



NUCLEAR SECURITY



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

Vol 11, No. 09, 01 March 2017

OPINION – Muthiah Alagappa

Aim for 'New' Nuke Order

Nuclear weapons remain the most dangerous, with the potential to kill millions and inflict massive damage. After the termination of the Cold War, it was widely presumed that nuclear weapons were becoming less significant. There were high-level attempts to move towards a global zero and the disbandment of nuclear weapons altogether. However, the global zero and disarmament approaches underappreciated the continuing importance attached to nuclear weapons by Russia and others.

After the break-up of the Soviet Union and its rapidly diminishing economic strength, Russia saw nuclear weapons as the lynchpin of its security and passport to great power status. Hence, despite agreeing to arms limitations with the United States, Russia continued to maintain a large nuclear arsenal and emphasised nuclear weapons in its security strategy. In Asia, China, India and Pakistan viewed nuclear weapons as essential to their security, with India and Pakistan declaring themselves nuclear weapons states in the 1990s.

Now, with Trump in the White House, the US has begun to re-emphasise nuclear weapons.

Now, with Trump in the White House, the US has begun to re-emphasise nuclear weapons. Recently, the Pentagon urged the White House to consider expanded nuclear options, including the development of a "tailored nuclear option for limited use". The contemporary nuclear order, however, is not in sync with reality and no longer tenable. It appears likely that more states will join the nuclear club.

<u>CONTENTS</u>	
☞	OPINION
☞	NUCLEAR STRATEGY
☞	BALLISTIC MISSILE DEFENCE
☞	NUCLEAR ENERGY
☞	URANIUM PRODUCTION
☞	NUCLEAR COOPERATION
☞	NUCLEAR NON-PROLIFERATION
☞	NUCLEAR PROLIFERATION
☞	NUCLEAR SAFETY
☞	NUCLEAR WASTE MANAGEMENT

Recently, the Pentagon urged the White House to consider expanded nuclear options, including the development of a "tailored nuclear option for limited use". The contemporary nuclear order, however, is not in sync with reality and no longer tenable. It appears likely that more states will join the nuclear club. It is widely believed that Israel has a powerful nuclear weapons capability (equivalent to that of China). India and Pakistan are now declared nuclear weapons states, developing delivery systems capable of carrying nuclear warheads. This brings the number of such states to eight. Despite wide-ranging sanctions, North Korea is

already a nuclear weapons state, or close to becoming one.

The international nuclear deal concluded by the Obama administration and others may temporarily slow nuclear weapons development by Iran, but it will likely be the 10th nuclear weapons state in the world. The possible repeal of the Iran nuclear deal by the Trump administration and growing animosity between the US and Iran may hasten the development of Iran's nuclear weapons capability.

Experience over the last six decades demonstrates that security is the overarching driver of nuclear weapons programmes. Other so-called drivers, like international prestige, are secondary. When security is the primary driver, countries and regimes are willing to pay a high price to develop their nuclear weapons capability. India and Pakistan paid a very high price, as North Korea is doing.

At the same time, there are virtual nuclear weapons states that have the technological know-how and plutonium base to go nuclear in a short time. Japan and South Korea are among those in this category. Experience over the last six decades demonstrates that security is the overarching driver of nuclear weapons programmes. Other so-called drivers, like international prestige, are secondary. When security is the primary driver, countries and regimes are willing to pay a high price to develop their nuclear weapons capability. India and Pakistan paid a very high price, as North Korea is doing.

Nuclear strategies will command greater attention in the years to come states will continue to acquire nuclear weapons capability if they perceive a threat and view nuclear weapons as necessary to deal with the threat. Reducing the significance of nuclear weapons requires addressing the underlying political disputes that give rise to such threats. All arms, including nuclear weapons, are symptomatic of conflict. Although they may, at times, exacerbate certain conflicts, nuclear weapons are not the cause of such conflicts.

The nuclear club is likely to number in the teens in the near to mid-term future. The growing significance of nuclear weapons in national security strategies implies that the nuclear strategy will become important again, although in a different strategic context. Countries, like China and India, have begun to develop more sophisticated nuclear weapons systems. China is testing MIRV systems, while India is perfecting its

intercontinental ballistic missile and BMD capabilities. At the same time, extended nuclear deterrence will become more significant. The US

will have to develop an effective extended nuclear deterrence system for Japan and South Korea if the related alliances are to hold and the nuclear ambitions of these countries kept in check. Nuclear strategies will command greater attention in the years to come.

States will continue to acquire nuclear weapons capability if they perceive

a threat and view nuclear weapons as necessary to deal with the threat. Reducing the significance of nuclear weapons requires addressing the underlying political disputes that give rise to such threats. All arms, including nuclear weapons, are symptomatic of conflict. Although they may, at times, exacerbate certain conflicts, nuclear weapons are not the cause of such conflicts. It is important to address the causes rather than the

symptoms. The problem in the Korean peninsula is not the nuclear threat perceived to emanate from North Korea. The Korean problem existed before the development of the North's nuclear weapons capability. Making "rolling back the nuclear weapons capability of North Korea" the first order of priority is to confuse cause and symptom. In moving towards sustainable peace in the Korean peninsula, it is important to address the political problem at the

heart of the dispute. Addressing the issue will greatly reduce the significance of nuclear weapons.

The NPT, which forms the lynchpin of the contemporary nuclear order, is outdated. The double standard in the treaty is no longer acceptable. And, disarmament is no longer a realistic goal. "Proliferation" has acquired a negative connotation. The focus should be on slowing the spread of nuclear weapons among states. More importantly, the focus should shift to preventing the spread of nuclear weapons to non-state actors, like terrorist groups. They pose a far greater danger to the security of certain countries and the state-centric system than states with nuclear weapons.

The purpose of NPT must shift accordingly, from preventing the spread of nuclear weapons among states to settling or resolving the underlying political disputes among them and preventing the spread of nuclear weapons capability to non-state actors, as well as encouraging nuclear safety and supporting the peaceful use of nuclear energy. To persist with the contemporary formal nuclear order is detrimental to states' national and international security. A "new" nuclear order, based on present and anticipated realities and problems, should be the goal.

The purpose of NPT must shift accordingly, from preventing the spread of nuclear weapons among states to settling or resolving the underlying political disputes among them and preventing the spread of nuclear weapons capability to non-state actors, as well as encouraging nuclear safety and supporting the peaceful use of nuclear energy. To persist with the contemporary formal nuclear order is detrimental to states' national and international security. A "new" nuclear order, based on present and anticipated realities and problems, should be the goal.

seminal events? In a national-security era dominated by fear of terrorism, a substantial part of the American population has either forgotten, or never knew, that national-security arguments from the 1950s-80s were dominated by the fear there might be a nuclear war. *The Bulletin of the Atomic Scientists*, a journal created by many of the brains that brought the world nuclear weapons to begin with, indexed the proximity of nuclear war every year by setting its "doomsday clock" – so many minutes to midnight. The clock continues to tick. It is three minutes to midnight.

The end of the Cold War pushed nuclear issues into the background for more than 25 years. Yet the weapons, even in reduced numbers, remained. Oh, there were some pretty major nuclear side-shows: Saddam Hussein, we were told, had a nuclear capability. (He didn't.) Iran was rushing toward such a capability and would never stop. (They did.) But the big one, the fear of a US-Russia nuclear armageddon, had receded into the past. Just when you thought it was safe to go out, the whole nuclear dilemma has tumbled back onto the table. Once again, we are

There were some pretty major nuclear side-shows: Saddam Hussein, we were told, had a nuclear capability. (He didn't.) Iran was rushing toward such a capability and would never stop. (They did.) But the big one, the fear of a US-Russia nuclear armageddon, had receded into the past. Just when you thought it was safe to go out, the whole nuclear dilemma has tumbled back onto the table.

thinking the unthinkable. The Russians are said to be "aggressively" expanding their nuclear arsenal, while the Americans start a trillion-dollar nuclear modernization program of their own.

The Chinese, not to be outdone, modernize their own strategic weapons, and North Korea announces it will test a strategic missile capable of striking the U.S. Meanwhile, India, whose

Source: <http://www.nst.com.my>, 21 February 2017.

OPINION – Gordon Adams

Nuclear War has been Unthinkable for Decades. Not Anymore

Nuclear weapons are back in vogue. Ah, the fond memories: the 1984 TV movie *The Day After*, the nuclear freeze campaign, the B-1 bomber debate, the M-X missile fight. Don't remember these

nuclear test led to the creation of NSG to prevent the spread of nuclear technologies – and which has not signed the non-proliferation treaty – wants to join that group. Russia's Putin declares "it's best not to mess with us," adding "I want to remind you that Russia is one of the leading nuclear powers." Not missing a beat, Trump responds in kind: "Let it be an arms race. We will outmatch them at every pass and outlast them all."

Supporters of the trillion-dollar U.S. nuclear modernization program, found in the Pentagon, the Energy Department's National Nuclear Security Administration, Los Alamos and Lawrence Livermore, are, no doubt, delighted at this turn of events. It's not that the U.S. does not have enough nuclear weapons; we have more than enough. The answer to the nuclear dilemma is political, not military. It involves reassurance on all sides about intentions and capabilities; renewed negotiations to limit the expansion of nuclear programs; and a recognition that stability is in the interests of both Russia and the U.S....

Source: <http://www.montereycountyweekly.com>, 23 February 2017.

OPINION – Artem Kureev

Could Russia and the US Prevent Nuclear and Environmental Doomsday?

The U.S.-based NTI and the Moscow-based Center for Energy and Security Studies (CENESS) launched a new joint report on the future of U.S.-Russian nuclear cooperation. It includes 51 recommendations for mutually beneficial cooperation in different fields, including nuclear science, nuclear energy, nuclear safety, nuclear security, and nuclear environmental remediation. "If implemented, these projects could result in safer nuclear reactors, stronger defenses against nuclear and

The answer to the nuclear dilemma is political, not military. It involves reassurance on all sides about intentions and capabilities; renewed negotiations to limit the expansion of nuclear programs; and a recognition that stability is in the interests of both Russia and the U.S.

radiological terrorism, and cleaner approaches to nuclear environmental remediation," Nunn, the co-chairman of the Nuclear Threat Initiative, and Ivanov, the president of the Russian International Affairs Council and Russia's former FM (1998–2004), wrote in the foreword to the report.

Their recommendations might become even more relevant in 2017, given the

fact that numerous nonproliferation endeavors of Russia and the U.S. fell short because of their current confrontation. And with the presidency of Trump, who plans to modernize U.S. nuclear arsenal, the risks are increasing.

Two Minutes and 30 Seconds Until the Disaster: About a month ago, on Jan 25, U.S. atomic scientists released the 2017 Doomsday Clock Bulletin within the project, founded by University of Chicago in 1945. They created the Doomsday Clock to convey the threats to humanity and the entire world. Eventually, it has become a good indicator of the world's vulnerability to an apocalypse from the possible nuclear arms race, climate change and disruptive technologies in other fields. The authors of the Bulletin moved the minute hand of the Doomsday Clock 30 seconds closer to a hypothetical disaster: "It is now two minutes and 30 seconds to midnight," it reads.

The idea to create the Doomsday Clock came shortly after the 1945 U.S. atomic bombing of two Japanese cities Hiroshima and Nagasaki, when

Since the 1940s, the clock time has been changed more than 20 times. For example, in 1953, after the first testing of thermonuclear bombs, humanity came much closer to the catastrophe, according to atomic scientists: two minutes left until the disaster. Today, the indicators are also alarming — two minutes and 30 seconds to midnight.

American physicists understood that nuclear weapons could pose the existential threat to the entire humanity. In 1947, Chicago's scientists set up the Clock at 11:53 p.m., which meant seven minutes left to midnight and the apocalypse. Since the 1940s, the clock time has been changed more than 20

times. For example, in 1953, after the first testing of thermonuclear bombs, humanity came much closer to the catastrophe, according to atomic

scientists: two minutes left until the disaster. Today, the indicators are also alarming — two minutes and 30 seconds to midnight. During the Cold War doomsday might happen only in the case of direct confrontation of the U.S. and the Soviet Union — if they would dare to start the warfare through the nuclear exchange.

Amidst the increasing global instability, climate change and environmental problems, is modern civilization really facing an existential threat? Is the world becoming more dangerous and unstable? Or might American atomic scientists just be exaggerating their pessimism? Since the collapse of the Soviet Union in 1991, the Doomsday Clock had 17 minutes left until the apocalypses. It was partly because the U.S. and Russia have closely cooperated since that time and signed the START-1. Yet with India and Pakistan testing their nuclear potential, terrorists keeping an eye on nuclear arsenal and Iran and North Korea launching their own nuclear initiatives, doomsday seems to have been brought closer and closer. The last straw became the victory of the flamboyant Trump in the U.S. 2016 presidential elections: He expressed his readiness to use nuclear weapons in the Middle East (to fight terrorists) and denied the threat of global warming.

Nuclear Weapons and Non-state Actors: Could all these factors lead to disaster? The nuclear apocalypse won't necessarily mean doomsday for humanity (the civilization might survive, with large-scale panic, epidemics, total collapse of many societies and countries, increasing crime rate becoming routine). Yet if Trump could really dare to use nuclear weapons to deal with local conflicts in the Middle East, it could indeed pose an existential threat to the entire world.

Historically, America used nuclear weapons to bomb Hiroshima and Nagasaki to showcase its potential to its main adversary — the Soviet Union.

However, afterwards, some representatives of America's top brass proposed to use nuclear weapons in Vietnam and North Korea during the Indochina wars (fortunately, they didn't). Today, some militaries might yield to temptation to fight efficiently with Islamic radicals. After all, one nuclear missile could wipe out a distant and inaccessible terrorist base. It could create a chilling effect and undermine the efforts of terrorists psychologically. Moreover, there is a legal loophole to bypass the 1968 NPT: Those countries that signed it, cannot use nuclear weapons against any other countries, especially, those that don't possess nuclear weapons. Yet the ISIS is a non-state actor, which is seen by the global community as a terrorist organization, forbidden in civilized countries.

This means that Washington might showcase its nuclear arsenal to deal with ISIS. Hopefully, Trump won't dare to use nuclear weapons, given the fact that his team includes many professionals, who would not allow this scenario to come true. After all, the U.S. has other less risky and quite efficient options to fight terrorists. Nevertheless, the worst-case scenario should not be ruled out and the world should keep a close eye on it to prevent such a precedent. If a country with a nuclear arsenal uses it to resolve a local military conflict, the implications will be grave.

Downplaying Climate Change: However, the fact that Trump downplays the impact of climate change might also mean that the Doomsday Clock is a good and reliable indicator for predicting a global catastrophe. Many people underestimate the implications of climate change or other natural disasters — be it melting ice in the Arctic, the large-scale eruption of a volcano elsewhere and the following exposure to volcanic ash. For example, 200 years ago, in 1816, the eruptions of Indonesia's volcanoes led to the emission of a large amount of volcanic ash in the atmosphere

Hopefully, Trump won't dare to use nuclear weapons, given the fact that his team includes many professionals, who would not allow this scenario to come true. After all, the U.S. has other less risky and quite efficient options to fight terrorists. Nevertheless, the worst-case scenario should not be ruled out and the world should keep a close eye on it to prevent such a precedent.

and it had an impact on Europe. This 2017 was labeled as “the year without a summer” or “the poverty year.” It had been the coldest year for 550 years because of severe climate abnormalities that caused average global temperature to drop significantly.

Naturally, this led to famine with all its unpleasant implications. Today such an incident could be a disaster given the fact that the planet is overcrowded, with its population exceeding 7 billion people. The first casualty could become the third world countries, which don't have modern technologies and resources to withstand such incidents. Food crises might become common and develop in accordance with the domino effect scenario, leading to a global economic crisis. Humanity is currently disintegrating and cannot cope with such natural disasters. Unfortunately, the problem is aggravated by the fact that objective and reliable research on environmental and nuclear risks remains in the shadow of politics. Politicians are reluctant to invest in the long-term environmental and nuclear security projects. And this is not a good sign.

Humanity is currently disintegrating and cannot cope with such natural disasters. Unfortunately, the problem is aggravated by the fact that objective and reliable research on environmental and nuclear risks remains in the shadow of politics. Politicians are reluctant to invest in the long-term environmental and nuclear security projects. And this is not a good sign.

Source: <http://www.russia-direct.org>, 23 February 2017.

OPINION – Dasari V. Rao, Patrick McClure and David I. Poston

Nuclear Reactors to Power Space Exploration

For the past five decades – from the Apollo-era lunar science experiments to the Mars Curiosity and the New Horizons missions – Pu-238 Radioisotope Thermal Generators (RTG) have served as a power source. While some of the NASA's forays will continue to rely on these RTGs, others will require larger power sources to enable human space and planetary exploration and

establish reliable high bandwidth deep-space communications.

Solar power cannot handle this goal. A larger nuclear-based power source is required.

In a recent Washington Post article, Jeff Bezos, founder of amazon.com and creator of Blue Origin space project said, “I think NASA should work on a space-rated nuclear reactor. If you had a nuclear reactor in space – especially if you want to go anywhere beyond Mars – you really need nuclear power. Solar power just gets

progressively difficult as you get further way from the sun. And that's a completely doable thing to have a safe, space-qualified nuclear reactor.” Calls for space nuclear power are not new. In fact, numerous reactor concepts have been proposed in the past. Their development is often dampened by the perception that nuclear is too hard, takes too long and costs too much.

Inherently Safe Design:

During steady state, a reactor operates with a neutron multiplication factor of '1.000'; that is, the number of neutrons in the core remains unchanged from one generation to the next generation. Almost

every perturbation in a reactor's operation ultimately translates into either a positive or a negative reactivity insertion incident, defined as the state in which the core neutron multiplication factor deviates from its steady state value. Sudden and significant positive reactivity insertion can lead to runaway reactor kinetics, wherein temperatures can exceed thermal limits very rapidly. Past development approaches relied on sophisticated control systems to reduce or eliminate such a likelihood. Luckily, reactors also have an inherent ability to self-correct via negative temperature reactivity feedback; reactor power automatically decreases as core

temperature increases, and vice versa. It has been known that strongly reflected small compact fast reactors, such as kiloPower, can be designed to maximize these mechanisms to a point of being totally self-regulating. Our objective is to design-in self-regulation as the front-line feature in order to minimize technical and programmatic risk and to demonstrate via testing that self-regulation is both reliable and repeatable.

To that end, multi-scale and multi-physics simulations are relied upon to perform high fidelity design studies that explicitly examined (a) how choices related to fabrication, alloying and bonding techniques would affect the internal crystalline structure of each nuclear component and in turn (b) how that morphology affects that components thermal, mechanical and nuclear performance at conditions of interest. Nevertheless, reactor recovers from this perturbation and regains steady state, assuring us that there is no need for advanced autonomous control system.

Rapid Prototyping and Engineering Demonstration:

A key objective of the affordable strategy is that the nuclear components can be fabricated to the exacting tolerances demanded by the designers. This includes not only the physical dimensions, but also density and crystalline phase of the alloys. The materials' characteristics determine thermal and mechanical performance of the core, which in turn affects its nuclear performance. After several joint efforts, an exact replica of the kiloPower core was fabricated at Y-12 with depleted uranium. This provided needed experience and data on casting, machining and material characteristics of the reactor core. The second phase involved engineering demonstrations where the DU core is assembled together with the rest of the system (including the heat pipes and Stirling engines) in the configuration needed for a flight space reactor. Finely controlled resistance heaters were used to

A key objective of the affordable strategy is that the nuclear components can be fabricated to the exacting tolerances demanded by the designers. This includes not only the physical dimensions, but also density and crystalline phase of the alloys. The materials' characteristics determine thermal and mechanical performance of the core, which in turn affects its nuclear performance.

closely mimic the nuclear heat profile that is expected in the nuclear core during regular operation. These tests were performed in a vacuum chamber to simulate the environment in outer space. Data collected during these tests confirmed the predictions of computer simulations of the reactor.

The data showed a well-characterized thermal response of the system including demonstrating that the Stirling engines could meet the required electrical output. Other data, like the thermal expansion of the reactor core, were measured as input to computer simulations of the nuclear kinetics and system dynamics. These data were then used to help complete the design for the

nuclear demonstration experiment that is planned for later in 2017.

Los Alamos National Laboratory, in partnership with NASA Research Centers and other DOE National Labs, is developing and rapidly maturing a suite of very small fission power sources to meet power needs that range from hundreds of

Watts-electric (We) to 100 kWe. These designs, commonly referred to as kiloPower reactors, are based on well-established physics that simultaneously simplifies reactor controls necessary to operate the plant and incorporates inherent safety features that guard against consequences of launch accidents and operational transients. Equally important, designers have taken a fundamentally different approach for rapidly maturing the concept from design to full-scale demonstration. Feasibility of the design was demonstrated in 2012 and since then designers have focused on successfully overcoming the remaining R&D challenges driving towards a full-scale demonstration in 2017.

Full-scale Nuclear Test: The nuclear demonstration test will occur in late summer or early fall of 2017. The test will be conducted at the Device Assembly Facility at the Nevada

National Security Site (NNSS). It will be comprised of a ~32 kilogram enriched uranium reactor core (about the size of a circular oatmeal box) made from uranium metal going critical, and generating heat that will be transported by sodium heat pipes to Stirling engines that will produce electricity. The test will include connecting heat pipes and Stirling engines enclosed in a vacuum chamber sitting on the top of a critical experiment stand. The critical experiment stand has a lower plate than can be raised and lowered. On this plate will be stacked rings of Beryllium Oxide (BeO) that form the neutron reflector in the reactor concept. A critical mass is achieved by raising the BeO reflector to generate fission in the reactor core. Once fission has begun, the BeO reflector will be slowly raised to increase the temperature in the system to 800 degrees Centigrade. The heat pipes will deliver heat from the core to the Stirling engines and allow the system to make ~250 watts of electricity.

For the purpose of testing only, two of the eight Stirling engines will make electricity, the others will only discard heat. The data gained will inform the engineers regarding startup and shutdown of the reactor, how the reactor performs at steady state, how the reactor load follows when Stirling engines are turned on and off and how the system behaves when all cooling is removed. This data will be essential to moving forward with a final design concept.

Potential for Missions to Mars: Once the nuclear demonstration testing has been completed, the path to putting a nuclear reactor on a NASA mission to deep space or the Mars surface is still several years away. A finalized design must be completed along with rigorous testing of the system for reliability and safety.

The most recent NASA studies have focused on the use of KiloPower for potential Mars human exploration. NASA has examined the need for power on Mars and determined that approximately 40 kilowatts would be needed. Five

10-kilowatt KiloPower reactors (four main reactors plus one spare) could solve this power requirement. The 40 kilowatts would initially be used to make oxygen and possibly propellant needed by the Mars Ascent Vehicle to send astronauts back into Martian orbit. After making oxygen or fuel, the power would then be available to run the Martian habitat or provided power to Martian rovers all needed by the astronauts during their stay on Mars. Nuclear power has the advantage of being able to run full time day or night, as well as being able to operate closer to the Martian poles where it is believed water exists in substantial quantities.

Lessons Learned: Lessons learned from the KiloPower development program are being leveraged to develop a Mega Watt class of reactors

termed MegaPower reactors. These concepts all contain intrinsic safety features similar to those in KiloPower, including reactor self-regulation, low reactor core power density and the use of heat pipes for reactor core heat removal. The use of these higher power reactors is for terrestrial applications, such as power

The use of these higher power reactors is for terrestrial applications, such as power in remote locations, or to power larger human planetary colonies. The MegaPower reactor concept produces approximately two megawatts of electric power. The reactor would be attached to an open air Brayton cycle power conversion system.

in remote locations, or to power larger human planetary colonies. The MegaPower reactor concept produces approximately two megawatts of electric power. The reactor would be attached to an open air Brayton cycle power conversion system. A Brayton power cycle uses air as the working fluid and as the means of ultimate heat removal. MegaPower design and development process will rely on advanced manufacturing technology to fabricate the reactor core, reactor fuels and other structural elements. Research has also devised methods for fabricating and characterizing high temperature moderators that could enhance fuel utilization and thus reduce fuel enrichment levels.

Source: Dasari V. Rao, Director of the Office of Civilian Nuclear Programs, Patrick McClure, System Design and Analysis, of Los Alamos National Laboratory, and David I. Poston of Los Alamos National Laboratory, <http://www.lamonitor.com>, 22 February 2017.

NUCLEAR STRATEGY

USA

Trump Wants to Make Sure U.S. Nuclear Arsenal at 'Top of the Pack'

President Donald Trump said on 23 February he wants to ensure the U.S. nuclear arsenal is at the "top of the pack," saying the United States has fallen behind in its weapons capacity. In a Reuters interview, Trump also said China could solve the national security challenge posed by North Korea "very easily if they want to," ratcheting up pressure on Beijing to exert more influence to rein in Pyongyang's increasingly bellicose actions.

Trump also expressed support for the European Union as a governing body, saying "I'm totally in favour of it," and for the first time as president expressed a preference for a two-state solution to the Israeli-Palestinian conflict, but said he would be satisfied with whatever makes the two sides happy. Trump also predicted his efforts to pressure NATO allies to pay more for their own defence and ease the burden on the U.S. budget would reap dividends. "They owe a lot of money," he said.

In his first comments about the U.S. nuclear arsenal since taking office on Jan. 20, Trump was asked about a December tweet in which he said the United States must greatly strengthen and expand its nuclear capacity "until such time as the world comes to its senses regarding nukes." Trump said in the interview he would like to see a world with no nuclear weapons but expressed concern that the United States has "fallen behind on nuclear weapon capacity."

"I am the first one that would like to see ... nobody have nukes, but we're never going to fall behind any country even if it's a friendly country, we're never going to fall behind on nuclear power. ... It would be wonderful, a dream would be that no

country would have nukes, but if countries are going to have nukes, we're going to be at the top of the pack," Trump said.

... Analysts have questioned whether Trump wants to abrogate New START or would begin deploying other warheads. In the interview, Trump called New START "a one-sided deal." "Just another bad deal that the country made, whether it's START, whether it's the Iran deal ... We're going to start making good deals," he said.

I am the first one that would like to see ... nobody have nukes, but we're never going to fall behind any country even if it's a friendly country, we're never going to fall behind on nuclear power. ... It would be wonderful, a dream would be that no country would have nukes, but if countries are going to have nukes, we're going to be at the top of the pack.

The United States is in the midst of a \$1 trillion, 30-year modernisation of its ageing ballistic missile submarines, bombers and land-based missiles. Trump also complained that the Russian deployment of a ground-based cruise missile is in violation of a 1987 treaty that bans land-based

American and Russian intermediate-range missiles. ...

Source: <http://uk.reuters.com>, 24 February 2017.

BALLISTIC MISSILE DEFENCE

RUSSIA

Russia Ready for War: Putin's Ballistic Missile Launchers Set for Combat

DM Shoigu said 99 per cent of Russia's intercontinental ballistic missile launchers are combat-capable with 96 per cent ready for immediate use. Mr Shoigu told Russian MPs: "The intercontinental ballistic missiles launchers are being maintained in a way that allows to ensure a nuclear deterrent. "99 per cent of the launchers used by the Strategic Missile Forces are combat-capable, and 96 per cent of them are permanently ready for immediate use." Russia is carrying out a huge modernisation and rearmament programme for its Strategic Missile Forces. By the end of 2017 the entire country will be protected against missiles, Mr Shoigu revealed.

He said: "In addition, all new early-warning radar systems will become operational this 2017, so that the entire country is protected against missiles of all types, including ballistic missiles." Russian ground troop units will also be equipped with advanced Iskander-M mobile short-range ballistic missile systems to replace the ageing Tochka-U systems.

..."Iskander tactical ballistic missile systems are capable of hitting both small-size and large-area targets at a distance of up to 500 km to destroy missile and multiple launch rocket systems, long-range artillery guns, aircraft and helicopters at aerodromes, command posts and communications centres.

"The Iskander tactical ballistic missile complex includes a launcher, a loader-transporter, a routine maintenance vehicle, a command post vehicle, an information post, an ammunition equipment set and training aids." On top of upgrading its nuclear capabilities, Mr Shoigu said Russia's military has created a force tasked with waging information warfare. The Kremlin sees spreading propaganda as crucial in modern warfare and Moscow's actions have come under intense scrutiny after US intelligence agencies accused Russia of mounting an "influence operation" to help Trump win the US presidential election. In an address to the State Duma, or lower house of parliament, Mr Shoigu said the new troops tasked with information warfare are more potent and effective than those used in the past. He said: "Propaganda must be smart, competent and effective."

Source: <http://www.express.co.uk/>, 22 February 2017.

NUCLEAR ENERGY

GENERAL

Nuclear Power Use on the Rise Globally

There will be a "significant" increase in the global use of nuclear energy between now and 2030, according to Amano, the DG of the IAEA. As of 2015, more than 30 IAEA member states were actively considering or planning nuclear power programs, and at the moment, over 60 reactors are under construction in 15 countries, including four in the UAE. "In the lowest scenario, there will be a two per cent increase (in the use of nuclear power worldwide). In the highest scenario, there will be a 56 per cent increase by 2030," Amano said. "The countries that are considering the increase in nuclear power are states in which climate change is one of the strongest reasons for the use of nuclear power."

Russian ground troop units will also be equipped with advanced Iskander-M mobile short-range ballistic missile systems to replace the ageing Tochka-U systems. ..."Iskander tactical ballistic missile systems are capable of hitting both small-size and large-area targets at a distance of up to 500 km to destroy missile and multiple launch rocket systems, long-range artillery guns, aircraft and helicopters at aerodromes, command posts and communications centres.

As of 2015, more than 30 IAEA member states were actively considering or planning nuclear power programs, and at the moment, over 60 reactors are under construction in 15 countries, including four in the UAE. "In the lowest scenario, there will be a two per cent increase. In the highest scenario, there will be a 56 per cent increase by 2030.

Philippe Jamet, the former commissioner of the French Nuclear Safety Authority, noted that countries must remain extremely careful and maintain the highest possible safety measures as they turn to nuclear power. Jamet noted that – in the last 40 years – there

have been three major nuclear safety accidents, at Three Mile Island in the US, at Chernobyl in the Soviet Union, and at Fukushima in Japan.

"This is quite a high frequency," he said. "This calls for modesty, because in none of these accidents there was any warning. The day before those accidents, everybody believed that nuclear safety was achieved. We never can avoid

surprises." "We have to be modest in our predictions, and we also have to be very careful," he added. "The key players in nuclear energy have to strive a lot for continuous improvement. There are many areas where continuous improvement can be done, and should be done, and this is from an institutional point of view."

Amano, for his part, said that in the IAEA's point of view, the Fukushima disaster had a positive effect on worldwide nuclear energy safety. "Safety culture has strengthened a lot after Fukushima" he said. "The concept of safety (is now) widely accepted." Despite better safety precautions, Amano said that public acceptance of nuclear power often holds nations back from achieving their nuclear power goals. "Social acceptance is one of the most important issues," he noted. "(In some countries) there were delays because of technical reasons, but delay by social acceptance is very long, and in some cases the projects failed."

One major misconception, he noted, is that nuclear waste cannot be disposed of safely. "It is widely believed that there is no solution to deal with nuclear waste," he said. "That is wrong. "It is difficult to deal with high-level waste and spent fuel, but even with these high-level wastes and spent fuel, there is a solution, which is deep geological disposal."

Regarding the UAE's own nuclear ambitions, Amano said that the IAEA is "very happy" at the close cooperation between the organisation and Emirati authorities. "Since the beginning of the project, the UAE and IAEA have been working in close cooperation," he said. "We have trained nuclear professionals and been cooperating with Khalifa University, and your country is organising a nuclear management school." In October, Amano added, the UAE is organising a ministerial-level nuclear power conference.

Source: Bernd Debusmann Jr., <http://www.khaleejtimes.com>, 14 February 2017.

NIGERIA

Lack of Leadership Hinders Nigeria's Nuclear Road Map

Lack of leadership is frustrating Nigeria's 2000 target of generating 1,000 megawatts of electricity from a nuclear plant by 2017, experts say. Nuclear scientists and engineers helped Nigeria develop a road map in 2000 to generate nuclear energy to help address the country's power challenges. Seventeen years after the launch of the ambitious nuclear programme that was widely criticised by civil society groups, the government has not even acquired sites for the plants. The first nuclear plant, according to the road map, was to begin generating electricity this year. In the road map, experts allotted 2005-2012 for personnel and infrastructure development; 2006-2008 for design certification, regulatory and licensing approvals; 2007-2015 for construction and start-up; and 2017 for hooking to the national grid to meet government's desire of generating electricity from a nuclear power reactor.

Achibong, a nuclear engineer based in Nigeria, told *SciDev.Net* this 15 February in an exclusive interview that the set targets failed because of lack of funding, absence of competent professionals and in-fighting between the various government agencies on who has the mandate to supervise the programme. "The various nuclear line agencies, commissions and the ministry of science and technology are fighting each other on who controls the programme and as a result we have not been able to make headway," Achibong explains. Isoun, former Nigeria science and technology minister who initiated the programme, tells *SciDev.Net*: "The [successive] governments have failed to provide

In the IAEA's point of view, the Fukushima disaster had a positive effect on worldwide nuclear energy safety. "Safety culture has strengthened a lot after Fukushima" "The concept of safety (is now) widely accepted.

Seventeen years after the launch of the ambitious nuclear programme that was widely criticised by civil society groups, the government has not even acquired sites for the plants. The first nuclear plant, according to the road map, was to begin generating electricity this year.

the needed leadership to actualise the programme. There is an urgent need for political will on the part of [the current] government for the attainment of the road map. Road maps or timeframes are estimates."

He adds, "The programme is still alive [although] some of the estimates have outlived their timeframes. But there is still hope." According to Isoun, the Nigeria Atomic Energy Commission is collaborating with Nigerian universities for the training of the needed personnel for the programme and urged the involvement of the private sector.

But Bassey, president of Health of Mother Earth Foundation, one of the civil society organisations against the programme, tells *SciDev.Net* that Nigeria does not need the programme. "Nigeria has no business with nuclear power. We should be focussed on energy production from renewable sources. Nuclear [energy] is expensive and very vulnerable considering Nigeria's track record in maintenance of facilities," Bassey says.

Source: <http://www.scidev.net>, 22 February 2017.

RUSSIA

Russia's Most Powerful Nuclear Plant Reactor Enters Commercial Operation

Russia's most powerful nuclear reactor, also unparalleled in the world, has entered commercial operation. As the nuclear power concern Rosenergoatom has said the order to commission the 6th unit of the Novovoronezh NPP was signed by Rosenergoatom's CEO Andrey Petrov on the basis of permission obtained from the state nuclear energy corporation Rosatom. The reactor went on stream for the first time on August 5, 2016 to undergo comprehensive testing. In contrast to the customary VVER-1000 reactors the NPP-2006 project at Novovoronezh boasts a number of advantages that considerably improve

its economic parameters and safety.

The reactor's capacity is up 20% to 1,200 megawatts in contrast to the VVER's 1,000 megawatts; the life cycle of the main equipment, such as the reactor's hull and steam generators, was doubled to 60 years from 30 years and the high degree of automation and new engineering solutions allowed for reducing personnel by 25%-30%. The reactor has such unparalleled features as the core melt trap and a passive heat transfer system that cools the reactor with the natural air flow even when power supply is off and participation of personnel is impossible.

Generation 3 Plus reactors are under construction in the United States and France, but Russia's

reactor at Novovoronezh is the first one of the new generation to have entered commercial operation. The Novovoronezh NPP is an affiliate of the concern Rosenergoatom. It is situated on the Don River 42 kilometers south of Voronezh. It is Russia's first NPP to have been equipped with water-pressurized

The reactor's capacity is up 20% to 1,200 megawatts in contrast to the VVER's 1,000 megawatts; the life cycle of the main equipment, such as the reactor's hull and steam generators, was doubled to 60 years from 30 years and the high degree of automation and new engineering solutions allowed for reducing personnel by 25%-30%.

VVER reactors. Each of the power plant's five reactors was a pilot project in a series of power supply reactors.

Currently three reactors at Novovoronezh are in operation. The first and second reactors were shut down in 1984 and 1990 respectively. The third reactor is being withdrawn from operation. Rosenergoatom has been building two new generation NPP-2006 reactors at Novovoronezh since 2007. All newly-built units will be equipped with VVER-1200 reactors.

Source: <http://tass.com/economy/933183>, 28 February 2017.

SOUTH AFRICA

The Largest Procurement is in the Hands of the High Court in Cape Town

The brinkmanship over government's controversial

decision to procure up to 9,600 MW of nuclear power capacity is set to be exposed in the High Court in Cape Town.... Two applicants in the case, Earthlife Africa and the Southern African Faith Communities' Environment Institute (SAFCEI), are challenging Energy Minister Pettersson's determination to go the nuclear route. At stake is the largest procurement in the history of South Africa which could cost upwards of R1 trillion, which is roughly the size of the national Budget. Critics warn that this deal has the potential to bankrupt the country and that there is enormous room for high-level corruption.

In terms of the Energy Regulation Act (ERA), the minister is empowered to take such decisions, known as a section 34 determination, regarding the amount and type of South Africa's future energy supply. The original nuclear determination was made — in secret— by then Minister Martins in 2013 and suddenly gazetted by Joemat-Pettersson in December 2015. It was this 2013 decision — nominating the DOE to procure 9,600MW of new nuclear power — that the litigants sought to have set aside.

They argued that a decision of such magnitude could not proceed without an open and transparent process of public consultation, something the DoE had failed to do. Earthlife and SAFCEI also wanted the court to declare unlawful a number of international agreements on nuclear energy that the government signed with the US, South Korea and most importantly, Russia. The agreement signed with Russia in September 2014 is substantially more detailed than those signed with the US and South Korea, and lays out the specific type of Russian technology to be used in the procurement of nuclear power plants. In terms of the agreement, Russia would also be indemnified from any liability arising from a potential nuclear accident.

Earthlife and SAFCEI argued the agreement with Russia was premature as it amounted to the first

stages of procurement. They said the detailed nature of the agreement precluded an open, fair and transparent procurement process and appeared to suggest the outcome was predetermined to favour Russia. There was a sudden twist when the parties met in court for the first time in December 2016. On December 13, the first day of the hearings, the government's legal team revealed that Joemat-Pettersson moved the goal-posts by purporting to issue a brand-new determination which would shift the responsibility for procurement from the Department of Energy to Eskom.

The determination was published the following day. By appearing to replace the original determination that the applicants were challenging, this new 2016 determination derailed proceedings. Earthlife and SAFCEI requested a postponement to address the new determination, which was granted along with a cost order against the minister. In the meantime, Eskom has forged ahead with a Request for Information (RFI) for the 9,600 MW nuclear programme. The power utility describes this as a "stand-alone information-gathering exercise". ...The minister's affidavit states that in September 2016 she received legal advice which prompted the decision to issue a new determination designating Eskom as the procuring agency instead of the DoE.

However, the legal opinion itself was not submitted to the court. Earthlife and SAFCEI now argue that the timing of the legal advice and the determination that followed suggest a deliberate attempt to throw a spanner in the works and side-step legal proceedings. In their final court papers they note: "It seems then that the 2016 determination was a deliberate attempt by the Minister to avoid the clear issues identified in the applicants' papers, although this has not been acknowledged." Joematt-Pettersson's papers claim the advice from her lawyer was to the effect

The agreement signed with Russia in September 2014 is substantially more detailed than those signed with the US and South Korea, and lays out the specific type of Russian technology to be used in the procurement of nuclear power plants. In terms of the agreement, Russia would also be indemnified from any liability arising from a potential nuclear accident.

that the DoE was not allowed to procure on behalf of other state entities, such as Eskom, without their consent. It was then supposedly indicated by Eskom that it would not consent to the DoE procuring on its behalf.

Earthlife and SAFCEI question why the minister did not take Eskom to task for its refusal to cooperate, but instead rewarded the company by making it the procuring authority, despite

outstanding questions as to how the troubled utility would afford this hugely expensive project. Joemat-Petterson maintains that the 2016 determination "was mainly informed by the same considerations that informed the 2013 determination" and that "no process of public participation was and is required in respect thereof". However, Earthlife and SAFCEI will argue in court that the current determination, like the previous one, is unlawful precisely because there was no consultative process undertaken by the minister or the energy regulator, Nersa.

The two NGOs also charge that the minister has "irrationally and unlawfully" based her decisions on an outdated Integrated Resource Plan (IRP), which is supposed to guide ministerial decisions by forecasting energy needs and determining the types of sources from which electricity is to be generated. The minister

based her determination on the 2010 IRP, which calls for a large role for nuclear in the energy mix. But the IRP is supposed to be updated every two years and a subsequent IRP in 2013, which showed a greatly reduced need for nuclear, was shelved. Earthlife and SAFCEI point out that a public process to generate an updated IRP is underway, and with it an up-to-date assessment

of the need for and cost effectiveness of nuclear, given the renewable energy revolution.

The IRP is supposed to be updated every two years and a subsequent IRP in 2013, which showed a greatly reduced need for nuclear, was shelved. Earthlife and SAFCEI point out that a public process to generate an updated IRP is underway, and with it an up-to-date assessment of the need for and cost effectiveness of nuclear, given the renewable energy revolution.

new nuclear power stations. "The optimal least cost mix is one of solar PV, wind and flexible power generators," the report states. Despite this, Eskom has been reluctant to sign on renewable independent power producers, but has shown determination in pushing for nuclear. Eskom's fragile financial position, and the fact that the utility has been beset by political interference and governance problems that saw the resignation of CEO Brian Molefe after being implicated in the Public Protector's State of Capture report, are

added reasons why the decision to make it the procuring agency has drawn criticism.

In November 2016 ratings agency Standard and Poor's downgraded Eskom's credit rating from "BB+" to "BB", maintaining a negative outlook. The shift of responsibility to Eskom could potentially have implications for Treasury oversight and the cost of electricity for users, yet

there is little in the record to suggest that the minister has fully applied her mind to these matters. Earthlife and SAFCEI are asking the court to force the minister and Eskom to go back to the drawing board by declaring both the 2013 and the 2016 determinations unconstitutional and invalid.

Source: <http://amabhungane.co.za/>, 21 February 2017.

UK

UK Needs National Lab to Coordinate Nuclear R&D

The UK's National Nuclear Laboratory (NNL) cannot fulfil the role its name describes while it relies on commercial work for part of its funding. That was the consensus of three expert witnesses to the House of Lords Science and Technology Committee's inquiry into priorities for nuclear research and technologies. NNL has been providing independent advice to the UK government and working with other national laboratories around the world since 2008. It has also been delivering research and technology to support the nuclear fuel cycle. Its major customers including the Nuclear Decommissioning Authority (NDA), Sellafield, Springfields, the Ministry of Defence, EDF Energy and the UK Atomic Energy Authority (UKAEA).

...Tynan added that Sellafield Ltd is funded by the NDA, which is funded by government. ...Based at the University of Sheffield with support from the University of Manchester, the Nuclear AMRC Tynan heads combines industry expertise and university innovation to help manufacturers improve capabilities and performance. It is also part of the High Value Manufacturing (HVM) Catapult. Catapult centres were established by Innovate UK (previously the Technology Strategy Board) to promote R&D through business-led collaboration between scientists, engineers and market opportunities. HVM Catapult is one of these and comprises seven Technology and Innovation centres working with companies of all sizes to bridge the gap in - and accelerate the activity between - technology concept and commercialisation.

...Nuclear AMRC's experience of four years working

with NNL has been "very positive", he said. "We find them supportive, collaborative and professional. They have unique experience in the UK and probably something like thousands of man years of experience in civil nuclear and the challenges that it faces.

HVM Catapult is one of these and comprises seven Technology and Innovation centres working with companies of all sizes to bridge the gap in - and accelerate the activity between - technology concept and commercialisation.

The difficulty for NNL is that the role as a national lab is unclear. It has a commercial remit and that has the potential to reduce its independence. It also [has] programs that are commercially driven

and not necessarily on research priorities, so its resource can be diverted from possibly national imperatives by having to focus on commercial business.

"However, neither is NNL a university, so it's not purely academic. And so its current mission of having to sit in this quasi-commercial position and to some extent be an independent advisor to government, yet fund itself through commercial work and work with commercial clients, is a difficult role. "There are some real challenges that NNL is specifically equipped to deal with and that's in waste management and decommissioning for the long-term program, but we shouldn't forget that they have the ability to do front-end work on new technology and fuel

manufacturing.... Burke said, "ideally", NNL should be solely government funded and "not diverted with commercial work"....

The difficulty for NNL is that the role as a national lab is unclear. It has a commercial remit and that has the potential to reduce its independence. It also [has] programs that are commercially driven and not necessarily on research priorities, so its resource can be diverted from possibly national imperatives by having to focus on commercial business.

Where Responsibility Lies:

Through its inquiry, the committee is exploring issues such as where responsibility lies for ensuring the UK has a

coherent and consistent long-term policy for civil nuclear activities, as well as how the nuclear sector might benefit from a 'sector deal' as discussed in the government's Industrial Strategy Green Paper. Tynan referred to the Nuclear Industry Council (NIC), which was established

in 2013 as a partnership between the government and industry to provide high-level strategic direction to the country's nuclear sector. The principal responsibility for a UK nuclear program "has to sit with government" and thus with the Department for Business, Energy and Industrial Strategy (BEIS), Tynan said. ...

Role of NIC: The committee asked the witnesses about the "expanded remit" of NIC compared to the previous role of the Nuclear Innovation and Research Advisory Board (Nirab), the term of which ran from January 2014 to December 2016. Tynan said NIC "encompasses the entire scope" of a program for nuclear in the UK and "it's important to ensure that that we link civil nuclear with defence". Nirab's principal role was limited to identifying R&D priorities. It had no oversight of those programs, nor was it responsible for their delivery, he said. Bluck said universities are an "obvious candidate" to provide a focus on nuclear research, but coordination between them is "based upon the small number of modest projects that we have fought for together". ...

Coordinating Funding: Tynan said there are "two pieces to the problem" in terms of coordination. One is coordination of funding, which he said was "an issue for nuclear R&D". "There are different sources of funding. We now see a growth in potential regional funding, so Local Enterprise Partnerships can fund locally activities that they believe can create value. There is central funding that tends to come from BEIS and that could be on a business program or on innovation funding and the sources of those forms of funding are

There is central funding that tends to come from BEIS and that could be on a business program or on innovation funding and the sources of those forms of funding are different, and then there's commercial income on collaborative work in R&D. There's an issue of, do we understand exactly where the funding streams are and are they addressing the right things.

NNL's annual turnover is around £100 million (\$125 million), of which more than 40% comes from Sellafield Ltd, where its work is focused on cleaning up the nuclear legacy on the Sellafield site. It also has major contracts with EDF Energy and Rolls Royce to carry out post-irradiation examination work. For EDF Energy this relates to fuel and graphite from the AGR reactor fleet. Collectively, Sellafield, EDF Energy and Rolls Royce account for over 80% of NNL's revenue.

different, and then there's commercial income on collaborative work in R&D. There's an issue of, do we understand exactly where the funding streams are and are they addressing the right things." A national nuclear laboratory should coordinate R&D activity, he said....

Performing Well: A spokesman for NNL said on 22 February it is performing well as a commercial business and receives high approval scores from its customers and stakeholders. "However we recognise that

the current commercial funding model of NNL is not perfect. It can limit NNL's ability to fulfil its remit as well as it might, since the level of NNL's 'earnings to reinvest' (essentially our operating profit) is currently insufficient to deliver a program of work which will fully realise the longer-term opportunities available. For example, on long-term R&D, NNL neither coordinates nor performs the breadth of research in advanced reactors (Gen IV) and fuel cycles needed to inform government policy or secure future value for the UK."

NNL's annual turnover is around £100 million (\$125 million), of which more than 40% comes from Sellafield Ltd, where its work is focused on cleaning up the nuclear legacy on the

Sellafield site. It also has major contracts with EDF Energy and Rolls Royce to carry out post-irradiation examination work. For EDF Energy this relates to fuel and graphite from the AGR reactor fleet. For Rolls Royce this concerns examination of fuel from the UK's nuclear submarine fleet. Collectively, Sellafield, EDF Energy and Rolls Royce account for over 80% of NNL's revenue, the spokesman said.

NNL receives no grant funding from government, but it sometimes performs work where a branch of government is the customer, to deliver specific packages of work. "We do not advocate becoming solely government-funded, but we feel that a revised model might deliver a better balance and allow us to operate more effectively as a true national laboratory. Such a model would certainly retain a significant volume of commercial work to maintain efficiencies and customer focus, sustain skills and utilise facilities and generate revenue," the spokesman said. ... NNL plans to address these issues more fully in its written submission to the House of Lords inquiry...

Source: <http://www.world-nuclear-news.org>, 22 February 2017.

With supply-side adjustments accounting for the recent ascent and a crowded supply picture, there needs to be an improvement in demand before prices can stage a sustained recovery. According to UxC, global uranium inventories are currently sitting at 1.4 billion pounds. Global annual uranium demand is about 173 million pounds per year, which means that there is enough uranium available for years of consumption. For prices to ascent, new nuclear capacity is essential.

and a crowded supply picture, there needs to be an improvement in demand before prices can stage a sustained recovery. According to UxC, global uranium inventories are currently sitting at 1.4 billion pounds. Global annual uranium demand is about 173 million pounds per year, which means that there is enough uranium available for years of consumption. For prices to ascent, new nuclear capacity is essential.

The demand side of the equation will improve, eventually, with dozens of nuclear reactors around the world under construction and even more in the planning phases. But for now, it is a bit premature for a rally. After price retreat buyers now know that they still have the upper hand when it comes to price

negotiations. In the coming weeks, pending any significant fundamental changes, spot uranium prices will likely drift lower, with their only support coming from the already planned production cuts.

Source: <http://www.economiccalendar.com>, 22 February 2017.

URANIUM PRODUCTION

GENERAL

Uranium Spot Prices Run Out of Momentum

The uranium spot price rally stalled, ending the commodity's ascent that started in December after prices fell as low as \$17.75 per lb. The spot price recovery rally started to gain steam in early 2017 after Kazakhstan's state-owned miner announced a significant reduction in uranium production. With Kazakstan a major global uranium supplier, this added upside support to battered uranium prices. Now; however, spot uranium prices have started to retreat on declining buying interest. According to TradeTech, only two transactions took place, and spot uranium prices declined, shedding \$1.50 to touch \$25.00 per lb. Over the course of the week, sellers were resistant to lower prices, and this was reflected in the reduced amount of transactions.

The developments suggest uranium has climbed as high as it can for the moment. With supply-side adjustments accounting for the recent ascent

NUCLEAR COOPERATION

CHINA-FRANCE

China, France to Intensify Nuclear Energy Cooperation

Chinese Premier Keqiang and French PM Cazeneuve in Beijing announced on 21 February their intention to strengthen nuclear energy cooperation between the two countries. "China intends to strengthen cooperation [with France] throughout the whole chain in the sphere of nuclear energy, to steadily promote the implementation of the project on the construction of Hinkley Point nuclear plant, to explore joint nuclear energy market development in third countries, to expand aerospace cooperation, to deepen cooperation on combating climate change," Li said.

In turn, Cazeneuve said that France and China were major energy and industrial states with great potential of cooperation, and comprehensive strategic partnership with Beijing was an important part of Paris' foreign policy. The parties are said to have signed a number of agreements on developing cooperation in the spheres of economy, nuclear energy, science and technology, humanitarian exchanges, and also exchanged viewpoints on international and global issues of mutual interest....

Source: sputniknews.com, 21 February 2017.

EU-IAEA-IRAN

EU, IAEA Reaffirm Commitment to Iran Deal in Joint Statement

... In their joint statement, the EU and the IAEA "reaffirmed support for the JCPOA based on their respective mandates," the joint release read, detailing the outcome of the EU-IAEA summit. EU foreign policy chief Mogherini "will remain in close contact with the IAEA regarding continued implementation of the agreement" in her capacity as coordinator of the Joint Commission established under the JCPOA, the statement added. The Commission, which brings together representatives of the parties to the agreement, is tasked with monitoring its implementation.

"The EU will provide technical support to the IAEA such as equipment and training," the statement further read. "The EU also informed about its bilateral cooperation with Iran in implementation of Annex III of the JCPOA,

France and China were major energy and industrial states with great potential of cooperation, and comprehensive strategic partnership with Beijing was an important part of Paris' foreign policy. The parties are said to have signed a number of agreements on developing cooperation in the spheres of economy, nuclear energy, science and technology, humanitarian exchanges, and also exchanged viewpoints on international and global issues of mutual interest.

lifetime of the agreement." Such assertions by the EU and the IAEA are in contrast with the bellicose rhetoric of the administration of US President Trump toward the accord. Trump has called the deal "the worst accord ever" and "one of the dumbest" ones he has come across.

Source: <http://www.payvand.com/>, 20 February 2017.

JAPAN-USA

Toshiba Pulling Plug on US Nuclear Reactor Plan

Toshiba appears set to withdraw from a plan to build two nuclear reactors at a U.S. power plant amid sizable write-downs on American nuclear operations and lengthy construction delays. The

Toshiba appears set to withdraw from a plan to build two nuclear reactors at a U.S. power plant amid sizable write-downs on American nuclear operations and lengthy construction delays. The Japanese manufacturer had been contracted to build the third and fourth reactors for U.S. utility NRG Energy's South Texas Project, taking Toshiba's advanced boiling water reactors abroad for the first time.

Japanese manufacturer had been contracted to build the third and fourth reactors for U.S. utility NRG Energy's South Texas Project, taking Toshiba's advanced boiling water reactors abroad for the first time. Toshiba looks to pull out of the project, and will decide later what to do with its stake in the joint venture that serves as the developer.

The reactors were to debut as early as 2016. But delays on the project have brought heavy costs

for Toshiba, including write-downs totaling 72 billion yen (\$638 million at current rates) logged in fiscal 2013 and fiscal 2014. Ground has not been broken on the units, while work such as civil engineering lies outside Toshiba's purview. Further losses are unlikely, according to a source involved with the project. Orders received by Westinghouse for new nuclear facilities in the U.S. and abroad will proceed, with some modifications to curb risks, Toshiba said. NRG has suspended the bulk of work toward construction on the South Texas Project due to heightened nuclear safety regulations, and the company said it will end further investment. Tokyo Electric Power Co. Holdings was initially to take part in the project, but later reconsidered.

Toshiba had sought a way to complete the two reactors even after NRG backed away from the plan. The U.S. NRC issued licenses to build and operate the units in February 2016. But the Japanese company in May ended its alliance with Chicago Bridge & Iron, a partner on the project, and later withdrew an application to renew the certification of its reactor design — a necessary step toward construction. Chicago Bridge & Iron is embroiled in a lawsuit with Westinghouse over the latter's acquisition of a CB&I unit. Toshiba's involvement in a liquefied natural gas terminal in nearby Freeport, Texas, will not be impacted by the halt on nuclear construction, a source familiar with the matter said.

Source: <http://asia.nikkei.com/>, 20 February 2017.

UK-EU

Worries over UK's Decision to Quit Euro Nuclear Agency

The government's plans to quit the Euratom treaty pose a fresh threat to the UK's increasingly embattled nuclear new build programme, a new

report has warned. Last month (January) Brexit secretary Davis confirmed its intention to pull out of Euratom, the European nuclear research agency that predates the European Union and its predecessors. The plans were included in explanatory notes to the Brexit Bill. The decision was criticised by Greatrex, the chief executive of the Nuclear Industry Association....

Now a new study by the IME says the government's plans to quit the treaty could imperil fuel supplies, jeopardising energy security as well as threatening plans to build new nuclear reactors and decommissioning activities. The IME said the government should create a transitional framework for the nuclear industry instead and as well as create new nuclear cooperation agreements (NCAs) with Euratom and non-EU trading countries ahead of leaving Euratom.

A new study by the IME says the government's plans to quit the treaty could imperil fuel supplies, jeopardising energy security as well as threatening plans to build new nuclear reactors and decommissioning activities. The IME said the government should create a transitional framework for the nuclear industry instead and as well as create new nuclear cooperation agreements (NCAs) with Euratom and non-EU trading countries ahead of leaving Euratom.

In particular, nuclear goods, services and research activities should be part of any new trade deals negotiated with the US, Canada, Australia, China and South Africa. Dr Baxter, head of energy and environment at IME and lead author of the report, said: "Without suitable transitional arrangements, the UK runs the risk of not being able to access the markets and skills that enable the construction of new nuclear power plants and existing power stations may also potentially be unable to access fuel." ...

Source: <http://www.building.co.uk>, 21 February 2017.

NUCLEAR NON-PROLIFERATION

IRAN

'Iran is Not Going to Produce Nuclear Weapons. Period': Zarif

Iranian FM Zarif spoke at the Munich Security Conference on 19 February, reiterating that the Islamic Republic has no intention of developing a

nuclear arsenal and attributing rising extremism in the Middle East to marginalization, lack of hope, and "foreign occupations...beginning with Palestine." "Iran is not going to produce nuclear weapons. Period," Zarif said, noting that it had committed to nuclear non-proliferation in its signing of the JCPOA, the landmark nuclear accord brokered between Iran and six world powers in 2015.

Zarif maintained that Iran was not attempting to join a "dangerous club" of nuclear armed states in the region, in what was apparently a veiled reference to Israel. Israel is believed to be the Middle East's sole nuclear-armed power, though it has long refused to confirm or deny that it has such weapons.

"They have the audacity" to warn about the nuclear threat posed by Iran, Zarif proclaimed, when they are "the destabilizing force in the region." Zarif's remarks echoed.... "The only regime in ME with nukes, ICBMs & a history of aggression whines about Iran's means of defense. Fear-mongering hype IS fake news," he wrote....

Zarif maintained that Iran's recent ballistic missiles tests do not breach the nuclear accord imposed by the UN, which U.S. President Trump has slammed as "one of the worst deals I've ever seen." A war of words had been escalating between Tehran and Washington since even before Trump took office in January, and peaking after the U.S. president slapped fresh sanctions against Tehran's weapons procurement network following a ballistic missile test on January 29. "Iran does not respond well to threats, coercion, or sanctions," Zarif said, criticizing the idea of "crippling sanctions" against the Islamic Republic. During a follow-up panel,

Iran was not attempting to join a "dangerous club" of nuclear armed states in the region, in what was apparently a veiled reference to Israel. Israel is believed to be the Middle East's sole nuclear-armed power, though it has long refused to confirm or deny that it has such weapons.

When drafting the proposal, the report included four broad themes for each nation to focus on including ensuring that all nuclear talks are not stymied by political relations, that scientific engagement be used as a vehicle for rebuilding trust, that nuclear cooperation be used on the premise of mutual benefit, and that both nations have special imperative to work together to reduce the threat of nuclear terrorism.

Republican Senator Lindsey O. Graham said he "didn't believe a word [Zarif] said." ...

Source: <http://www.i24news.tv>, 19 February 2017.

USA-RUSSIA

New Joint Report Highlights Projects to Advanced Key Nuclear Nonproliferation Objectives between the US, Russia

The NTI, along with the Moscow-based Center for Energy and Security Studies (CENESS), recently released a report highlighting 50 projects that advance key nuclear non-proliferation objectives for the US and Russia across five thematic areas. The report, part of a dialogue on potential U.S.-Russia nuclear cooperation, includes a series of projects involving nuclear science, nuclear energy, nuclear safety, nuclear security, and nuclear environmental remediation.

When drafting the proposal, the report included four broad themes for each nation to focus on including ensuring that all nuclear talks are not stymied by political relations, that scientific engagement be used as a vehicle for rebuilding trust, that nuclear cooperation be used on the premise of mutual benefit, and that both nations have special imperative to work together to reduce the threat of nuclear terrorism.

"Today, the danger of nuclear terrorism is real, serious, and growing," Nunn, former U.S. senator and co-chairman of NTI, said. "These dangers compel collaboration between the US and Russia. Communication between scientists and technical experts in the U.S. and Russian nuclear complexes, which dates back to the 1980s, has been frozen. The benefits

of cooperation can be significant for the US and Russia and for the world." ...

Source: *homelandprepnews.com*, 22 February 2017.

NUCLEAR PROLIFERATION

USA

Trump's Remarks Signal He Could Start a New Nuclear Arms Race

Trump's declaration on 23 February that "if countries are going to have nukes, we're going to be at the top of the pack," flew in the face of decades of U.S. efforts to negotiate cautious, mutual reductions in nuclear arsenals around the world. Trump's comments to Reuters essentially invited other nuclear powers to escalate their capabilities, and has the potential to set off a new nuclear arms race. "Mr. Trump must be careful not to upend decades of successful efforts to reduce bloated nuclear arsenals," said Kimball, executive director of the Arms Control Association. "The five most recent U.S. presidents, including Obama, W. Bush, Clinton, H.W. Bush, and Reagan, all negotiated agreements with Russia to reduce their nuclear stockpiles."

The NPT, which Congress ratified in 1970, requires the U.S. to pursue the "cessation" of a nuclear arms race between superpowers, and to take steps towards mutual disarmament. The whole idea was to end the nuclear arms race forever. Trump has stoked fears about a new arms race before. When pressed for details about his nuclear policies in December, he told MSNBC's Morning Joe "let it

Trump's declaration on 23 February that "if countries are going to have nukes, we're going to be at the top of the pack," flew in the face of decades of U.S. efforts to negotiate cautious, mutual reductions in nuclear arsenals around the world. Trump's comments to Reuters essentially invited other nuclear powers to escalate their capabilities, and has the potential to set off a new nuclear arms race.

He told Russian President Putin that he considers the Obama-era New START treaty a bad deal. The treaty calls for both countries to reduce their deployed strategic nuclear warheads to no more than 1,550, the lowest level in decades. The Russians currently have slightly more nuclear warheads than the U.S. – but the U.S., by contrast, has more strategic warhead launchers, according to the latest figures.

be an arms race," and later tweeted that the U.S. should "greatly strengthen and expand its nuclear capability until such time as the world comes to its senses regarding nukes."

Trump's spokesmen spent the following day trying to walk back his comments. But he later made his views on nuclear reduction clear when he told Russian President Putin that he considers the Obama-era New START treaty a bad deal. The treaty calls for both countries to reduce their deployed strategic nuclear warheads to no more than 1,550, the lowest level in decades. The Russians currently have slightly more nuclear

warheads than the U.S. – but the U.S., by contrast, has more strategic warhead launchers, according to the latest figures. "The US has certainly not 'fallen behind on nuclear weapon capability,'" wrote Kristensen, a nuclear expert at the Federation of American Scientists, in an email to The Intercept. "It is already 'at the top of the pack' and has the most capable nuclear forces in the world backed up by overwhelming conventional forces."

In 2013, national security officials in President Obama's White House determined that the U.S.

could safely reduce its deployed nuclear force by one third. Other experts have said it could go much lower. But instead of pursuing reductions that could have saved hundreds of billions of dollars, the Obama administration started investing in a trillion-dollar effort to modernize the arsenal, which budget critics

slammed as unaffordable.

Source: *theintercept.com*/, 23 February 2017.

NUCLEAR SAFETY

BELGIUM

IAEA Wraps up Belgium’s Doel NPP Safety Review

The IAEA said on February 23 that its team of nuclear safety experts completed an assessment of long-term operational safety at the Doel NPP Unit 1 and 2 in Belgium. The Belgian Ministry of Security and the Interior (IBZ) has requested the Safety Aspects of Long Term Operation (SALTO) review mission. The IAEA said in a press release that the in-depth review, which began on February 14, focused on aspects essential to the safe long-term operation (LTO) of the two units, which were put in commercial operation in 1975. Doel units 3 and 4 were not part of the review. In October 2015, the Belgian Federal Agency for Nuclear Control (FANC) approved the operator’s application to extend the operation of Units 1 and 2 by 10 years to 2025, pending the fulfilment of several safety-related conditions.

The SALTO team reviewed the plant’s organisation and programmes related to LTO, including human resources and knowledge management. The findings of SALTO reviews are based on the IAEA safety standards, the agency said. The IAEA said its team, which comprised experts from Canada, the Czech Republic, Finland, Japan, Slovenia, Sweden, Switzerland and the IAEA, concluded that the plant had made significant progress on ageing management and preparation for safe LTO. The plant’s LTO project has addressed most of the areas recommended by IAEA safety standards, and is addressing remaining topics.

The team identified several good practices at the plant that will be shared with the nuclear industry globally, including: The plant uses integrated risk management for LTO at programme and individual

project levels; the plant’s comprehensive scoping methodology for LTO evaluation; the plant uses incentives to keep staff and takes measures to ensure knowledge is not lost with turnover. The team provided a number of recommendations for improvements to LTO safety, including: the plant should ensure that all required systems, structures and components are included in the scope of ageing management during the LTO period; the plant should ensure consistency and completeness of data for structures and components in the scope of LTO; the plant should complete the review and update of the ageing management programmes for civil structures and components for the purpose of LTO.

The Doel plant management said it was committed to implementing the recommendations and requested that the IAEA schedule a follow-up mission in approximately two years. According to the IAEA, the team has provided a draft report to the plant management. The plant and FANC will have an opportunity to make factual comments on the draft. A final report will be submitted to the plant, FANC and the Belgian Government within three months.

The IAEA said its team, which comprised experts from Canada, the Czech Republic, Finland, Japan, Slovenia, Sweden, Switzerland and the IAEA, concluded that the plant had made significant progress on ageing management and preparation for safe LTO. The plant’s LTO project has addressed most of the areas recommended by IAEA safety standards, and is addressing remaining topics.

Source: www.neweurope.eu, 23 February 2017.

GENERAL

Cyber Security Measures of Rooppur Power Plant in Dark

Many participants expressed their worries over the matter at a seminar, titled “Entering the World of Nuclear Energy: Key Security Issues for Bangladesh”, in Dhaka on 22 February. The event was organized by Bangladesh Institute of Peace and Security Studies (BIPSS). Replying to a query, Dr Topychkanov from Carnegie Moscow Centre said, “Cyber security must be ensured. Otherwise there might be a huge risk. If still there is no

initiative taken it should be taken as early as possible.”

...An official of Bangladesh Atomic Energy Commission (BAEC) said ...”No initiatives regarding cyber security or other things have so far been taken, what the Project Director said is not convincing. The matter is also absent in the deal of the Rooppur Project.” Replying to another query, Dr Topychkanov assured that Russia will take back the highly radioactive nuclear waste of Rooppur power plant. Russia has a system to keep the radioactive nuclear waste making it further processed and has been taking the nuclear waste from others countries.... Bangladesh signed a contract with Russia on December 25, 2015 for the construction and commissioning of a NPP at Rooppur in Pabna at the cost of \$12.65 billion. The BAEC, under the Ministry of Science and Technology, is in charge of implementing this project. The NPP is expected to add 2,400MW of electricity to the national grid by 2023.

Source: <http://www.dhakatribune.com/>, 23 February 2017.

WGS 2017: As More Nations Pursue Nuclear Energy, Safety and Security Remain Top Concerns

Nuclear energy can help offset reliance on fossil fuels as global demand for power projected to hit record levels Dubai-UAE: 14 February, 2017: Nuclear power can make a significant contribution to reducing greenhouse gas emissions and improving energy security, while delivering energy in the large and growing quantities needed to sustain an expanding world population and foster development. The comments came on the

concluding day of the World Government Summit 2017 during a panel discussion entitled ‘The Future of Nuclear Energy’. The panel included Yukiya Amano, Director General, IAEA, Jamet,

Former Commissioner to the French Nuclear Safety Authority, and Hamad Al Kaabi, Permanent Ambassador of the United Arab Emirates to the IAEA.

The panelists noted that factors such as population growth, urbanization and

growing economic development will continue to drive the world’s energy demand to record levels in the coming decades. They said that while nuclear power provides clean, cheap and reliable energy, safety and security as well as the need for long-term public acceptance, expertise and funding are the top concerns the world needs to effectively address as more nations plan to build and commission nuclear plants.

Amano said that around 30 developing countries are considering introducing nuclear power for civilian use, and needed support so they can use it safely, securely and sustainably. ‘Six years after Fukushima, nuclear power is still a viable and safe option to address our energy needs in the face of climate change. Over 60 nuclear power plants are currently under construction globally, four of which are in the UAE. Authorities in these countries are

working very closely with international organizations such as the IAEA to benefit from international best practice and knowledge sharing.

Noting lessons drawn from catastrophes related to nuclear reactors such as Chernobyl, Fukushima and the Three Mile Island, Jamet said: ‘The key take away from major accidents

in the nuclear energy space is that nothing is infallible. Countries that wish to introduce nuclear power into their energy mix need to focus on all

Six years after Fukushima, nuclear power is still a viable and safe option to address our energy needs in the face of climate change. Over 60 nuclear power plants are currently under construction globally, four of which are in the UAE.

Countries that wish to introduce nuclear power into their energy mix need to focus on all safety and security aspects. This includes preparedness that goes above and beyond regulatory safeguards and needs to involve civil society, including security forces, the military, hospitals and the farming community - the entire value chain that may be affected in case of nuclear fallout.

safety and security aspects. This includes preparedness that goes above and beyond regulatory safeguards and needs to involve civil society, including security forces, the military, hospitals and the farming community - the entire value chain that may be affected in case of nuclear fallout.

In theory, the system designed by sCO₂-HeRo would stop a meltdown before it begins, opening a window for power plant operators to identify, and address, the potential overheating of the core by, for example, alternative mobile cooling systems.

The session also addressed key concerns pertaining to zero risk reactors and the necessity for both government-to-government agreements and industry-to-industry arrangements, to ensure safety and security, transfer of technology and human resource development...

Source: <http://menafn.com/>, 20 February 2017.

Supercritical CO₂, Molten Salt could Stop a Nuclear Meltdown before it Begins

... Over the last few decades, public fears in some countries have prevented more nuclear power from entering the grid. However, if the threat of a meltdown can be removed, some scientists think we should reconsider tapping into this carbon-free source of energy. They are working towards different ways to eliminate the risk of nuclear meltdowns, with automatic methods such as a heat removal system using so-called supercritical CO₂, a state where the chemical has properties of both a gas and a liquid, and the use of molten salt. The supercritical CO₂ approach effectively removes heat build-up from a core without the requirement of external power sources, meaning it could work if the power is somehow cut, for example, during a natural disaster.

In exceptional circumstances, a freeze plug, which is also made of salt and melts if the molten fuel gets too hot, allows the fluid to escape into a special container. The plug would also break in an event of an earthquake, preventing any sort of Fukushima-like accidents.

'By removing the heat, it prevents a potential core meltdown and buys time to react,' said Professor Brillert from the University of Duisburg-Essen in Germany, who is the project coordinator of sCO₂-HeRo, an EU-funded project developing the technology. In theory, the system designed by sCO₂-HeRo would stop a meltdown before it

begins, opening a window for power plant operators to identify, and address, the potential overheating of the core by, for example, alternative mobile cooling systems.

Its strength rests in the fact that supercritical CO₂ is able to transport huge amounts of heat in a low-cost, non-toxic and non-flammable way. In a reactor's case, it can rapidly

remove heat from the core's surface and release it through steam. 'The system kicks in automatically and no operator action is required,' said Prof. Brillert. Professor Starflinger, a nuclear energy expert from the University of Stuttgart in Germany, is also working on sCO₂-HeRo and says that its compact system means it can 'be tailored for old power plants' and 'new ones too'.

Coolant: Another technology that could prevent a meltdown is a Molten Salt Fast Reactor (MSFR), which uses molten salt combined with thorium and uranium to simultaneously act as a fuel and coolant. In MSFR systems, a 'meltdown has no meaning', according to Professor Kloosterman, a nuclear energy expert from Delft University of Technology, the Netherlands. 'Because the fuel is a fluid, if it heats up too much it will expand and the nuclear fission reactions die out - without intervention of operators or the control system.'

In exceptional circumstances, a freeze plug, which is also made of salt and melts if the molten fuel gets too hot, allows the fluid to escape into a special container. The plug would also break in an event of an earthquake, preventing any sort of Fukushima-like accidents.

'The risk that nuclides (radioactive atoms) can be distributed into the environment is very small in MSFR,' said Prof. Kloosterman, who is the project coordinator of SAMOFAR which is looking to develop MSFR using thorium as a fuel. 'Thorium is a lighter element so you produce about one thousand times less of the long-lasting actinides (such as) plutonium. The remaining waste only requires a storage time

of 500 to 1 000 years instead of 200 000 years.' SAMOFAR is developing a safety methodology and is testing safety devices for the MSFR experimentally and with numerical models. It is also measuring the properties of molten salts. All results have so far strengthened the optimism of MSFR as an inherently safe reactor. 'Many people see this technology as a kind of gamechanger, it could really change public opinion,' said Prof. Kloosterman, but admits we won't see any MSFR reactors 'until at least 2050'.

Neo-nuclear: China is expected to build between 40 and 60 new power plants by 2050. In Europe, for the first time in over 20 years, there are plans for new plants in France, Finland and UK while two more Russian-designed reactors are planned in Hungary. It appears nuclear energy is here to stay - making safety in power plants more important than ever. Fichot, from the French Institute for Radiological Protection and Nuclear Safety, said: 'What we learned from Fukushima, Three Mile Island and Chernobyl, is the risk (of a meltdown) was underestimated at the beginning.

A preventative solution developed in new plants is IVMR, which intends to stop the progression of a meltdown by automatically flooding the reactor pit with water if the system detects a rising temperature in the core, reducing the risk of human oversight. 'IVMR strategy will be implemented in some of the new reactors, in particular in new Chinese designs for which IVMR is the preferred strategy,' said Fichot.

Similar to sCO₂-HeRo and SAMOFAR, this would increase the level of safety at nuclear power plants. But at the moment IVMR can only prevent meltdowns in reactors with

a power capacity below 600 MWe. Many reactors run at 1 000 MWe and higher, and for them the possibility of IVMR preventing the progression of nuclear meltdowns can't be guaranteed. Fichot is the project coordinator of an EU-funded study, also called IVMR, investigating the IVMR strategy for higher power reactors. 'We are trying to identify the maximum level of power in a plant for which this strategy can be implemented.'

IVMR can help reduce the risk of a nuclear meltdown, but if it still occurs it won't completely eliminate the risk of contaminating the environment. It would have to be combined with other safety measures to maximise the level of safety. Responsibility would then rest with utility companies who implement these safety measures. However, this can be difficult in light of the very large investments needed to build a nuclear power plant, as well as for the general costs during its lifespan.

Source: horizon-magazine.eu/, 24 February 2017.

Next Generation of Robots for Use in Nuclear Sites

The University of Manchester is to lead a consortium to build the next generation of robots that are more durable and perceptive for use in nuclear sites. The cost of cleaning up the UK's existing nuclear facilities has been estimated to be between £95 billion and £219 billion over the next 120 years or so. The harsh conditions within these facilities means that human access is highly restricted and much of the work will need to be completed by robots.

Present robotics technology is simply not capable of completing many of the tasks that will be required. Whilst robotic systems have proven to be of great

China is expected to build between 40 and 60 new power plants by 2050. In Europe, for the first time in over 20 years, there are plans for new plants in France, Finland and UK while two more Russian-designed reactors are planned in Hungary. It appears nuclear energy is here to stay - making safety in power plants more important than ever.

IVMR can help reduce the risk of a nuclear meltdown, but if it still occurs it won't completely eliminate the risk of contaminating the environment. It would have to be combined with other safety measures to maximise the level of safety. Responsibility would then rest with utility companies who implement these safety measures. However, this can be difficult in light of the very large investments needed to build a nuclear power plant, as well as for the general costs during its lifespan.

benefit at Fukushima Daiichi NPP, their limitations, which include relatively straightforward tasks such as turning valves, navigating staircases and moving over rough terrain, have also been highlighted.

The new group comprising Manchester, the University of Birmingham, University of the West of England (UWE) and industrial partners Sellafield Ltd, EdF Energy, UKAEA and NuGen has been funded with £4.6m from The Engineering and Physical Sciences Research Council. It will develop robots which have improved, power, sensing, communications and processing power. They will also develop systems which are able to address issues around grasping and manipulation, computer vision and perception. Importantly the robots will be autonomous – able to operate without direct supervision by humans.

... Within the next five years, the researchers will produce prototype robots which will then be trialled in both active and inactive environments. It is anticipated that these trials will include using robotic manipulators to autonomously sort and segregate waste materials and to use multiple robots, working collaboratively, to characterise facilities that may not have been accessed for 40 years or more.

The technology will not only have potential for improving robots used at nuclear sites, but also in other hostile environments such as space, sub-sea, and mining. Or in situations such as bomb-disposal and healthcare which are dangerous or difficult for humans. The University of Manchester has already developed small submersible and ground-based vehicles that can be deployed to survey nuclear facilities, which will be used in this project, allied with the skills and knowledge of the other partners.

Source: <https://phys.org/news/2017-02-robots-nuclear-sites.html>, 28 February 2017.

INDIA–PAKISTAN

Pakistan, India Extend Five-Year Accord to Reduce Risk of Nuclear Disasters

Pakistan and India have agreed to extend their agreement on reducing the risk from accidents relating to nuclear weapons by next five years (2017-2022), the Foreign Office said in a statement on 21 February. The agreement between two nuclear armed neighbours came into force in 2007. It was subsequently extended for a period of five years in 2012. The pact that constitutes a part of the Nuclear CBMs agreed between Pakistan and India, is aimed at promoting stability and security. It enables immediate exchange of information in the event of any incident relating to nuclear arms under their respective jurisdiction and control, which could risk a nuclear fallout or create the risk of a nuclear exchange, added the FO statement. ...

Source: en.dailypakistan.com.pk, 21 February 2017.

It will develop robots which have improved, power, sensing, communications and processing power. They will also develop systems which are able to address issues around grasping and manipulation, computer vision and perception. Importantly the robots will be autonomous – able to operate without direct supervision by humans.

JAPAN

Japan Nuclear Power Industry Set to Initiate Safety Checks

A Japanese power industry group will soon begin rating utilities' nuclear operations on a five-point safety scale, providing a safety

assessment separate from government standards to rebuild public trust in nuclear power. The Japan Nuclear Safety Institute will rate members such as Tokyo Electric Power Co. Holdings, Kansai Electric Power and Japan Atomic Power based on inspections of nuclear facilities' operations and management beginning in the fiscal that starts in April. High marks will reduce the annual dues members pay to the group, which range in the hundreds of millions of yen, or millions of dollars, for major power companies. The institute plans to work with insurers to lower premiums for high scorers. Results of the inspections will not be made public.

Nearly six years after the March 2011 disaster at Tepco's Fukushima Daiichi plant, the Japanese

public remains deeply distrustful of nuclear power. Little progress has been made in bringing reactors back online, due in part to stiff local opposition. The Japan Nuclear Safety Institute hopes its own efforts will help allay public fears. Industry-led standards have helped make nuclear plants safer in the U.S. and elsewhere.

Source: <http://asia.nikkei.com>, 21 February 2017.

USA

Public Input Sought on Seabrook Nuke Plant Degradation

The Nuclear Regulatory Commission is seeking public comment regarding NextEra Energy Seabrook's proposal to address concrete degradation at Seabrook Station. NextEra is in the process of having its license for Seabrook Station extended by 20 years and must first demonstrate to the NRC how it plans to address alkali silica reaction, or ASR, a chemical reaction that causes concrete degradation. ASR was discovered in several plant structures in 2010. In 2016, NextEra filed a license amendment request that would amend language in its license to include plans for addressing the degradation. The newly opened public comment period, which started Feb. 7, gives members of the public a chance to weigh in on the license amendment request before the NRC decides whether to approve it. Comments must be filed by March 9, and public hearings can be requested before an April 10 deadline.

NRC spokesperson Sheehan said on 20 February there had been no public comment or hearing requests filed yet. NextEra sent its initial license amendment proposal to address ASR August 2016, but the company was told in September it needed to provide more information. The NRC said it needed more details on how NextEra would monitor movement caused by degradation in the actual concrete structures. The commission also sought more information on how the plant's concrete's backfill, which strengthens the foundation of concrete structures, will be protected against ASR, as well as more technical

information on certain testing of the ASR.

In October, NRC officials said NextEra had provided sufficient information regarding its plan to address ASR, allowing the license amendment and renewal processes to move forward. ASR commonly causes degradation in structures like bridges and dams and can lead to gradual movement of concrete. Seabrook Station is the first plant in the U.S. to have ASR reportedly found in its structures. The NRC has stated ASR is not a safety concern, but the commission is still determining if NextEra will be able to safely monitor the reaction down the road. NRC officials say it should take until 2018 to approve or deny NextEra's license amendment request, which would then allow the NRC to complete the plant's full license renewal. Sheehan said there is no timetable set for the completion of the license renewal, though he said addressing ASR is the biggest hurdle that remains.

ASR commonly causes degradation in structures like bridges and dams and can lead to gradual movement of concrete. Seabrook Station is the first plant in the U.S. to have ASR reportedly found in its structures. The NRC has stated ASR is not a safety concern, but the commission is still determining if NextEra will be able to safely monitor the reaction down the road.

The Advisory Committee on Reactor Safeguards, which advises the NRC, will also hold a meeting on Feb. 24 at the NRC headquarters in Rockville, Md., to look at the license amendment request. The ACRS is an independent body of nuclear safety experts that advise the NRC in decision making. Despite the NRC stating

ASR is not a safety concern in Seabrook Station right now, activists against the nuclear industry have said too little is known about ASR and its effects to keep Seabrook Station open. Groups like No More Fukushimas, based in Newburyport, Massachusetts, have called for the immediate closure of Seabrook Station.

Source: <http://www.seacoastonline.com>, 20 February 2017.

NUCLEAR WASTE MANAGEMENT

USA

Emptying Waste from Leaking Tank Completed

The Department of Energy has completed work to empty as much waste as possible from Hanford's double-shell tank with an interior leak,

according to a notification to the state Department of Ecology. DOE was required by a settlement agreement with the Department of Ecology to have the tank emptied of enough waste to determine the cause of the leak by March 4. "Preparations for tank inspections are being initiated," the notice said. Tank AY-102, Hanford's oldest double-shell waste storage tank, held about 744,000 gallons of radioactive and hazardous chemical waste when work started to empty it almost a year ago (2016) on March 3.

Waste is being emptied from Hanford's older, leak-prone single-shell tanks for storage in double-shell tanks until the waste can be treated for disposal. The waste is left from the past production of plutonium for the nation's nuclear weapons program. DOE also has not ruled out the possibility of determining if Tank AY-102 could be repaired and put back into service, although officials have said a return to service seems unlikely. The tank, which has held waste since about 1970, had documented construction issues.

After using two different technologies to retrieve waste from the enclosed, underground tank, DOE contractor Washington River Protection Solutions removed about 98 percent of the waste in the tank, according to a memo sent to its employees on 21 February. The contractor estimates about 19,000 gallons of sludge remain in the tank. Tank AY-102 was slowly leaking waste into the space between its shells when a settlement agreement was reached in 2014 between the state and DOE, setting deadlines for emptying it. The waste is not believed to have breached the outer shell of the tank to contaminate the environment. The Department of Ecology is "now awaiting confirmation from DOE demonstrating that they have in fact met the retrieval criteria set out in the settlement agreement," Ecology said in a statement 21 February...

"Follow-up activities to further investigate or implement additional retrieval will be planned and executed based on the result of the video inspection," the memo said. Information learned from inspecting the tank after removing waste

may be helpful in assessing the condition of Hanford's 27 double-shell tanks that remain in service. Waste is being emptied from Hanford's older, leak-prone single-shell tanks for storage in double-shell tanks until the waste can be treated for disposal. The waste is left from the past production of plutonium for the nation's nuclear weapons program. DOE also has not ruled out the possibility of determining if Tank AY-102 could be repaired and put back into service, although officials have said a return to service seems unlikely. The tank, which has held waste since about 1970, had documented construction issues.

The tank, which has a capacity of about 1 million gallons, had 593,000 gallons of liquid waste that was quickly pumped out when retrieval started last year. But the estimated 151,000 gallons of waste in the form of sludge it held were more difficult to remove. Work to remove the sludge began with two standard sluicers, a technology that has been used in the past to empty tanks. But four extended-reach sluicers that are more flexible and can reach more areas within the tank also were prepared.

Washington River Protection Solutions did an exceptional job planning, coordinating and executing the work to retrieve waste, said Smith, manager of the DOE Hanford Office of River Protection, in a statement on 21 February. ...More than two years of work was needed to improve infrastructure at AY-102 and the double-shell tank that now holds the waste before retrieval work began. Some of it was high-risk work, as the memo to employees pointed out. The construction team had to use specialized long-reach tools to remove old equipment, including five obsolete pumps contaminated with radioactive waste.

The tank, which has a capacity of about 1 million gallons, had 593,000 gallons of liquid waste that was quickly pumped out when retrieval started last year. But the estimated 151,000 gallons of waste in the form of sludge it held were more difficult to remove. Work to remove the sludge began with two standard sluicers, a technology that has been used

in the past to empty tanks. But four extended-reach sluicers that are more flexible and can reach more areas within the tank also were prepared. Work began with those sluicers in December and continued until this month, when little more waste could be retrieved with the technology. The sluicers spray liquid waste on sludge to break it up and move it toward a pump for removal from the tank. The project shows "how critical work can be accomplished safely and effectively when labor and management work together to resolve our issues and concerns," said the memo from Lindholm and Molnaa. Multiple control systems were used to protect workers from hazards, including the potential exposure to chemical vapors, they said.

Source: <http://www.tri-cityherald.com/>, 21 February 2017.

Bexar County Says No to High-Level Nuclear Waste Route

Proposed plans to develop a nuclear waste disposal site in Andrews County along the Texas-New Mexico border have gotten the attention of Bexar County. There are concerns that some high-

level radioactive waste would be transported through this area on trains. Not only can accidents happen, but there's also the threat of terrorist attacks. Tom 'Smitty' Smith, the former director of Public Citizen Texas, addressed Bexar County Commissioners Court on 21 February.

"In the state report that looked at this, the TCEQ report, it said that the greatest risk is probably in transportation," said Smith. "And in transportation, the places you want to look at are the high value targets. Not a little town of 15,000 on the New Mexico border, but places like San Antonio where you've got military bases that have the strategic air command." Commissioner Calvert also gave a perspective of the level of radioactive material. "A single train car would likely contain as much plutonium as was in the bomb that dropped on Nagasaki," said Calvert. "That is alarming, that is a risk that is not worth our community taking." Commissioners Court passed a resolution opposing consent to transport high-level radioactive waste on railways or highways through Bexar County. The Nuclear Regulatory Commission will determine the routes.

Source: <http://tpr.org/>, 21 February 2017.



Centre for Air Power Studies

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

Centre for Air Power Studies

P-284

Arjan Path, Subroto Park,

New Delhi - 110010

Tel.: +91 - 11 - 25699131/32

Fax: +91 - 11 - 25682533

Email: capsnetdroff@gmail.com

Website: www.capsindia.org

Edited by: Director General, CAPS

Editorial Team: Dr. Sitakanta Mishra, Hina Pandey, Arjun Subramanian P, Chandra Rekha, Dr. Poonam Mann, Gideon Kharmalki

Composed by: CAPS

Disclaimer: Information and data included in this newsletter is for educational non-commercial purposes only and has been carefully adapted, excerpted or edited from sources deemed reliable and accurate at the time of preparation. The Centre does not accept any liability for error therein. All copyrighted material belongs to respective owners and is provided only for purposes of wider dissemination.