan have been collaborating in civil nuclear area since January 2009 when Kazakh nuclear company KazAtomProm signed an MoU with NPCIL for supply of uranium.

The nuclear agreement with USA led to India issuing a Letter of Intent for purchase of 10,000 MW nuclear reactors from USA. However, liability concerns and a few other issues prevented further progress in the matter. India's nuclear liability law gives accident victims the right to seek damages from plant suppliers in the event of a mishap.

It has apparently deterred foreign players like General Electric and Westinghouse Electric, a US-based unit of Toshiba, with companies seeking further clarification on compensation liability for private operators. Risks related to nuclear power generation prompted Indian legislators to enact

the 2010 Nuclear Liability Act which stipulates that nuclear suppliers, contractors and operators must bear financial responsibility in case of an accident. The legislation addressed key issues such as nuclear radiation and safety regulations, operational control and maintenance, management of nuclear power plants, compensation in the event of a radiation-leak accident, disaster clean-up costs, operator responsibility and supplier liability.

An accident like the 2011 Fukushima Daiichi nuclear disaster would have dire economic consequences in heavily populated India as did the 1984 Union Carbide Bhopal tragedy, the world's worst industrial catastrophe. India has taken significant steps over the last few years to address this issue. It has ratified the Convention on Supplementary Compensation for Nuclear Damage and set up an insurance pool of Rs 1,500 crore

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(US\$225 million) for liability risks that may arise from the construction and operation of nuclear power plants in the country. It is uncertain, however, if this amount will effectively assuage supplier concerns. For example, after the Bhopal gas calamity, the Indian government claimed US\$3.3 billion in damages. The proposed insurance pool is paltry in comparison.

India and Russia signed an agreement dating back to 1988 to establish nuclear reactors in India. Not much progress was possible in subsequent years due to sudden disintegration of the Soviet Union in 1991 and India's financial difficulties and related international developments. The project was revived during the visit of FM Primakov to India in 1998 when it was decided to construct two VVER (Water-Water Energetic Reactor) 1000 MW reactors at Kudankulam in Tamil Nadu.

Bilateral partnership in nuclear and other areas was further strengthened with the establishment of the Strategic Partnership between the two countries during President Putin's first visit to India in 2000. A 2008 bilateral agreement provided for an additional four, third generation VVER-1200 reactors of capacity 1170 MW each. Russia declared that it

would not impose curbs on export of sensitive technology to India. A new bilateral accord signed in Dec 2009 gave India freedom to proceed with the closed fuel cycle which includes mining, preparation of fuel for use in reactors, and reprocessing of spent fuel.

The first reactor with Russian collaboration, the new 1,000-MW power plant at Kudankulam, started commercial operations in 2014. The second reactor has achieved 85 per cent capacity and is likely to accomplish full capacity by early next year. Concrete pouring for the 3rd and 4th units was done by PM Modi and President Putin during the 17th India-Russia Summit in Goa on 15 October, 2016. Construction is expected to start

shortly. Negotiations on the 5th and 6th units are in progress and are likely to conclude soon.

Agreement was reached at the India-Russia Summit in December, 2014 in New Delhi to identify another site in India for another 6 reactors. This is likely to be in Andhra Pradesh. Final decision is expected soon. So far nuclear plants with Russian support only have been constructed in India. They are successfully generating electricity. The two sides will soon develop a framework for collaboration in the field of radioactive waste management. They will also promote localisation of manufacturing of equipment and fuel assemblies in India. They will expand collaboration in nuclear power plants technical maintenance and repair, modernisation and retraining of personnel. These initiatives can be expected to provide a strong fillip to the "Make

in India" initiative of the government. Russia's VVER reactors are among the more advanced Gen III+ designs and provide clean, cheap and reliable energy.

India and Russia are cooperating under a long term agreement to expand civil nuclear collaboration free from any restrictions or curbs on India in future. In addition to establishing more nuclear power

reactors, Russia has agreed to transfer the full range of nuclear energy technologies and ensure uninterrupted supply of fuel. Civil nuclear cooperation between India and Russia has been a major element in rejuvenating bilateral partnership in recent years. It heralds a glorious future in the years to come. Nuclear energy sector has the potential to be a strong bridge in partnership between India and Russia.

India's Indigenous Nuclear Plants: In addition to the two reactors at Kudankulam, Tamil Nadu built with Russian assistance and two others at Tarapur, Maharashtra which were established in 1969 with US/Canadian assistance and are currently operating at 160/100 MW capacity, India currently

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has 18 indigenously developed Pressurised Heavy Water Reactors (PHWR) which are located in Maharashtra (2), Rajasthan (6), Tamil Nadu (2), Karnataka (4), UP (2) and Gujarat (2), with a total capacity of 4.44 GW. Energy generation by these reactors has reached levels of 90 per cent capacity after problems related to availability of uranium fuel were resolved consequent to the NSG waiver in 2008.

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The cost of imported fuel for running nuclear reactors is low which is an important reason that nuclear power is cheaper than other fuels such as coal or natural gas. Compared to power plants using fossil fuels, nuclear power has high initial costs. However, fuel cost is a minor expense during the nuclear plant's life, leading to lower lifetime costs for nuclear power compared to either coal or gas.

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In recent years, India has accorded greater importance to thorium fuels and fuel cycles because of large deposits of thorium (518,000 tonnes), a non-fissile material, in the form of monazite in beach sands as compared to modest reserves of low-grade uranium (92,000 tonnes). The long-term goal of India's three-stage nuclear power program is to develop an advanced heavy-water thorium cycle. Thorium has the potential to provide several hundred times the energy with the same mass of fuel as uranium. The fact that thorium can theoretically be utilised

in heavy water reactors has tied the development of the two types of reactors. A prototype reactor that would consume Uranium-Plutonium fuel while irradiating a thorium blanket is currently under construction at Kalpakkam. Thorium reactors would also be safer and not susceptible to production of nuclear weapons. This could be the harbinger of development of a new generation of cleaner, cheaper, safer nuclear power. India could be in a position to make thorium reactors operational by 2025.

Even in the best case scenario, share of nuclear energy in India's total electricity mix would still be low. For example, if India's total installed electrical capacity including all sources rises to over 1000 GW as per estimates of the World Energy Outlook, nuclear energy, at 52 GW, would still be just around five percent of the total. With PM Modi setting an ambitious goal of tripling nuclear power over the next decade, India's nuclear-power sector is in the best shape it has ever been to deliver that target. India is on course to double its nuclear power generation capacity to more than 10,000 MW over the next five years.

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Nuclear Surge only Way to Go? India's energy demands are expected to rise rapidly in the coming years. Energy

is required to fuel the rapid economic growth and expansion to confront the scourge of poverty that afflicts more than 150 million people in the country, provide energy to the more than 200 million population who still don't have access to commercial electricity, and raise the per capita level of energy consumption from the current low level of 1,000 kWh to more acceptable levels closer to the world average of 3,000 kWh.

Currently India is highly dependent on fossil fuels like oil, gas, coal, much of which are imported. In addition to the unacceptably high quantum of outgo of foreign exchange, fossil fuels are highly polluting and have a huge detrimental impact on the environment. Business as usual is hence not possible. It is imperative for India to move to more environment friendly forms of energy which also don't necessitate the outflow of large amounts of scarce foreign exchange resources. Renewables particularly solar and wind whose production costs have fallen significantly in recent times would be an important component of this energy mix. Nuclear energy would also be an indispensable element of the future energy generation programme.

Two aspects in this regard will need to be taken note of. Firstly to launch a concerted reach-out to those who continue to be wary and apprehensive of the safety and security of nuclear reactors and materials. It has been proven beyond all reasonable doubt that with all recent technological changes, nuclear power is as safe, if not safer than power generation through fossil fuels. There is also considerable anxiety about the manner of disposing nuclear waste and the period for which it will continue to be radio-active. Reassurance on this score by scientists, experts and those in the know of intricate issues involved should be proactively communicated to common citizens. It is pertinent to remember that notwithstanding the 2011 Fukushima disaster, Germany is the only country in the world that has turned its back on nuclear power and that also mostly for political reasons and not on scientific or technological

considerations.

Currently there are more than 60 reactors being constructed in 15 countries all over the world. Out of these only five are in India. As per plans declared by the government, India intends to draw 25 per cent of its electrical energy from nuclear sources by 2050. This includes 20 GW by 2020 and 63 GW by 2032. It is doubtful whether these targets will be met. The government has already revised the targets to declare that India will produce 14.6 GW by 2021 and 27.5 GW by 2032.

Even with the rapid increase in renewable and nuclear power generation, fossil fuels will continue to be the mainstay of the Indian power scene for the foreseeable future. It is however imperative that nuclear energy which is competitive, safe, reliable and clean continues to be an increasingly important source to power the growth and development of the country.

Source: The author is a former Ambassador of India to Kazakhstan, Sweden and Latvia. He is currently President, Institute of Global Studies. [http://](http://swarajyamag.com/)

swarajyamag.com/, 12 December 2016.

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OPINION – Prateek Joshi

Are Nuclear Weapons Pushing India and Pakistan towards War?

The nuclear doctrines of India and Pakistan have more or less clearly defined contours, especially in the event of an Indo-Pak conflict. The twin pillars of "No First Use" and "Credible Minimum Deterrence" define India's policy. Pakistan's nuclear doctrine is still not officially declared,

though the missiles, named after medieval invaders who plundered the Indian subcontinent, leave no doubt that India is their destination. As bilateral relations continue to experience a downward spiral, both nations are looking for new strategies to inflict maximum punishment on each other, further stretching the limits of their nuclear umbrellas.

With Pakistan going nuclear, India's superiority in conventional strength got blunted and the more balanced equation gave further impetus to protracted sub-conventional warfare with India. The emergence of a wide spectral vacuum allowed Pakistan to escalate tensions, yet discouraged New Delhi to engage conventionally. Only a year after its nuclear tests in 1998, Pakistan launched a limited war in Kargil. Although India responded firmly and recaptured the intruded positions, the Kargil misadventure also prompted Pakistan to develop a successful deterrence strategy which would later thwart New Delhi's ability to engage with a nuclear Pakistan following the 2001 Parliament Attack and the 2008 Mumbai attacks.

Pakistan's addition of tactical nuclear weapons or the Hatf-IX Short Range Ballistic Missiles, equipped with low yield nuclear warheads, to its arsenal has lowered the threshold, as not only they miniaturize the theatre of conflict but also point toward a shift from centralized to delegated command and control (an authorization to junior officers). According to leading Indian military strategist Brigadier (Ret.) Kanwal, Pakistan is developing "nuclear weapons designed for battlefield use." The Pakistani army claims that it is willing to use these weapons against the Indian army if it crosses into the Pakistani territory, which shows its resolve to deter the Indian army from even planning any move on these lines.

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Adjustments Under the Modi Government: India's ineffectiveness in pressurizing Pakistan after 2008 Mumbai attacks and the series of border skirmishes in 2013 fueled anger among Indian citizens. Pakistan loomed large during the 2014 general elections with the then-opposition BJP accusing the ruling UPA-led government of failing to contain Pakistan. As promised, the Modi-led government began developing new policies to engage with Pakistan after initial peace overtures failed. Halfway through the present government's tenure, the intensity and

magnitude of asymmetric warfare against India has only grown. Notable was the attack on the Indian Air Force base at Pathankot merely a few days after PM Modi paid a surprise visit to his Pakistani counterpart in Lahore.

After Pathankot, the escalation has only grown in Kashmir Valley with a steep rise in attacks against troops stationed in Jammu and Kashmir. When the Indian army launched "surgical strikes" across the LoC in response to an attack on its army base along the LoC, the move was hailed as a doctrinal shift

aimed at curbing cross-border terrorist attacks. This was followed by a statement from India's Defense Minister, who called for an overhaul of the nation's nuclear doctrine to redefine it on more subtle lines as a means of strengthening deterrence. According to the defense minister, India's policy of "No First Use" had

outlived its utility.

Pakistan has adapted to New Delhi's policy in innovative ways, chasing an Indian submarine out of Pakistan's territorial waters and shooting down an Indian drone which had reportedly crossed the LoC. Ceasefire violations after the surgical strikes have reached up to three hundred incidents. Surgical strikes seem to have had no

impact on Pakistan's policy towards India. More alarmingly, the attacks on Indian troops have taken a gruesome form. The Indian Army blames the mutilation of dead soldiers' bodies on the Border Action Team (BAT) Commandos of the Pakistan Army. Further, the recent appointment of Pakistan's new army chief – someone with extensive experience on Line of Control postings – is not a coincidence. ...

Source: <http://nationalinterest.org/>, 08 December 2016.

OPINION – Hua Han

China and Disarmament: Three Questions Going Forward

Amid today's possible transformation from a US-centric global order to a multilateral one— ...nuclear disarmament is once again featuring high among the topics discussed by strategists, scientists, and policy makers. Kulacki calls on China to take a more active role in global efforts to abolish nuclear weapons, and this is a reasonable expectation. China, with its growing power and influence, is obligated to take more responsibility over global governance in general and nuclear disarmament in particular. Indeed, under Jinping, China has demonstrated aspirations greater than those of "just another national power asserting its own interests," to borrow Kulacki's phrase. China now seeks to become a great power that –through its own approach – offers public goods and seeks out common interests with other countries.

But any discussion of China's role in the emerging

nuclear order must be based on an understanding of how the global nuclear order has evolved and what forces have shaped it. In this order, which was

established in the 1950s, China – along with Britain, France, and others— occupies a middle ground. On one side of them are the two nuclear superpowers – the US and Russia (or, in earlier days, the Soviet Union). On the other side are the non-nuclear states, which represent a great majority of nations. This configuration has not significantly changed even though the bipolar world collapsed 25 years ago and China emerged as the world's second-largest economy around 2009. China's clout in the nuclear order remains modest compared to the country's importance in the Asian financial system and the global economic order. China "revisionist" intentions and will not seek nuclear superpower status in the foreseeable future.

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Security, Uncertainty, Capacity: How vigorously China pursues its existing disarmament commitments, and whether it takes a leadership role in disarmament, depend on how Beijing answers the following questions. First, considering the huge gap between China and the US in conventional defense capabilities, can China protect its security interests *without* maintaining its relatively small nuclear deterrent? Washington's forward deployment of missile defense and precise strike capabilities along the Chinese maritime frontier leads Beijing to view any drastic disarmament initiative with caution. Though Beijing is well aware of the desire of many non-nuclear weapon states to eliminate nuclear weapons, and

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is supportive of their efforts, disarmament initiatives must take into consideration the overarching security environment. China's interests are best served by a pragmatic approach to disarmament, and this accounts for China's abstention in October's UN vote on a nuclear weapon ban treaty. (All other officially recognized nuclear weapon states voted against negotiating a ban treaty.)

The second question is whether China is ready for nuclear reductions amid the uncertainty in the existing nuclear order. After Obama's eight years of largely unfruitful disarmament discourse, we are now entering new territory. People in the US and around the globe are wondering about the nuclear posture that the US will display under President Trump – wondering if Trump might “press the button” and whether he can be trusted with thousands of nuclear warheads....

The final question is whether China currently has the capacity to play a leading role in the global disarmament arena. China is still undergoing a momentous social and economic transformation. The government's top priorities remain economic development and social stability. China's recent behavior abroad has been described as assertive, but Beijing's foreign policy hasn't completely moved away from the low-profile approach known in Chinese as *tao guang yang hui*. China's diplomatic capability in general and its nuclear diplomacy in particular are still underdeveloped. Under such circumstances, China has a limited ability to influence the evolution of the nuclear order, create norms, and set the agenda in multilateral institutions. Nonetheless, Beijing is on a trajectory toward playing a more active role in the nuclear order. In years to come, as China

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The termination of any one of these programs on its own would have been lamentable, but Moscow's wholesale withdrawal from nuclear cooperation is alarming. The plutonium disposition agreement had been an important step, underscoring each country's commitment to removing 34 metric tons of plutonium from weapons program stockpiles and disposing of it in a mutually acceptable and verifiable manner.

develops a larger community of nuclear policy experts and enhances its diplomatic skills, that trend should only continue.

Source: <http://thebulletin.org/>, 08 December 2016.

OPINION – Siegfried S. Hecker

US-Russia Rift Threatens Science Ties that Keep US Safe

Amid increasing tensions between Washington and Moscow over Syria, Ukraine, cyber hacking, and military maneuvers in the Baltics, the Kremlin's systematic termination of nuclear cooperation with the US has gone relatively unnoticed. Both countries embraced such cooperation as a shared global responsibility after the end of the Cold War. A return to nuclear confrontation now sets the clock back, putting both countries at enormous risk and endangering global stability. This fall, Moscow suspended the US-Russian agreement on the disposition of excess weapons plutonium,

terminated an agreement on converting research reactors from highly enriched to low-enriched uranium, and ended a 2013 agreement to cooperate on nuclear- and energy-related scientific research and development. These actions followed Moscow's termination of most initiatives under the Nunn-Lugar Cooperative Threat Reduction Program, including cooperation on nuclear materials security,

which ended in December 2014. And earlier 2016, Russian President Putin chose not to have his country participate in the last of the NSS organized by US President Obama.

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had been an important step, underscoring each country's commitment to removing 34 metric tons of plutonium from weapons program stockpiles and disposing of it in a mutually acceptable and verifiable manner. Putin's suspension of the agreement—though triggered by Washington's announcement that it would take a different approach to disposing of its own excess plutonium—appears politically motivated, as suggested by the onerous conditions he specified would have to be met in order to resume the deal. The suspension will have little practical effect, since both sides will likely proceed with their preferred options for disposing of excess plutonium, as neither needs it for its nuclear arsenal. Nevertheless, Moscow and Washington have lost an opportunity to demonstrate progress toward verifiable disarmament to the rest of the world.

The termination of the program to convert Russian research reactors is unfortunate, but it was something that neither Russia's technical nor political communities regarded as a high priority. What is more important is that the US and Russia are continuing to cooperate to facilitate such conversion in Russian-origin reactors in third countries, which contain the most vulnerable material.

Suspending the scientific research agreement is unfortunate and unwise. Such cooperation is not a favor that Moscow does for Washington, but rather a necessity for its own scientists to stay internationally connected. US-Russia cooperation on fundamental science existed even during the Soviet days. It flourished during the immediate

post-Cold War period, particularly between scientists from the Russian and American nuclear weapons laboratories. It produced innumerable benefits in specific disciplines for scientific communities in both countries. It was that scientific cooperation in the early 1990s that helped to reintegrate Russian nuclear scientists into the international scientific community, and laid the foundation for expanded nuclear security cooperation between Russia and the West.

What is most worrisome is Moscow's stated reason for ending nuclear cooperation: Putin blames Washington's hostile actions toward Russia. He insists that Washington will have to undo egregious actions inflicted upon Russia over the past two decades, for example by curbing the NATO military presence in countries that joined the alliance after 2000, repealing the Magnitsky Act, which imposes visa bans and financial sanctions on certain Russian officials, and making reparations for economic sanctions imposed on Russia since 2014.

Russia's recent steps are tearing apart the fabric of US-Russian nuclear cooperation, which took decades to develop. The bilateral effort that began 25 years ago as the Soviet Union disintegrated was extraordinary in that it served well both Russia and

the US, along with an anxious world. Never before had a country with tens of thousands of nuclear weapons, over one million kilograms of fissile materials that could fuel bombs, hundreds of thousands of nuclear workers, and a huge nuclear complex been thrust into political and economic chaos. In Washington and other capitals around

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Russia's recent steps are tearing apart the fabric of US-Russian nuclear cooperation, which took decades to develop. The bilateral effort that began 25 years ago as the Soviet Union disintegrated was extraordinary in that it served well both Russia and the US, along with an anxious world. Never before had a country with tens of thousands of nuclear weapons, over one million kilograms of fissile materials that could fuel bombs, hundreds of thousands of nuclear workers, and a huge nuclear complex been thrust into political and economic chaos.

the world, the nuclear dangers took an unexpected turn, with nations feeling threatened not by the enormous nuclear arsenal in the hands of the Soviet government, but rather by the prospect that the huge former Soviet nuclear assets—weapons, materials, and experts—would no longer remain in the government's control but could slip into the hands of others waiting to create havoc in the world.

Visionary leadership in both countries—by dedicated professionals in government, nongovernmental organizations, and academia—fostered 25 years of nuclear cooperation. In retrospect, in spite of the current retrenchment, cooperation served Washington well because it helped avoid a nuclear catastrophe of unknown proportions. Cooperation also enabled the rapid implementation of a series of nuclear weapons treaties, which over 30 years resulted in a nearly 80 percent reduction in each country's nuclear arsenal. It brought long-needed relief from Cold-War tensions and fears of annihilation.

Cooperation served Moscow as well. Most important, it allowed Russia to safely reduce its nuclear arsenal, which involved the difficult tasks of transporting record numbers of nuclear weapons, disassembling them, and storing the fissile materials safely and securely. Bilateral cooperation greatly enhanced security in Russia's nuclear complex and its military sites, allowing them to be upgraded to meet the new, challenging security environment resulting from the dissolution of the Soviet Union. Cooperation between Russian nuclear scientists and engineers and their American counterparts facilitated successful resolution of many of the most sensitive nuclear security challenges and helped to prevent a brain drain, that is, the leakage of technical expertise outside the Russian nuclear complex.

Although a decade of high oil prices enabled temporary prosperity, Russia has not been able to make the transition to a democratic and economically competitive state in the new global

environment. Today, Putin's Russia blames the West, particularly the US, for the country's economic hardships and for fomenting instability in Russia and along its periphery, as well as in other troubled spots around the globe.

Against this backdrop of distrust, Putin has rebuilt Russia's military, which decayed dramatically in the 1990s, and which is now flexing its muscle in Syria. Though Putin signed the bilateral Treaty of Moscow in 2002, and was PM when Russia signed the New START in 2010, both of which reduced the country's nuclear stockpile, he has steadily increased the role of nuclear weapons in Russia's security. Addressing Russian nuclear weapons developers in Sarov in 2012, he said, "we should not tempt anyone by allowing ourselves to be weak. ... It is for this reason that we will under no circumstances surrender our strategic deterrent capability, and indeed, will in fact strengthen it." Putin has continued to strengthen Russia's nuclear arsenal by developing and introducing new types of strategic and tactical nuclear weapons.

Some of Putin's vitriol against Washington undoubtedly results from his belief that the US is trying to impose its will on the world, and also sow domestic unrest in Russia against his government. Some surely stems from having a very different

strategic vision of the world than that promoted by Washington since the end of World War II. Putin's strong anti-American rhetoric apparently resonates with the Russian public, or at least strengthens his domestic support.

To be sure, US president-elect Trump and Putin speak collegially of each other, potentially opening a window of opportunity to resume US-Russian cooperation. There would be no better place to start than with nuclear cooperation, because the strong anti-American public sentiment in Russia has spilled over into the nuclear realm, one in which there is no room for error. Terminating bilateral cooperation on preventing the spread of nuclear weapons to either other governments or terrorist groups will hurt both countries. A retrenchment that isolates

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nuclear scientists and engineers from their foreign counterparts will endanger the safety and security of weapon and nuclear material stockpiles.

To make its case for going it alone, Moscow points to the desperate 1990s as a lost decade, one in which Washington took advantage of Russia's weakness to advance its own agenda. In the nuclear arena, though, these claims are unfounded. First, they assume an incorrect premise. Unlike the Russian economy and military, the nuclear complex did not collapse. It was not embarrassed. No secrets were lost. In spite of incredible financial, political, and personal hardships, it avoided nuclear catastrophe and positioned itself to rebound in the ensuing decade. Second, the actual record of US-Russian cooperation in the nuclear sphere during the past 25 years does not warrant the narrative that Washington took advantage of a challenged Russian nuclear complex....

Unlike the Russian economy and military, the nuclear complex did not collapse. It was not embarrassed. No secrets were lost. In spite of incredible financial, political, and personal hardships, it avoided nuclear catastrophe and positioned itself to rebound in the ensuing decade.

Ukraine's ability to actually produce a nuclear weapon remains in question. While numerous research and production facilities based in what now is Ukraine were involved in building the Soviet nuclear arsenal, the country's current economic troubles and technological backslide would make constructing even a simple nuclear device a major challenge – even if the Ukrainian government does undertake such a project.

Source: <http://thebulletin.org/>, 08 December 2016.

NUCLEAR STRATEGY

UKRAINE

Radical MPs Bid to Make Ukraine Nuclear Again

The Radical Party faction of the Ukrainian parliament is seeking to withdraw Ukraine's membership of the 1968 international treaty which bans the development of nuclear weapons and keeps nuclear technology in check. ...

Now Kiev may follow Pyongyang's example if the Radical Party faction in parliament has its way. The party's leader, Lyashko, has long called for the government to restore the country's nuclear capability, which Ukraine briefly possessed in the wake of the collapse of the Soviet Union. The number of nuclear warheads deployed on

Ukrainian territory by the USSR was only behind those possessed by Russia and the US. But by 1996, all of them had been handed over to Russia, which was busy dismantling a large portion of the costly Soviet nuclear stockpile. In 1994, Ukraine was given security assurances by Russia, the US and the UK in the so-called Budapest Memorandum in exchange for its accession to the NTP. Similar documents were signed with Kazakhstan and Belarus, which were in a comparable position. China and France gave milder commitments to Ukraine in separate statements.

The memorandum was never ratified by any party, but after the then-Ukrainian region of Crimea opposed the 2014 armed coup in Kiev and voted in a referendum to break away and rejoin Russia, many politicians in Ukraine – Lyashko among them – and their backers elsewhere accused Moscow of

breaching its commitments under the document.... Lyashko is a populist politician with a strongly nationalist voter base, and is well known for his publicity stunts. His bill to restore Ukraine's nuclear status was registered in parliament on 06 December. A date for a committee discussion on the issue is yet to be set.

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Source: www.rt.com, 06 December 2016.

USA

US Needs to Bolster Nuclear Arsenal and Missile Defense, Experts Say

As the US nuclear arsenal ages and adversaries develop better long-range missiles, the US needs to enhance its deterrence capabilities, lawmakers and experts said during a recent high-profile gathering of members of the national security community. Concerns about North Korea should prod policymakers into action, Sen. Sullivan, R-Alaska, said during a recent panel discussion at the Reagan National Security Forum in Simi Valley, California.

“At some point we’re going to wake up and our public is going to wake up to the fact that the head of North Korea ... is probably going to have the capability to hit our country with an intercontinental ballistic missile with a nuclear warhead on top of it,” he said.

...The US should enhance its tracking and sensor systems and increase the number of interceptors in its arsenal, he argued. The election of Trump to be the next president bodes well for investment in these capabilities, according to Sullivan. “It is an area where the president-elect has talked a lot about the need to ramp that up, so I think you’re going to see a lot of focus on missile defense” during his administration, he said. More investment is needed to ensure that other nations respect US capabilities, said Tauscher, a Democrat who previously served as undersecretary of state for arms control and international security affairs, and special envoy for strategic stability and missile defense.

The existing ground-based system has had mixed results in testing, including failures to intercept mock enemy warheads. That has sparked doubts

among adversaries that it could actually do the job, she said. While bolstering its missile defenses, the US must also enhance its own nuclear arsenal to strengthen deterrence, the panelists said. As legacy systems approach the end of their service lives, the Defense Department is moving forward with plans to acquire new

As legacy systems approach the end of their service lives, the Defense Department is moving forward with plans to acquire new intercontinental ballistic missiles, bombers, ballistic missile submarines and air-launched cruise missiles that could deliver nuclear weapons. Warhead modernization is also in the works.

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The Pentagon and independent nuclear experts project that the plans, if fully implemented,

would cost hundreds of billions of dollars in the coming decades. The bill to upgrade the nuclear enterprise will be “massive,” said former Sen. Kyl, R-Ariz., who now serves as senior counsel at Covington & Burling LLP. “We’ve allowed it to atrophy and we’ve allowed a lot of obligations to pile up that should have been taken care of” earlier, he said. “All three legs of the triad have basically run out of their life and need to be replaced all at the same time. We should never have allowed that to happen.”

Sullivan expects Congress to spend about \$234 billion over the next 10 years on nuclear modernization. The idea of investing more

The Navy and Air Force also have ambitious plans to modernize their conventional forces during the same period. The Navy is slated to buy new aircraft carriers, destroyers, attack submarines and fighter jets, among other items. The Air Force intends to procure large quantities of the F-35 joint strike fighter, the B-21 bomber and the KC-46 tanker.

taxpayer dollars in this and missile defense enjoys strong bipartisan support at a time when political gridlock has become the norm in Washington, D.C., he noted. “That’s a lot of money but I think it’s important enough and it can be done,” he said. Nevertheless, finding enough funding to meet the nuclear modernization

needs of the services won’t be an easy task.

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aircraft carriers, destroyers, attack submarines and fighter jets, among other items. The Air Force intends to procure large quantities of the F-35 joint strike fighter, the B-21 bomber and the KC-46 tanker. Analysts are warning about the approaching modernization “bow wave” that is expected to hit the Defense Department in the coming years. Senior defense officials recognize that the price tag will be high.

...Lawmakers have created a national sea-based deterrence fund outside of the Navy’s regular shipbuilding account to help pay for the new Columbia-class ballistic missile submarine. National Defense asked Goldfein whether he believes the Air Force should receive similar consideration as it seeks to acquire new nuclear missiles and bombers.... The Air Force’s top officer said policymakers should consider the strategic benefits that the nuclear arsenal provides, not just the price tag. ...

Source: <http://www.nationaldefensemagazine.org/>, 06 December 2016.

BALLISTIC MISSILE DEFENCE

GENERAL

Accelerating Warnings to Populations during a Ballistic Missile Attack

Allied Command Transformation (ACT) personnel conducted a controlled investigation as part of the Combined Air and Missile Defence Exercise 2016 (CAMDEX 16) and multinational Steadfast Alliance Exercises (SFAE) from 25–29 April 2016. CAMDEX 16 served as a capstone event for an Integrated Air and Missile Defence exercise spanning both the European Combatant Command and Central Combatant Command areas of responsibility.

This interface aims to expedite sharing of unclassified critical data such as missile launch alerts, warning areas and impact point prediction, thereby enabling Nations more time to warn impacted populations, identify shelter, coordinate emergency response, and provide recovery activities following a BMD attack.

As part of the CAMDEX 16, the ACT-led experiment validated the Ballistic Missile Defence Civil Military Interface Standard Operating Procedures (BMD CMI SOP), and observed information flow processes, staff organization and cross-national interaction. This validation experiment originates from 2015 when the North Atlantic Council approved BMD information requirements for the

Alliance. ACT Operational Experimentation branch developed draft Standard Operating Procedures (SOPs) with support from subject matter experts and delivered those to the Crisis Management Element (CME) December 2015 with the intent to validate the assumptions in 2016 in a realistic and highly intense

exercise environment.

Part of these requirements, assigned the operation of the warning systems’ civil-military interface to NATO Headquarters’ Crisis Management Element (CME). This interface aims to expedite sharing of unclassified critical data such as missile launch alerts, warning areas and impact point prediction, thereby enabling Nations more time to warn impacted populations, identify shelter, coordinate emergency response, and provide recovery activities following a BMD attack.

“We tested NATO BMD Civil Military Interface functions by successfully sending 150 launch notification messages to national civil protection authorities with only a minimal delay thereby giving national authorities valuable time to warn

their population and alert emergency services,” said Günter Bretschneider, Head, Civil Emergency Planning Outreach Section, NATO HQ Brussels. “We are confident that this concept is sound and should be further developed.”

With core NATO information services located on classified NATO networks, a timely and secure unclassified transfer allowing for an internet based email distribution is a challenge but required in order to minimise population warning time.

With core NATO information services located on classified NATO networks, a timely and secure unclassified transfer allowing for an internet based email distribution is a challenge but required in order to minimise

population warning time. ...While most of the information requirements are satisfied from NATO HQ to Nations, damage assessment reports will be sent from Nations to HQ for overall situational awareness and allocation of support measures. Germany's Federal Office of Civil Protection and Disaster Assistance (BBK), Italy's Civil Defence Agency, and Romania's General Inspectorate for Emergency Situations played roles as attacked nations. The BBK interface is co-located with the NATO Combined Air Operations Centre (CAOC) Uedem, and served as an additional source for data gathering in this Experiment.

"Germany used CAMDEX to exercise all processes related to passive BMD from detection through political release approval and data transfer from classified NATO networks into the national modular warning system (MOWAS) until the final alert message distribution through media and cellular services. The exercise has again demonstrated the necessity for intercultural collaboration between Nations and Organizations.... Outputs from this experiment include the Technical Architecture Reference Documents as prerequisite for the development of an automated solution with minimum human-in-the-loop responsibilities.

Source: <http://www.act.nato.int/>, 08 December 2016.

RUSSIA

Russia Tests New Underwater Nuclear Drone amid Growing Tensions with the West

Russia has carried out a test of a revolutionary unmanned nuclear submarine, according to US intelligence sources. Unnamed Pentagon officials reportedly said the underwater drone was launched on 27 November but did not give details about whether the test was a success. A spokesman for the Pentagon, Captain Davis, told the *Washington*

Free Beacon that the US military "closely monitors Russian military underwater military developments" but declined to comment on the test in detail. It comes as Russia has stepped up its development of nuclear technology in the past year as relations with the West have deteriorated further. The existence of the nuclear submarine was first reported in September and confirmed by the Russian military two months later. US intelligence agencies said the submarines, which have been given the code name "Kanyon" by the Pentagon, will be equipped with the largest nuclear weapons in existence.

Source: <http://www.independent.co.uk/>, 10 December 2016.

Named after the navy's first Medal of Honor recipient of World War II, USS John Finn is equipped with an integrated air and missile defence radar to enhance its detection and reaction capabilities against modern air warfare threats, as well as BMD. Powered by four gas turbine engines, John Finn can travel at speeds of more than 30k. The 509ft-long vessel is the 63rd Arleigh Burke (DDG 51) class destroyer, and the first of the DDG 51 Flight IIA restart ships.

USA

US Navy Receives New Arleigh Burke-Class Destroyer USS John Finn

The US Navy has taken delivery of Arleigh Burke-class guided missile destroyer, John Finn (DDG 113), from Huntington Ingalls Industries (HII). The delivery follows the successful completion of the ship's third and final

round of sea trials in the Gulf of Mexico in November 2016. The trials were conducted by the navy's Board of Inspection and Survey (INSURV) to validate the ship's performance. The DD 250 document has been signed to officially transfer custody of the ship from HII to the US Navy. HII DDG 51 programme manager George Nungesser said: "Years of working with the DDG 51 programme has created a team of shipbuilders who truly understand what it means to build these ships.

"Today they share in the honour of delivering this ship on the 75th anniversary of Pearl Harbor and are able to take a moment to honour the men and women who will continue to carry on the mission that John Finn and his fellow sailors

fought so bravely for. It is a memory that will last forever." The Arleigh Burke-class guided missile destroyers have been designed to conduct multi-threat air, surface and subsurface battles simultaneously.

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Source: <http://www.naval-technology.com/>, 09 December 2016.

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tsunami-led equipment failure resulted in three nuclear meltdowns and the release of radioactive material in a nuclear power plant in Fukushima, Japan. "In general, the interest in expanding nuclear power in the large Asian countries will continue," Srinivasan told IANS. In Europe and North America, the desire to reduce carbon emissions would push revival of nuclear power, he said. Application of radiation

technologies in medicine, biology, agriculture and industry would grow globally.

"This will improve the perceptions about the benefits of radiation technologies and help overcome the negative perceptions about nuclear energy, in certain sections of society," he said. Vietnam National Assembly, on November 22, voted to abandon plans to build two multi-billion-dollar nuclear power plants with Russia and Japan, citing lower demand forecasts, rising costs and safety concerns. Around the same time when Vietnam voted against nuclear power plants, Switzerland voted against a proposal for strict

phasing out of its nuclear power plants, which supply around 40 per cent of the country's power.

Srinivasan said the difference in situation prevailing in both the countries led to different reactions. The referendum was initiated by the Green Party, according to which all nuclear plants would be phased out after a life-span of 45 years. The plan, backed by the Green Party, would mean closing three of Switzerland's five nuclear plants in 2017,

with the last shutting in 2029.

In Vietnam, prospect of low cost natural gas would be one reason for stopping the nuclear

Overall nuclear power is likely to expand in Asian countries. In the post Fukushima world, where safety concerns were repeatedly raised around nuclear power plants Vietnam may pursue nuclear power as well. "In general, the interest in expanding nuclear power in the large Asian countries will continue," In Europe and North America, the desire to reduce carbon emissions would push revival of nuclear power, Application of radiation technologies in medicine, biology, agriculture and industry would grow globally.

NUCLEAR ENERGY

ASIA

Nuclear Power is Set to Expand in Asian Countries: M.R. Srinivasan

Days after Vietnam stalled its plans to build nuclear power plants citing safety concerns, a nuclear expert in India says overall nuclear power is likely to expand in Asian countries. In the post Fukushima world, where safety concerns were repeatedly raised around nuclear power plants, Retired Chairman of Atomic Energy Commission and Founder-Chairman of NPCIL M.R. Srinivasan told IANS that the incident was "location specific".

He also added that eventually, Vietnam may pursue nuclear power as well. In March 2011, a

project at this stage. "The prevailing low cost of solar photovoltaics may give a boost to solar power, and offshore natural gas may offer a near term economic source of energy," Srinivasan told IANS. "However, I believe they will pursue nuclear energy in the long run. Over time they will need base load energy and that would favour nuclear power development," he said.

Talking about Switzerland, the scientist said: "As for Switzerland, Swiss business groups are right in concluding that a hasty exit from nuclear energy would hurt them." Switzerland would not want to lose 40

per cent of its electricity coming from nuclear power plants at economic prices, he added. Srinivasan also ruled out the overall fear post Fukushima. "The Fukushima accident which resulted in the earlier Swiss decision is being seen in a more balanced manner.

"Reviews carried out on the safety of nuclear power plants around the world have confirmed that the earthquake and Tsunami that hit Fukushima were location specific. "Enhancing safety under Station Blackout conditions has been carried out at manageable costs and is proving to be very reliable," he said.

Srinivasan also cited the example of Germany, and said over-dependence on renewable energy might have its own fallout. "Germany is finding that over reliance on renewable energy, as a result of their decision to phase out nuclear, is hurting them," Srinivasan said. "It would be no surprise if Germany itself does a rethink on exit from nuclear energy, especially, because of the need to reduce carbon emissions," he added.

In India, nuclear power is the fourth-largest source

of electricity in India after thermal, hydroelectric and renewable sources of electricity. As of 2016, India has 22 nuclear reactors in operation at seven sites, having an installed capacity of 6,780 MW. This was around 2.2 per cent of the total electricity.

Source: [http:// tech.firstpost.com](http://tech.firstpost.com), 13 December 2016.

HUNGARY

Hungary's Nuclear Ambitions for Climate Change

Beatrix Kadar, deputy state secretary for energy affairs at Hungary's Ministry of

National Development, stressed the importance of nuclear energy in the country's electricity mix, while Attila Aszódi, the government commissioner responsible for the Paks II expansion project, charted progress made with plans to build new reactors.

Paks currently comprises four Russian-supplied VVER-440 pressurized water reactors, which started up between 1982 and 1987. These units provide one-third of Hungary's electricity. An inter-

governmental agreement signed in early 2014 would see Russian enterprises and their international sub-contractors supply two new units at Paks – VVER-1200 reactors – as well as a Russian state loan of up to €10.0 billion (\$11.2 billion) to finance 80% of the project.

Kadar told the conference in the Hungarian capital on 5 December: "Nuclear will continue to remain an important part of Hungary's

energy strategy with the maintenance of its reactor capacity. As nuclear power plants are almost emission-free producers of electricity, they are economical and efficient tools for meeting environmental and climate protection targets.

Over-dependence on renewable energy might have its own fallout. "Germany is finding that over reliance on renewable energy, as a result of their decision to phase out nuclear, is hurting them," Srinivasan said. "It would be no surprise if Germany itself does a rethink on exit from nuclear energy, especially, because of the need to reduce carbon emissions.

Nuclear will continue to remain an important part of Hungary's energy strategy with the maintenance of its reactor capacity. As nuclear power plants are almost emission-free producers of electricity, they are economical and efficient tools for meeting environmental and climate protection targets. Nuclear energy also contributes to security of supply and through its low operation cost to the competitiveness of the national economy.

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Following Kadar to the podium, László Varró, the IEA's chief economist, said wind and solar power are transforming the electricity industry, but not fast enough to put the world on track for the UNFCCC's Paris Agreement target to hold the global temperature increase well below 2°C. This "climate stabilisation" target needs nuclear power to play a significant role in the low-carbon power mix, Varró said.

Varró, who is a Hungarian national, based his comments on the IEA's latest edition of its World Energy Outlook (WEO), which was published on 16 November. The WEO's 450 Scenario shows global nuclear generation output increasing by almost two-and-a-half times by 2040, compared to the present day – from 2535 TWh to 6101 TWh.

Kadar said natural gas plays an important role in the country's power generation mix thanks to the fuel's flexibility, but the national target for renewables to account for 14.65% of primary energy consumption by 2020 requires "significant upgrades in technical, regulatory and market design".

Another challenge, she added, "lies in the uncertainties about the development of innovative technologies, such as energy storage and battery technologies that can have a major impact on the pace of the energy transition". Bigger emphasis, she said, should be put on the development of energy storage technologies to make it possible to store energy for a longer time. "All national actions should be complex in approach in future by taking into account the needs of society and benefitting the economy as a whole. The World Energy Outlook forecast can therefore offer us energy policies, both current and future ones," she said.

Paks II: In his conference presentation on 6 December, Aszódi noted that nuclear leads the ENTSO-E electricity generation mix - with more than 800 TWh - and is followed by hydro, hard coal, natural gas, lignite, wind, and solar PV. According to the ENTSO-E net generation capacity mix, nuclear is fourth, after natural gas, hydro and wind, but before hard coal, solar PV, lignite and oil.

Citing World Nuclear Association data, he noted there are 450 nuclear units in operation worldwide, providing 391 GWe of net installed capacity in total and 17,000 reactor years of operation experience. In 2015, some 2441 TWh of electricity were supplied by nuclear units.

There are 450 nuclear units in operation worldwide, providing 391 GWe of net installed capacity in total and 17,000 reactor years of operation experience. In 2015, some 2441 TWh of electricity were supplied by nuclear units. "This amount of electricity would have caused a large amount of 2°C emissions if it had been produced on a fossil-fuel basis. This would have been 1120 million tonnes of 2°C in natural gas-fired power plants, 2120 million tonnes of 2°C in coal-fired power plants, or 2400 million tonnes of 2°C in lignite-fired power plants.

"This amount of electricity would have caused a large amount of 2°C emissions if it had been produced on a fossil-fuel basis. This would have been 1120 million tonnes of 2°C in natural gas-fired power plants, 2120 million tonnes of 2°C in coal-fired power plants, or 2400 million tonnes of 2°C in lignite-fired power plants," he said. "With a 2°C-intensity of 15-30 t 2°C /GWh, nuclear power is "the most important low-carbon electricity source in efforts to combat climate change."

Speaking to World Nuclear News during the conference, Aszódi said Hungary's energy policy is "clearly in line with the prognoses the IEA has prepared". He said: "Everyone talks about electricity sources which are only at a share of one-third – wind and solar in 2040 in the 450 Scenario - but no one talks about the two-thirds share – which is mainly nuclear and hydro, with a negligible share of gas and coal. What I see is a dramatic decrease in coal and the need for the capacity maintenance of nuclear. But capacity maintenance in 2040 means new construction of nuclear power plants are needed. We are working on capacity maintenance in Hungary and we hope that other countries, not only the UK, Finland and France, but others too will do the same in the long

term.”

The European Commission last month cleared Hungary’s award of a contract to Russia’s Rosatom to build the two new units at Paks. It had been examining until recently two matters related to Paks II - procurement and whether funding of the project amounts to state aid. On 17 November it closed the infringement procedure it had launched against Hungary over public procurement rules in connection with the project. It is still investigating whether there is state aid. ... Aszódi told WNN Hungary is hopeful it will receive the European Commission’s final decision before the end of the year.

“Our analysis of the age distribution of European power plants shows that in the next 15 years about 25% of all current production capacity will be retired, or older than 55 years. The picture is even worse further out, so we will definitely need in the near future power plants that are independent of weather conditions, like nuclear,” he said.

The first Paks II unit is to be completed in 2025 and the second in 2026. The Hungarian Atomic Energy Authority said on 9 December it had received an application to extend the operating licence of unit 4 for another 20 years, until 31 December 2037. Units 1 and 2, which received their 20-year licence extensions earlier this decade, will operate until the ends of 2032 and 2034, respectively. The regulator is expected to decide this month on a 20-year extension for Paks 3 - to the end of 2036.

Source: World Nuclear News, 13 December 2016.

JAPAN–FRANCE

Mitsubishi Heavy, Japan Nuclear Fuel to Invest in France’s Areva

Mitsubishi Heavy Industries Ltd. and Japan Nuclear Fuel Ltd. are making final arrangements to invest tens of billions of yen in atomic energy company Areva, which is being bailed out by the French government, sources close to the matter said on 08 December. Through the investment, the

heavy machinery manufacturer and the spent-fuel reprocessing firm hope to improve technical cooperation with Areva on decommissioning reactors and reprocessing nuclear fuel. Areva has been reeling from weak global demand since the 2011 Fukushima disaster triggered a slump in the nuclear power industry. Areva is being bailed out by the French government, which has been asking Mitsubishi Heavy to invest since 2015.

MHI President Miyanaga had said that investing in Areva, which has expertise in decommissioning procedures and fuel reprocessing, would benefit Japan as it faces the prospect of decommissioning more aging nuclear reactors amid high public concern over nuclear safety. A major Chinese

nuclear power company is also considering investing in the state-owned group. Mitsubishi Heavy is also planning to invest in Areva’s plant-building arm in hopes of winning orders to build nuclear power plants in emerging economies where demand is growing. The heavy machinery maker and

Areva are already involved in a joint venture to develop nuclear plants with advanced reactors.

Source: <http://www.japantimes.co.jp/>, 08 December 2016.

KENYA

Kenya Plans First Nuclear Power Plant at \$5 Billion Cost

Kenya plans to begin constructing its first nuclear power plant at a cost of \$5 billion by 2021 as the country seeks to bring down the cost of electricity. An unreliable and expensive power supply is cited by business as a deterrent to investment in East Africa’s biggest economy. The nuclear plant, due for completion in 2027, will add 1,000 megawatts, according to the nation’s Nuclear Electricity Board’s acting Chief Executive Officer Juma. The nation generates about 2,299 megawatts of electricity, mainly from geothermal wells and hydro-electricity dams, according to the Energy

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Regulatory Commission. It intends to increase capacity to 6,766 megawatts by 2020.

The government has finished a grid analysis and is now carrying out a feasibility study, Juma said in an interview. It will invite construction bids after settling on a suitable technology and on the site. The government is considering both public-private partnerships and government-to-government agreements as financing options, he said.

"When we talk of 1,000 megawatts, we are talking half of the capacity we have right now in the country," Juma said the coastal city of Mombasa on 29 November. "It is very expensive, so we are looking at several funding options. We are speaking to various governments."

Funding Options: Kenya and South Korea signed agreements to collaborate on designing, constructing and operating nuclear reactors when the African nation's energy secretary, Keter, visited the Asian country in September. Kenya is seeking to build a 4,000-megawatt facility by 2033. Nuclear power would lower the cost per unit to about 4-6 US cents per kilowatt-hour, Juma said. The country is trying to wean itself off diesel-generated electricity that costs about 38 cents per kilowatt-hour. Kenyan power consumers pay an average of 18.7 US cents per kilowatt-hour, compared with 9 cents in neighboring Tanzania and 3 cents in Ethiopia, African Development Bank data show.

Source: www.bloomberg.com, 30 November 2016.

SOUTH AFRICA

Outa Says there is No Case for Nuclear

Civic rights organisation Outa on 08 December said it believed the case for building new nuclear energy reactors had been dismantled after the energy minister's advisors told public hearings there were cheaper viable options. "Following input provided by numerous entities at Wednesday's Integrated Energy and Resource Plan (IEP and IRP) draft documents, Outa believes

the rationale for any plans to introduce nuclear energy into South Africa's electricity grid has been removed," Outa's portfolio director Blom said.

He said the first day of hearings on the draft resource and energy blueprints had shown that they contained serious flaws in their assumptions of the prices of different energy technologies and that there was a need to for the IRP base case scenario to use the cheapest options. The base case scenario advanced in the IRP provides for South Africa to add 20 gigawatt of new nuclear energy by 2050 and Eskom has said it would it go to the market with a request for proposals by the end of the year still.

A team of experts that advised Energy Minister Pettersson challenged this conclusion and said their input was ignored.

Business Day reported that members of the panel of 40 experts told the hearings that the department's decision to impose artificial constraints on how much renewable energy could be added to the grid, as well

as outdated pricing had allowed nuclear into the model. Outa chairman Duvenhage said the hearings had already yielded valuable input for the final IRP and he did not see how it could support the government and Eskom's plans for nuclear expansion. ...Outa has called on the department to allow more time for public submissions. "We remain concerned that the DOE is trying to force the process to be complete by the end of March 2017, which we believe will not be sufficient time," Blom said.

Source: <http://www.iol.co.za/>, 08 December 2016.

SWITZERLAND

Switzerland Votes Not to Abolish Nuclear Power After All

Swiss voters rejected plans to shut down most of the country's nuclear industry in a referendum on 25 November, with 54.2 percent voting against the initiative. If it had been successful, the vote would have forced the country to shut down three

The base case scenario advanced in the IRP provides for South Africa to add 20 gigawatt of new nuclear energy by 2050 and Eskom has said it would it go to the market with a request for proposals by the end of the year still.

of the country's five nuclear reactors in 2017, with the remaking pair of reactors shutting down by 2029. The initiative would have limited the life span of nuclear plants to 45 years, so the newest of the plants, which began operating in 1984, would have had to close in 2029. Switzerland gets about 40 percent of its electricity from nuclear power, according to the World Nuclear Association. "We would have liked to win, that's clear, but 45 percent for 'yes' is a good result," Rytz, the chairwoman of the Swiss Green party, told a local television station. "The problems haven't been resolved with this referendum Sunday."

Source: <http://dailycaller.com/>, 28 November 2016.

UK

Brexit puts Europe's Nuclear Fusion Future in Doubt

Brexit puts the future of the world's largest nuclear fusion reactor, based in Oxfordshire, in doubt. By leaving the EU the UK might also exit Euratom, the EU's framework for safe nuclear energy. "It would be bizarre and extreme for the UK, which has been at the forefront of fusion research for 50 years, to just leave these projects," says Chapman, CEO of the UK Atomic Energy Authority. "It would make no sense strategically."

The UK government has yet to say what its plans are for cooperating with Euratom, but part of the Brexit negotiations will have to include the nuclear fusion experiment JET. Decommissioning JET is expected to leave around 3000 cubic metres of radioactive waste, which would cost around £289 million to deal with, according to the UKAEA. At the moment, JET hosts 350 scientists and is

funded by 40 different countries. Its aim is to commercialise nuclear fusion, which releases energy by forcing atoms together in the same process that powers the sun.

The energy output should be far greater than that of current nuclear power stations and produce a smaller amount of waste. But making it work effectively has proved incredibly difficult, as reactors require huge amounts of energy to get going and only remain stable for short periods.

During its existence JET has set many nuclear fusion records, including the world record for fusion power in 1997. Recently, JET has been running experiments to help with building ITER, a larger and more powerful reactor in France.

"JET is the best place to prepare for ITER's first run in 2025," Chapman says. "There's nowhere else like it in the world." Due to delays with ITER, the plan was for JET to continue running after its scheduled finish date in 2018. Whether that happens or not will depend on Brexit negotiations. "Discussions with the European commission have made clear that to get the most out of ITER, JET must continue running past 2018," Chapman says. "Whether that will happen will depend on the political climate."

Source: [www. news scientist. com/](http://www.news scientist.com/), 30 November 2016.

USA

How Natural Gas and Nuclear have Made the US Greener

A new study by Brookings found increases in natural gas and nuclear energy for electricity generation have allowed parts of the US to

The initiative would have limited the life span of nuclear plants to 45 years, so the newest of the plants, which began operating in 1984, would have had to close in 2029. Switzerland gets about 40 percent of its electricity from nuclear power, according to the World Nuclear Association.

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'decouple,' with states reducing their carbon dioxide emissions but seeing their economies grow. Two-thirds of US states saw their economies grow while they reduced their carbon-dioxide emissions from 2000 to 2014. They did this by relying more on natural gas and nuclear energy for electricity production and less on coal, according to a report published on 08 December by the Brookings Institution.

Thirty-three states, primarily in the Northeast and South, as well as the District of Columbia, reduced their carbon emissions while they grew their GDP during those years, a term known as "decoupling." Many Northeastern states reduced their carbon emissions by increasing the amount of electricity they generate from natural gas, while parts of the South did so, in part, because they rely on nuclear energy. Several analyses from earlier 2016 already found dozens of countries decoupled, a feat once thought near impossible because renewable energies were thought to hurt economic growth.

In fact, the WRI found in April that the US is the largest country to experience multiple consecutive years of decoupling. But the study by the Brookings Institution's Metropolitan Policy Program is the first of its kind to examine this trend state-by-state. The study also comes as the world's nations are poised to experience a shift in how they power their economies and lives, although the direction now remains unclear. In addition to 2015 being the first year in a decade with flat global carbon emissions, it also saw the passage of the Paris climate agreement. But President-elect Trump could reverse this momentum.

During his campaign, he promised to revive the coal industry, and tear up environmental regulations that he says hurt the economy. But the study's authors and some environmental

researchers say it plots a model for other states and countries to look to, and suggests this trend will continue with or without Washington's help.

"The focus of action is actually going to depend more and more on the states now," says Saha, who is one of the study's authors, and an associate fellow at Brookings. "States have to take on more and more responsibility to keep the momentum going, especially in an era of federal drift and retreat."

..."Historically, we have seen that a lot of energy innovation has actually happened at the state level," including clean energy funds, Renewable Portfolio Standards, clean-energy finance banks, and policies such as carbon-emission targets and renewable energy standards. "More and more the states have to step up and keep this momentum." In the study, Dr. Saha and Muro, a senior fellow at Brookings, compared the GDP growth of all 50 states and D.C. to data on energy-related carbon dioxide emissions from 2000 to 2014. While multiple factors have influenced the pace of decoupling, "some of the most important factors are market trends and the shifting nature of state economies," the report notes.

The difference among states, Saha tells the Monitor, partly boils down to how they generate electricity. The Northeast and South achieved decoupling through natural gas and nuclear energy. In Massachusetts, for instance, electricity production from natural gas increased 32 percent, from 28 percent in 2000 to 60 percent in 2014. In Tennessee, where two nuclear facilities account for more than a third of electricity generation, carbon emissions were reduced by 19 percent, while the state's economy expanded by 23 percent. Much of the Midwest and West went the other way, however.

Sixteen states saw their carbon emissions rise with their economies, in part because they rely

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on coal to produce electricity. Nebraska saw its carbon emissions increase by 26 percent, while North Dakota saw its carbon emissions increase by 16 percent. The report adds to several analyses of global carbon emissions. In March, the IEA in Paris found carbon emissions from the energy sector stayed flat for the past two years even as the global economy grew by more than 3 percent. In April, WRI found 21 countries have achieved decoupling since 2000, although they noted this trend occurred for a variety of reasons, from carbon taxes in Sweden to an increase in renewable energies in Denmark.

While environmental researchers welcomed the Brookings study, they also wondered about so-called "carbon leakage," in which a country, state, or city sees many of its industries move to places with lesser or no curbs on greenhouse gases. Prakash, founding director of the University of Washington's Center for Environmental Politics, noted in an email to the Monitor that the study acknowledges carbon leakage in Northeastern states that have been importing more hydroelectric power from Canada, in addition to generating more electricity from natural gas. ...

Source: <http://www.csmonitor.com/>, 08 December 2016.

Rauner Signs Legislation to Keep Two NPP Open and Hike Consumer Bills

Hundreds of happy Exelon workers jammed into a high school gym near the Quad Cities to watch Illinois Gov. Rauner sign the bill that will save their jobs at the nuclear plant in Cordova and one in Clinton, in central Illinois. The bill also enables Exelon to increase costs for all the electricity consumers it serves. Rauner told them there was a lot of opposition to the Future Energy Jobs Bill. ...The bill contains subsidies and other provisions

that Exelon says will allow it to keep the two nuclear power plants open, with 800 direct jobs in Cordova and 700 in Clinton, plus thousands more dependent on those workers and their families. Rauner attended a similar rally and ceremonial bill signing on 07 December afternoon in Clinton. Meanwhile, manufacturers say the energy law Rauner signed will make it harder for them to compete.

The law requires households and large-scale consumers alike to pay a subsidy that Exelon will use to fund a pair of nuclear plants. The Illinois Manufacturer's Association's Denzler says that hike in electric rates will cost some of his members millions of dollars a year. "Certainly for manufacturing companies, energy prices are often the single most expensive cost they have," Denzler said. "even more than personnel," Denzler says Illinois' relatively low energy prices had been seen as a draw. Exelon threatened to lay off thousands of workers in Clinton and the Quad Cities without the subsidy.

Source: <http://northernpublicradio.org/>, 07 December 2016.

Illinois Sees the Light – Retains Nuclear Power

December 1st, the Illinois State Legislature passed a measure that will allow continued operation of two of the state's six nuclear power plants. In a nail-biter more reminiscent of overtime at the Super Bowl, the Illinois State Legislature passed The Future Energy Jobs Bill (SB 2814) with less than an hour remaining in the legislative session. The bi-partisan bill allows Exelon's Clinton and Quad Cities nuclear power plants to remain open, saving 4,200 jobs and over 22 billion kWhs of carbon-free power each year, more than all of the state's renewables combined.

These two plants were in jeopardy of closing

In Tennessee, where two nuclear facilities account for more than a third of electricity generation, carbon emissions were reduced by 19 percent, while the state's economy expanded by 23 percent. Much of the Midwest and West went the other way, however sixteen states saw their carbon emissions rise with their economies, in part because they rely on coal to produce electricity. Nebraska saw its carbon emissions increase by 26 percent, while North Dakota saw its carbon emissions increase by 16 percent.

because even at a low cost of five cents or so per kWh, they were losing a combined \$100 million per year because they could not compete with cheap natural gas and wind energy that is subsidized at 2.3¢/kWh. Illinois taxpayers subsidize solar energy at 21¢/kWh. This bill provides these nuclear plants with just 1¢/kWh, and only until market conditions change.

Exelon had drafted a press release announcing the closure of the two plants that was to be issued last night if the bill failed. Instead, these plants will be operating for at least another 10 years, producing over 200 billion kWhs of carbon-free energy. In addition to preserving nuclear energy as a way to support cleaner air, the measure also expands the state's energy efficiency programs and makes changes to the state's renewable portfolio standard sought by renewable advocates.

Source: <http://www.forbes.com/>, 04 December 2016.

URANIUM PRODUCTION

KAZAKHSTAN

New Fabrication Plant for Kazakhstan

Construction of a nuclear fuel fabrication plant has begun in Kazakhstan, KazAtomProm, CGN and Areva have announced. The plant will use Areva fabrication technology and will be managed by a joint venture between KazAtomProm and China General Nuclear Power Corporation (CGNPC). The three companies said the plant would have a production capacity of 200 tonnes of fuel assemblies per year, with production scheduled to begin in 2020.

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Kazakhstan is currently the world's leading uranium producer, accounting for 39% of output in 2015, and already has the capability to manufacture fuel pellets at UMP's 2000 tonne per year plant. KazAtomProm has previously said it aims to supply up to one-third of the world fuel fabrication market by 2030. Areva signed an agreement with KazAtomProm to build a fabrication plant in 2011, following earlier agreements signed in 2010 and 2008.

It will be managed through Ulba-FA, a joint venture of KazAtomProm subsidiary Ulba Metallurgical Plant (UMP) (51%) and CGNPC subsidiary CGN-URC (49%).

A contract has been signed by Areva NP and Ulba-FA that provides a licence for fuel fabrication technology, engineering documentation, the supply of key production equipment and personnel training. A joint statement issued by the three companies described construction of the plant as "one of the breakthrough projects to be implemented

under KazAtomProm's strategy, which focuses on the development of a vertically integrated fuel cycle company with advanced nuclear fuel fabrication facilities."

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Kazakhstan has been moving towards becoming a major nuclear fuel supplier to China, with CGN-URC and UMP signing agreements earlier 2016 for the development of Kazakh uranium mines and the construction of a nuclear fuel plant in Kazakhstan. In late November, officials from KazAtomProm and the Kazakh government visited China for talks on enhanced cooperation in the uranium mining and nuclear power sectors, including the

supply of Kazakh uranium products to China.

The companies said the new fuel fabrication plant is expected to have a "guaranteed market" for 20 years. Half of the KZT 49 billion (\$147 million) investment in the plant would be provided by the Chinese partner. KazAtomProm CEO Zhumagaliyev said the plant was the result of long-term cooperation between Kazakhstan, China and France and was a strategic step by KazAtomProm towards production diversification. "Maintaining our uranium mining leadership, we are planning to offer to the market fuel for nuclear power plants of Kazakh origin, which will allow us to strengthen our position on the global nuclear market," he said.

CGNPC director general Shanming said the project allowed CGNPC and KazAtomProm to take their cooperation to a "new level". Areva CEO Knoche said Areva had started production of the necessary equipment for the project. "Areva is proud to be selected as a full scope technology provider for this future fuel plant. This contract reinforces the strong links between Areva, KazAtomProm and CGNPC," he said.

Source: <http://www.world-nuclear-news.org/>, 08 December 2016.

MAURITANIA

Aura Energy Recommences Tiris Definitive Feasibility Study in Mauritania

This is following its recent successful UK listing and fund raising. The Tiris uranium project in north eastern Mauritania is a shallow open-pit mining project with a 49 Mlb U₃O₈ indicated and inferred resource, 94% recovery rates and simple processing allowing a potential 500% grade uplift.

It is forecast to have C1 cash costs of US\$30/lbU₃O₈ and low-capex costs of \$45 million and has a development MOU signed with a Chinese engineering group. Since the fundraising in September 2016 Aura has continued planning and review for the re-establishment of the DFS programme which is now fully underway.

The activities have included the following:

- Appointment of Rod Unwin as the Tiris study manager, an experienced African study manager having completed studies for Mineral Deposits on the Sabodala gold mine and Grand Cote mineral sands projects in Senegal
- Permanent appointment of Dr Will Goodall as principal metallurgist for Aura Energy
- Establishment of the Tiris project peer review committee
- Commencement of down hole gamma logging of 2015 drillholes
- Ultra-detailed ground radiometric surveying of mineral resources
- Planning of geophysical studies for the review and drilling of regional water sources
- Re-commencement of the environmental impact study
- Continuation of metallurgical studies for leaching and beneficiation
- Preparation of documents for the mining lease application
- Meeting with Mines Ministry officials in Mauritania

Aura Energy's Tiris project remains a small low capex development capable of significant uranium production based on the beneficiation step in the process. As part of the field activities Aura Energy will also commence an initial scoping sample programme on its Sabkha, or salt pan, for possible soda ash and lithium occurrences.

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for possible soda ash and lithium occurrences. The location of the Sabkha between Aura Energy's Tiris project east and west tenements provides a favourable location should a source of soda ash (Na₂CO₃) be identified.

The company's 2014 scoping study identified the need for up to 16 000 t of soda ash which, including transport, would account for

approximately 25% of Tiris' operating costs. Utilising a nearby source of soda ash has the potential to significantly reduce these costs. Additionally, potential for revenue from other minerals such as lithium or back-loading soda ash to port for export would further reduce the Tiris operating cost.

Reeve, Aura Energy's executive chairman says, "Aura remains extremely fortunate to have retained such a high-quality team of technical professionals to advance its Tiris project. With the DFS firmly back underway and field activities commenced we remain confident of completing the study by the end of 2017." "Aura maintains that with recovery of the uranium price over the coming two years and the strategic balance of its other minerals exploration programme it is perfectly positioned to fund and construct Tiris to coincide uranium production with an improved uranium pricing environment. To have this study back underway and finally towards completion and with the sampling of Aura's new soda ash and lithium tenements commences an exciting period towards our ultimate goal of cashflow".

Source: www.miningreview.com, 08 December 2016.

NUCLEAR COOPERATION

IRAN-USA

Mohammad Zarif's Strong Statement Makes Waves as US President-Elect Trump Continues to Vocally Oppose the Nuclear Agreement

Iranian FM Zarif said during a seminar in Tokyo on 08 December, when filming was not allowed, that it was in the interest of the US to remain committed to a multilateral nuclear treaty. The US Senate voted to extend the Iran Sanctions Act (ISA) for 10 years, and Iran vowed to retaliate, saying it violated 2015's agreement with six major powers to curb its nuclear program in return for the lifting of international financial sanctions. A

diplomatic thaw between the US and Iran over the past two years appears in jeopardy with US President-elect Trump taking office in January.

Trump said during his election campaign he would scrap the nuclear agreement, calling the pact "a disaster" and saying it could lead to a "nuclear holocaust". Zarif, in Japan as part of an Asian tour that included India and China, told the seminar that while the agreement was multilateral and endorsed by the UNSC, this did not mean it might not be violated by the US, which he said had a "less than respectable" history in respecting international laws.

The ISA renewal would not infringe on the nuclear agreement. US lawmakers have also said the ISA extension would make it easier for sanctions to be quickly reimposed if Iran contravened the nuclear deal. But Iran's nuclear energy chief, Salehi, who played a central role in reaching the nuclear deal, described the extension as a "clear violation", if implemented.

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reaching the nuclear deal, described the extension as a "clear violation", if implemented.

Source: <http://www.jpost.com/>, 08 December 2016.

NUCLEAR DISARMAMENT

GENERAL

Nuclear Disarmament: A Breakthrough at the UN?

The fact that twenty years have passed without any progress in the field of multilateral nuclear disarmament and that the post-Cold War period of detente has been substantially wasted explains the frustration of a great majority of non-nuclear weapons states. This frustration led to a vote at the First Committee of the UN General Assembly. On October 27, 2016, 123 countries voted in favour, 38 voted against and 16 abstained on draft resolution L.41 which calls for the convening of a United Nations Conference "to negotiate a legally-

binding instrument to prohibit nuclear weapons, leading towards their total elimination". It is the first time that such a bold proposal has been adopted.

The supporters of the move have the ambition of dealing with multilateral nuclear disarmament in one single negotiation framework instead of the traditional step-by-step approach that has prevailed so far - unfortunately, with disappointing results. The resolution, which is still to be confirmed by a vote of the General Assembly as a

whole in December, already establishes a date, venue, the participants, the rules of procedure and the duration of the negotiations. They are scheduled to take place in 2017 and all the 193 United Nations members will be invited. The participation and contribution of international organizations and civil society is also foreseen. The latter has actively supported the process leading to the adoption of the resolution and will likely also play a leading role in the future. The Conference will work for 20 days and will take place in two separate sessions. Unless otherwise agreed, General Assembly rules of procedure will apply.

This may mean that, if a consensus is not reached, decisions will be taken by a majority vote. It is quite unusual for decisions on legally binding norms on strategic security matters to be adopted by such a procedure. The previous major multilateral treaties were negotiated in Geneva and based on the rule of consensus. The Conference will take place in New York, not in Geneva, where the competent negotiating forum, the CD, is based. This a blow to the CD, whose 65 members have not even been able to agree on their program of work for the last 20 years.

All the NPT nuclear weapons states, with the exception of China, which abstained, voted

against L.41. Of the non-NPT nuclear capable countries, both India and Pakistan abstained, and Israel voted against. The belligerent DPRK,

surprisingly, voted in favour. With the exception of the Netherlands, which abstained, all NATO countries voted against the text. The US strongly urged its partners to do so.

It is regrettable that the mandate of President Obama, a Nobel peace prize recipient, who had forcefully advocated reducing the role of nuclear weapons in the US security

strategy, ends with a disappointing vote, precisely on nuclear disarmament. It is also regrettable that the European Union countries remain deeply divided over nuclear issues. Austria and Ireland, which belong to the five sponsoring countries of the text, together with Malta, Cyprus and Sweden voted in favour; the two European nuclear weapons states (France and UK) and the EU

countries which are members of NATO (with the Dutch exception) voted against. Finland abstained.

A non-supportive vote is contradictory to the legally binding provision of article VI of the NPT "to pursue negotiations in good faith on effective measures relating to cessation of the

nuclear arms race at an early date and to nuclear disarmament". It also disregards the 1996 consensual advisory opinion of the ICJ indicating that "There exists an obligation to pursue in good faith and bring to a conclusion negotiations leading to nuclear disarmament...." A non-supportive vote is also an incoherent position for the states parties to the NPT: in 2010 all of them subscribed to the concepts of a world free of nuclear weapons and noted the catastrophic consequences of their use. Needless to say, all NATO and EU countries are parties to the NPT.

The large majority of the countries that have not supported this resolution are either nuclear

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The large majority of the countries that have not supported this resolution are either nuclear weapon countries or nuclear-protected countries. It is likely that they will not participate in the Conference. This means that their voice will not be heard and their interests will not be taken into account.

weapon countries or nuclear-protected countries. It is likely that they will not participate in the Conference. This means that their voice will not be heard and their interests will not be taken into account. Many observers question whether it makes sense to negotiate a prohibition of nuclear weapons without the presence of most of the countries possessing such weapons. However, the successful outcomes of previous negotiations leading to the prohibition of anti-personnel land mines and cluster munitions indicate that meaningful agreements may be reached without the participation of the major players. Whether what worked for the prohibition of such conventional weapons with tactical uses like anti-personnel mines might also work for weapons of mass destruction, which have a strategic value, is still to be ascertained.

It is doubtful that the negotiating process which will be initiated in New York next year will deliver early concrete results. We should therefore not exclude that efforts can be made under the traditional step-by-step approach. The two processes must become mutually supportive.

Source: Article by Carlo Trezza, Former Italian Ambassador for Disarmament and Non-Proliferation, and former Chairman of the MTCR, <http://www.europeanleadershipnetwork.org>, 29 November 2016.

NUCLEAR SAFETY

USA

Pilgrim Nuclear Plant Staff said to be 'Overwhelmed'

Staff at the Pilgrim Nuclear Power Station appear to be "overwhelmed" and struggling to improve performance at the facility, which has a poor safety record and is set to close in less than three years, according to an internal memo from a federal regulator made public on 06 December. The memo, authored by Jackson of the NRC, indicated that inspectors had found a "safety culture problem" during their ongoing review, along with problems with maintenance, engineering, and the reliability of equipment at the 44-year-old plant.

Jackson's memo was inadvertently sent to an environmental advocate, who forwarded the message to the Cape Cod Times. The newspaper posted the memo online on 06 December. Jackson is leading a team of NRC investigators who began reviewing operations at the plant in November, as required by law because of the facility's low safety rating. The power station is scheduled to close permanently in May 2019.

Source: <https://www.bostonglobe.com>, 07 December 2016.

Palisades Nuclear Power Plant to Close in 2018

Entergy Corp., the plant's owners, made the announcement in a news release on 08 December. "Entergy recognizes the consequences of a Palisades shutdown for our approximately 600 employees who have run the plant safely and reliably, and for the surrounding community, and we will work closely with both to provide support during the transition," said Denault, Entergy's chairman and chief executive officer, in the release.

... Entergy and Consumers Energy have agreed to an early termination of their power purchase agreement for the Palisades plant, located in Van Buren County's Covert Township near South Haven, in 2018.

Entergy noted the agreement is subject to regulatory approvals. It said that "assuming regulatory approvals are obtained for the PPA termination, Entergy intends to shut down the Palisades nuclear power plant permanently on Oct. 1, 2018." The original agreement committed Consumers Energy to purchase nearly all of the power that Palisades generates through April 2022. Under the plan now, Palisades will be refueled as scheduled in the spring of 2017 and operate through the end of the fuel cycle, then permanently shut down in late 2018.

Entergy said that since it purchased Palisades from Consumers Energy in 2007 "market conditions have changed substantially, and more economic alternatives are now available to provide reliable power to the region." "The transaction is expected to result in \$344 million in savings, \$172 million of which is expected to

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lower Consumers Energy customers' costs over the early termination period from 2018 to 2022, and \$172 million of which Consumers Energy will pay to Entergy for early PPA termination," the release said. "The early termination payment to Entergy will help assure the plant's transition from operations to decommissioning, maintaining our commitment to meet US Nuclear Regulatory Commission requirements."

Palisades has long been Van Buren County's largest taxpayer and a major player in the region's economy. "To support the community during the transition, Entergy and the Consumers Energy Foundation will provide a total of \$10 million over several years in economic development funding for the Southwest Michigan region," the release said. Of the \$10 million, the Consumers Energy Foundation will contribute \$2 million and Entergy \$8 million. The companies will consult with the Council of Michigan Foundations and local stakeholders as it relates to the distribution of these funds.

"The process for reviewing requests for funds and distributing them will be announced later, with a focus on sustainable economic development that will broaden the community's tax base," the release said. "Entergy is committed to treating our employees fairly throughout this process and will assist employees who want to relocate within Entergy or leave the company," said Mohl, president of Entergy Wholesale Commodities, a business unit within Entergy. "Additionally, Consumers Energy has committed to work closely with Entergy as part of its ongoing talent recruitment efforts and will consider potential placement of up to 180 appropriately skilled employees from Palisades into the utility's workforce over time."

Palisades is licensed by the NRC to operate through March 24, 2031. The 45-year-old Palisades plant, one of the country's oldest nuclear power plants, has been under elevated

scrutiny from the federal regulators in recent years, with numerous unplanned shutdowns due to problems.

The NRC determined that the plant operated safely in 2015, but it was under increased NRC oversight for the first three quarters of 2015 due to its failure to accurately calculate radiation doses to workers during an activity in 2014. It began to receive the normal level of NRC oversight during the last quarter of 2015. The plant's reactor is one of the most "embrittled" reactors at US nuclear facilities, putting it at risk of cracking. The NRC in 2014 began a three-year review of results of tests on the reactor.

Source: <http://www.mlive.com/>, 08 December 2016.

NUCLEAR WASTE MANAGEMENT

AUSTRALIA

Exhuming South Australia's Nuclear Waste Import Dump

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Political support for South Australia's nuclear waste import project has collapsed. ...Labor Weatherill fumed, accusing the Opposition Leader of withdrawing his support for a nuclear waste dump before the consultation process had been completed. But the damage

was done. A Parliamentary Inquiry into the plan has heard some damning economic evidence. Even nuclear enthusiast Business SA chief McBride pronounced that the plan was now "dead". The beleaguered Weatherill now faces mutiny in his own party...

You would think that, with an election coming up in 2018, Weatherill might ponder on the advantages of making a gracious retreat, respecting the remarkably strong recommendation from his own Citizens' Jury, that the international nuclear dump was not to go ahead "under any circumstances". But Weatherill

is persisting with the plan, even though it is a bell tolling his political suicide. We can only suspect that Weatherill has some very poor advisers, or that he is beholden to the nuclear lobby.

Let not the Anti-nuclear Movement Rejoice: The plan for importing nuclear waste to South Australia has been several decades in the making and this recent government push has cost at least \$13 million. The nuclear lobby is not giving up so easily. The focus now shifts to the plan for a Federal Government nuclear waste dump in Barndioota. It would be naive to think that these two plans are not connected.

Australia has a relatively small but enthusiastic pro-nuclear lobby, led by Heard and Barry Brook. Heard – who has just started a pro-nuclear group seeking charity status – made the connection between the two waste dump plans, explaining why South Australia could take not only Australia's but also the world's nuclear waste.

It is a simple and, in a way, logical idea to say that once a place is radioactively polluted, well, why not choose that place to dump more radioactive pollution? That logic was expected to work for South Australia, seeing that widespread pollution had occurred as a result of the British atomic bomb tests. However, it backfired badly, when the Aboriginal communities and their doughty supporters, Sisters of St Joseph, produced compelling arguments against that idea.

That idea didn't work at first, but what if we got a nuclear waste dump in South Australia? One that started out storing "low level medical" nuclear waste but then got "intermediate level" nuclear waste originally derived from Sydney's Lucas Heights nuclear reactor? Especially as medical nuclear wastes are so short-lived – radioactivity lasting generally for just hours, or a few days, it would be pretty silly to have a great big repository site, with not enough wastes to fill it.

The Federal Government has been secretive about its current plan for a national nuclear waste dump. The publicity about it has been downright duplicitous. They say that the purpose for the dump is to dispose of medical radioactive wastes.

Medical Waste only Radioactive for Short Periods: Molybdenum-99 (Mo-99) is the most in demand medical isotope. It can be shipped from a nuclear reactor where it is created as a fission product, to the point of use as it has a reasonably long half-life of 66 hours. Its decay product, technetium 99m, with a six-hour half-life, is used as a tracer.

Now, if medical wastes are radioactive for only hours, or a few days, why would they need to be transported for thousands of miles across the continent? They are produced in very small quantities and currently stored near the point of use – in hospitals. (There's actually a strong argument for the use of non-nuclear cyclotrons to produce these isotopes close to the hospitals, rather than at the centralised nuclear reactor at Lucas Heights in Sydney.)

So, an underground nuclear waste facility for medical wastes, at remote Barndioota, in South Australia, doesn't seem necessary. But then there's the processed nuclear waste returning to Lucas Heights from France and the UK. The Australian Government describes this as intermediate-level waste that isn't harmful unless mismanaged. The French Nuclear Safety Authority (ASN) has classified it as high-level (long-life) waste according to standards set by ANDRA, the French national radioactive waste management agency. High-level waste is ANDRA's most severe nuclear waste classification.

It is pretty clear that the purpose of the proposed Barndioota nuclear waste dump is the disposal of Australia's intermediate to high-level waste returning from overseas. There are strong arguments for closing Australia's Lucas Heights reactor. However, that is not the subject here.... ANSTO was asked by the Federal Government to site, store and manage the return of reprocessed

The plan for importing nuclear waste to South Australia has been several decades in the making and this recent government push has cost at least \$13 million. The nuclear lobby is not giving up so easily. The focus now shifts to the plan for a Federal Government nuclear waste dump in Barndioota. It would be naive to think that these two plans are not connected.

waste until the National Radioactive Waste Management Facility is in place. ANSTO has applied to ARPANSA for licences to construct and operate an interim waste store.

Nobody is suggesting that the proposed Federal waste dump would develop into a site to receive international nuclear waste and there are significant reasons why that would almost certainly be impossible. One important reason is that Australia's "returning" nuclear wastes are very small – currently estimated at 680 cubic metres. The site is rumoured to have a capacity of about 10,000 cubic metres. The government is very cagey about the planned capacity.... It seems there is no way that the federal plan could develop into that grandiose project.

Federal Nuclear Waste Project to Start the Process:

But the federal nuclear waste project starts the process in some important ways. First, the plan must navigate several legal difficulties. In 2010, former premier Rann brought in laws to prevent a national nuclear waste dump being placed

in South Australia – laws which would have to be repealed before the Federal Government could proceed. Federally, the *National Radioactive Waste Management Act 2012* did water down prohibitions on nuclear waste dumping but there are still provisions that have to be overcome, particularly in relation to Aboriginal rights.

Secondly, there is that Aboriginal question. ...The South Australian Government recently imposed Aboriginal Regional Authorities upon the State's Indigenous communities. These are being used to fast-track and rubber stamp development over much of the land. They would be integral to Jay Weatherill's strategy of manufacturing consent.

Premier Weatherill is still bent on the grand plan to make South Australia a hub for commercial importation of nuclear wastes. He promises a plebiscite on the matter at some unspecified time in the future, to be held "at the end of the process, after everything has been worked out".

An unspoken part of the process must surely be the development of the Federal Government's nuclear waste facility in South Australia, which would conveniently overcome some big hurdles and would make that State look like an attractive place for a nuclear hub. Environmentalists had better stop rejoicing and start examining the machinations behind the Federal Government plan.

Source: [/independentaustralia.net/](http://independentaustralia.net/), 07 December 2016.

USA

Haakon County Potential Location for Nuclear Waste Disposal

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It's opposed by at least two South Dakota counties, but Governor Daugaard is in favor of the deep bore drilling of nuclear waste. Spink County already turned down a proposal by a nonprofit called Battelle to conduct a deep borehole field test; but now the company is eyeing Haakon County. It's part of a federal effort to find out if

deep rock is suitable for nuclear waste disposal. Governor Daugaard wants to move forward. One report says that the School of Mines would be involved.... Haakon County does not have any zoning laws, which might restrict such testing.

Source: <http://www.drgnews.com/>, 06 December 2016.

Energy Department Set to Release Nuclear Repository Plans, Possibly Affecting Savannah River Site

Nuclear waste material may soon have a new exit path away from the Savannah River Site and out of South Carolina under a soon-to-be released plan, according to US Department of Energy Officials. Senior Advisor for Defense Waste Disposal Buschman presented the details to the Savannah River Site Citizens Advisory Board. The board is comprised of local community members with vested interest in SRS activities. Its primary purpose is to provide advice, information and

recommendations on issues affecting the site and connected communities.

A designated national repository would replace the now defunct Yucca Mountain site. According to board members at the meeting, Yucca Mountain didn't have the capacity to store both defense waste materials and spent nuclear fuel from commercial sources; something the new draft plan aims to address. The Energy Department is looking at a deep geologic repository. That means the material would be transported to the site, arranged deep within the earth and isolated for permanent disposal to decay beyond the point of radiological danger.

Eligible defense materials include the glass-form waste at SRS. High level liquid waste left over from nuclear weapons production at SRS is processed from storage tanks through the Defense Waste Processing Facility. The waste stream is mixed through a delicate chemical process, melted into glass, and then poured into waste canisters. According to Buschman, the planned facility would be a permanent disposal facility for those canisters, effectively giving some of the SRS nuclear waste a pathway out of South Carolina.

Buschman said the plan includes consideration of feedback from industry and community members. The selected site would be consent-based, meaning the DOE would not unilaterally impose construction upon any community. The cost and schedule estimates forecast an 11-year timetable for designation and construction of a new facility. Initial cost estimates are around \$3 billion.

Depending on the site selected, though, Buschman said those costs could fluctuate.

She also noted that a new presidential administration at the beginning of 2017 could also bring different priorities in tow. Buschman said she could not speculate what President-

elect Trump's administration might do with the draft plan. The draft is set to publish in the coming days, although a firm date was not given. Once published, the draft is open for public comment. Buschman said at such early stages of a plan like this, speculation about community input is difficult to make. She also noted that while nothing is official, at least one American community seems to be expressing some interest as the future caretaker of the nation's defense nuclear waste.

Source: <http://www.aikenstandard.com/>, 06 December 2016.

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Centre for Air Power Studies

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