



Vol 13, No. 22, 15 SEP. 2019

**OPINION – Rajesh Rajagopalan**

**The Strategic Logic of the No First Use Nuclear Doctrine**

India adopted a NFU nuclear doctrine in 2003, but the counter-intuitive logic of the doctrine was controversial from the very beginning. The assumption among critics has been that a policy that relied on retaliation only, in which India will wait until it is attacked before it uses its nuclear weapons, reflected its general strategic passivity and political idealism, and was dictated primarily by India's desire to be a responsible international actor.

Nothing could be farther from the truth. Far from being any of these, India's NFU policy was a result of the lessons that India's key strategic thinkers learned in the long decades they spent thinking about the global experience with nuclear strategy and the implications of this for India's nuclear policy. It was dictated not by passivity or idealism but a deep realism, an understanding of the limited purpose that nuclear weapons can play in the strategy of any nuclear weapon power, but particularly that of one such as India. With the passing of some of the strategic stalwarts who framed the original policy, all that appears to be

**India's NFU policy was a result of the lessons that India's key strategic thinkers learned in the long decades they spent thinking about the global experience with nuclear strategy and the implications of this for India's nuclear policy. It was dictated not by passivity or idealism but a deep realism, an understanding of the limited purpose that nuclear weapons can play in the strategy of any nuclear weapon power, but particularly that of one such as India.**

**CONTENTS**

- ☞ **OPINION**
- ☞ **NUCLEAR STRATEGY**
- ☞ **BALLISTIC MISSILE DEFENCE**
- ☞ **NUCLEAR ENERGY**
- ☞ **URANIUM PRODUCTION**
- ☞ **NUCLEAR COOPERATION**
- ☞ **NUCLEAR NON-PROLIFERATION**
- ☞ **NUCLEAR PROLIFERATION**
- ☞ **NUCLEAR DISARMAMENT**
- ☞ **NUCLEAR SAFETY**
- ☞ **NUCLEAR WASTE MANAGEMENT**

holding up the policy is bureaucratic muscle-memory. This is insufficient to resist ideological challenges to the policy. It is, thus, time to revisit and reassert the original strategic logic behind NFU.

To be clear, it is not being suggested that India's security managers, present or past, have rethought the strategic logic of NFU, which remains the bedrock of India's nuclear doctrine. If there is a threat to India's NFU policy, it comes more from the ideological opposition it faces, not from

any careful reassessment of its strategic logic. The central reason behind India's NFU was the

recognition that nuclear weapons served only a very limited purpose, that of ensuring national survival. The only real threat to such survival was a nuclear attack. Nuclear weapons are unique because unlike any other weapon, they could wreak so much destruction in such a short time that they could potentially end an entire society in an afternoon. The only way to prevent such destruction is to threaten similar destruction on any potential adversary, thus deterring them from pursuing such a course of action. Threatening retaliation is the only solution because there is no defence against these weapons.

Though there were attempts by deterrence theorists in other parts of the world to consider the use of nuclear weapons for more limited tactical purposes than national survival, most Indian nuclear strategists were rightly skeptical of such possibilities. This drove some of the strongest proponents of India's nuclear weapon programme to be also deeply critical of the kind of elaborate nuclear doctrines and arsenals being developed by other countries, especially the two Cold War superpowers. It was not a logic that they wanted India to follow because it made little sense for anyone, and definitely not for India.

NFU was the outcome of this strategic logic. (The other corollary was a limited nuclear arsenal). If the primary purpose — indeed, the only purpose — of nuclear weapons was deterrence of other nuclear weapons, then threatening retaliation was the only manner in which these weapons could be used. The threat of retaliation is of course the

essence of deterrence: preventing someone from taking an action by threatening to punish them if they did. Retaliation, by definition, could only be for an action that was already taken, in this case,

**Retaliation, by definition, could only be for an action that was already taken, in this case, a nuclear attack that has already happened. Deterrence and retaliation automatically meant that there was no logic to using nuclear weapons first: hence, no first use. Additional benefits also accrue from NFU: tighter political command over nuclear weapons, a much more relaxed command and control regime and a much safer nuclear arsenal.**

a nuclear attack that has already happened. Deterrence and retaliation automatically meant that there was no logic to using nuclear weapons first: hence, no first use. Additional benefits also accrue from NFU: tighter political command over nuclear weapons, a much more relaxed command and control regime and a much safer nuclear arsenal.

First use, which is what giving up NFU means, is incompatible with nuclear deterrence of nuclear weapons. First use can have a non-nuclear deterrence purpose but only if a non-nuclear threat

**Not surprisingly, Pakistan's nuclear weapon programme began not as a response to India's nuclear weapons programme, but as a response to the demonstration of India's unambiguous conventional military supremacy in December 1971. For both Israel and Pakistan, a first use nuclear doctrine makes sense because of the non-nuclear existential threats they perceive.**

to national survival exists or is perceived to exist. Pakistan and Israel are two countries that perceive such non-nuclear threats to national survival. Israel, given the history of the Jewish people, the hostility of its neighbours and its own small size, believes that it faces a non-nuclear but nevertheless existential threat. Pakistan, similarly,

has always worried that India never fully reconciled itself to the partition and that it may some day seek to undo it, especially because of the huge conventional military power differential between India and Pakistan.

Not surprisingly, Pakistan's nuclear weapon programme began not as a response to India's nuclear weapons programme, but as a response to the demonstration of India's unambiguous conventional military supremacy in December 1971. For both Israel and Pakistan, a first use nuclear doctrine makes sense because of the non-

nuclear existential threats they perceive. It goes without saying, of course, that their perception may be unrealistic; it is, equally, irrelevant because states make security choices on the basis of their perceptions.

Of the other nuclear powers, only the US and Soviet Cold War first use doctrines makes some sense. Both worried about a surprise attack, and both kept their nuclear forces primed to launch at the first sign of a nuclear attack from the other side. In addition, the US also had extended deterrence

commitments to defend its allies against Soviet and Chinese attacks, which required the flexibility to launch a nuclear attack first. There is no such strategic logic for an Indian nuclear first use doctrine. India perceives neither any existential threats nor fears surprise nuclear attack nor has extended deterrence commitments.

A former Indian defence minister argued that India need not say it has an NFU in order to not bind itself. This is a common misperception: that the NFU limits India's options.

India's nuclear options are indeed extremely limited but they are limited not because of the NFU but because of the nature of nuclear weapons and the context of India's strategic needs. This can be made clear if we consider what nuclear options India gains if it were not "bound" by the NFU.

Giving up the NFU presumably frees India to use nuclear weapons first, but under what conditions would India possibly need to use nuclear weapons first? Any Indian first use of nuclear weapons against another nuclear power means the certainty of nuclear retaliation. Nothing can prevent such retaliation. And the nature of nuclear weapons

means that the consequences of such a retaliation, even if the retaliation is relatively minor one involving a few weapons, will be devastating. This is one reason why nuclear first use makes sense

only for countries facing certain death in any case, either from conventional or nuclear threats.

This is also why counterforce, which some former Indian officials have mused about, is such a fantasy. The logic of counterforce — attacking the adversary's nuclear forces instead of soft targets such as cities — is

that destroying the adversary's nuclear forces will prevent an adversary from being able to attack India with nuclear weapons. But counterforce attacks require perfect intelligence about where the adversary's nuclear forces are located so that they can be targeted. Not even the world's most powerful states have such intelligence; and India will pay a heavy cost if even a few weapons of an adversary survives such an assault.

Counterforce attacks may make some sense in retaliation to an initial nuclear attack, for if nuclear war has already started there might be some sense in trying to limit the damage that can be caused in subsequent waves of attacks. But of course, in such a scenario, counterforce becomes an adjunct to the NFU, not an

alternative. The problems of uncertain intelligence, combined with the horrible consequences of a mistake, also limits any attempt to even shave the NFU to adopt options such as Launch-On-Warning or Launch-Under-Attack. In addition to the very short reaction times in the India-Pakistan theatre (or even a Sino-Indian one), no political leader will order a nuclear attack on the mere suspicion that an enemy nuclear attack is underway.

**There is no such strategic logic for an Indian nuclear first use doctrine. India perceives neither any existential threats nor fears surprise nuclear attack nor has extended deterrence commitments. A former Indian defence minister argued that India need not say it has an NFU in order to not bind itself. This is a common misperception: that the NFU limits India's options.**

**Giving up the NFU presumably frees India to use nuclear weapons first, but under what conditions would India possibly need to use nuclear weapons first? Any Indian first use of nuclear weapons against another nuclear power means the certainty of nuclear retaliation. Nothing can prevent such retaliation.**

There is also some understandable frustration in India about Pakistan's adoption of TNWs as well as its recourse to terrorism as a state strategy. While the frustration is understandable, abandoning the NFU will provide little relief. Terrorism and TNWs are both an acknowledgement of Pakistan's conventional military weakness. Threatening to use Indian nuclear weapons first in response is so disproportionate that it will lack any credibility. Far more credible will be the Indian resolve to employ its conventional military superiority to respond to such threats and demonstrate the emptiness of Pakistan's escalation threats because that is what these are.

Considering both the strategic logic of India's NFU policy, as well as the futility of abandoning it, leads to the suspicion that such proposals are ideologically driven short-cuts to demonstrate Indian "resolve" rather than a careful response to India's strategic problems. That would be a shame because the NFU policy is uniquely suited to India's circumstances — a preponderant power in its neighbourhood that faces no existential threats.

*Source: Rajesh Rajagopalan is Professor of International Politics at Jawaharlal Nehru University, New Delhi, <http://www.orfonline.org>, 30 August 2019.*

**OPINION – Seshadri Chari**

**There is Need & Space, for Recalibrating 'No First Use'**

Defence Minister Rajnath Singh's recent comment that India might have to rethink its nuclear 'No First Use' policy in the future raised a howl of

protests. Those protesting assumed that the government is preparing to do away with NFU and open up the possibility of a nuclear first strike against Pakistan, which in turn could lead to both countries assuming hair-trigger alert postures. It would then take only one miscalculation or misreading on the part of either for a long nuclear winter to descend on the subcontinent. But, is that necessarily how things will turn out if India relooked at its nuclear doctrine?

Our nuclear programme is riveted on the principles of using nuclear energy for peaceful purposes, nuclear weapons only as a deterrent, and thus the commitment to NFU. India's nuclear doctrine, laid out in 2003, specifies all these aspects. Going further, India declared a self-imposed moratorium on further nuclear tests.

Yet, the changing geopolitical dynamics of the region and the world as well as technological changes leave us no option but to review the doctrine periodically to improve deterrence. The doctrine itself recognises the need to do so in the Preamble, "This document outlines the broad principles for the development, deployment and employment of India's nuclear forces. Details of policy and strategy...will flow from this framework and will be laid down separately and kept under constant review."

Indeed, the doctrine lays down that it "shall be revisited every five years," and specifies the areas that need review. We are expected to continue research on developing both delivery systems and warheads in the light of global technological advancements. In light of international nuclear regimes, it says, we shall cooperate with other

**Considering both the strategic logic of India's NFU policy, as well as the futility of abandoning it, leads to the suspicion that such proposals are ideologically driven short-cuts to demonstrate Indian "resolve" rather than a careful response to India's strategic problems. That would be a shame because the NFU policy is uniquely suited to India's circumstances — a preponderant power in its neighbourhood that faces no existential threats.**

**Our nuclear programme is riveted on the principles of using nuclear energy for peaceful purposes, nuclear weapons only as a deterrent, and thus the commitment to NFU. India's nuclear doctrine, laid out in 2003, specifies all these aspects. Going further, India declared a self-imposed moratorium on further nuclear tests.**

nations to strengthen the non-proliferation regime and work towards democratising these regimes. We are also committed to maintaining strict controls on the export of nuclear and missile-related equipment, materials and technologies, and these lists are to be revised from time to time.

Within this framework, there is a general consensus among the strategic and scientific communities that there is now a need to review the doctrine, lest we imperil our national security options. Nevertheless, it should be clear that reviewing the doctrine does not necessarily mandate or result in major alterations or going back on our NFU commitment.

Nuclear first use or first strike option has neither insulated nuclear powers against military setbacks nor given them any special advantage, if we go by the conflicts over the last few decades. On the other hand, a 'hair-trigger' alert doctrine virtually brought the US and USSR to the brink of a nuclear war during the infamous 'Cuban Missile Crisis'.

Advocates of a nuclear India were, and continue to be, aware of the fall-out of the Cold War and the arms race that ran counter to the UN mandate of total disarmament and a nuclear weapons-free world. Contrary to the Cold War era and the European experience, India and China have been able to develop their nuclear programmes in a much relaxed atmosphere, despite having had conflicts and not-so-tranquil borders between them. Even during the 2017 Doklam crisis, the N-word was not used by either side, providing a window of opportunity for the leadership of both

**Within this framework, there is a general consensus among the strategic and scientific communities that there is now a need to review the doctrine, lest we imperil our national security options. Nevertheless, it should be clear that reviewing the doctrine does not necessarily mandate or result in major alterations or going back on our NFU commitment.**

**Contrary to the Cold War era and the European experience, India and China have been able to develop their nuclear programmes in a much relaxed atmosphere, despite having had conflicts and not-so-tranquil borders between them. Even during the 2017 Doklam crisis, the N-word was not used by either side, providing a window of opportunity for the leadership of both countries to de-escalate the situation.**

countries to de-escalate the situation.

Unfortunately, the same cannot be said about Pakistan, which continues to slip into greater political, social and economic muddle. Whatever may be Pakistan's stated nuclear policy its strategy appears to be something different. In a totally asymmetric scenario and with limited options available to it, Islamabad has always used its "fastest growing nuclear stockpile" to create a scare rather than a deterrent against India. Be it the Kargil conflict, the post-Pulwama

developments or reactions to the abrogation of Article 370 by India, Pakistan has always raised the bogey of an impending nuclear conflict in the region.

Pakistan is developing low-yield warheads, which could be used by any one of the many 'non-state' actors on its eastern and western borders, with everything from Tel Aviv to Dhaka in their purview. There are also credible reports of Pakistan's security establishment clandestinely procuring and developing tactical nukes and short-range missiles that could 'accidentally' fall into the hands of jihadi forces.

In such a scenario, Delhi's response mechanism will have to be recalibrated to the extent that it lies somewhere between the Cold Start doctrine and Massive Retaliation. Any extension of the Cold Start response will have to be necessarily strengthened with a robust nuclear doctrine, with ease of operation in a limited timeframe and maximum operational manoeuvrability. Incidentally, the first Integrated Battle Group is being currently structured. The security and strategic architecture of any country

always has to be dynamic and flexible, all the more so, in a rough neighbourhood such as ours. Dithering on periodic recalibration of military strategy will seriously affect national security preparedness.

Source: <http://www.deccanherald.com>, 08 September 2019.

**OPINION – Rakesh Krishnan Simha**

**Going Ballistic: Why Imran Khan’s Nuclear Threat is a Sign of Pakistani Impotence**

Powerless to do anything after India revoked Article 370 and turned Jammu & Kashmir into a union territory, the Pakistani political-military leadership has been reduced to firing rockets on Twitter, trying to storm the Indian embassy in London, and issuing threats of nuclear war. What’s ironic is the Pakistan Army (which has 600,000 soldiers) urging Pashtuns to fight in Kashmir. A clash with India would be too much for the corrupt generals of the Pakistan Army. The conqueror of corner plots doesn’t have the cojones to fight the powerful Indian Army. Having lost all four previous wars against India, the actual war would be well outside their comfort zone.

Nearly broke and facing unprecedented inflation, Prime Minister Imran Khan has been on expeditions to Beijing, Washington and the Gulf emirates. In fact, so happy was Khan after the US released a few measly millions for the Pakistani military that upon his return from Washington DC he said, like a gushing bride, “It doesn’t feel like I have come back from overseas, it feels like I have come back with the World Cup.”

But after India’s Kashmir checkmate, the ear to ear grins have disappeared from the faces of the

Pakistani leaders. Most of them now wear a grim look as they have to explain what went wrong to an increasingly despondent - an irate - public which had been deluded for decades that the invincible Pakistan Army could roll into Delhi and defeat the Hindus at will. In order to justify their existence, the Pakistani elites are now using their final card - threaten nuclear war over the Kashmir issue and hope to get the world’s attention.

**Pakistani Art of Negotiation:** Pakistan is the only country in the world which negotiates with a gun to its head. Pakistani commentators like to say they can turn Mumbai and Delhi into ashes within

minutes of war breaking out. This is their favourite catchphrase which they use on TV talk shows, at international forums and before anyone who cares to listen.

In a whiny editorial in the Indiaphobic New York

Times, Imran Khan once again rattled the nuclear sabre: “If the world does nothing to stop the Indian assault on Kashmir and its people, there will be consequences for the whole world as two nuclear-armed states get ever closer to a direct military confrontation.” Khan cited Defence Minister Rajnath Singh to show India’s belligerence.

Rajnath had recently made it clear that the future of India’s “no first use” policy on nuclear weapons will “depend on circumstances”. Since irony is not a faculty that Pakistanis have in abundance, Khan failed to see that India’s position on no first use now fully aligns with that of Pakistan. Islamabad’s favourite

strategy for the past several decades has been to go to the brink, get into a war it cannot win and hope that China and the West will step to stop India from delivering the knockout punch.

**The security and strategic architecture of any country always has to be dynamic and flexible, all the more so, in a rough neighbourhood such as ours. Dithering on periodic recalibration of military strategy will seriously affect national security preparedness.**

**Nearly broke and facing unprecedented inflation, Prime Minister Imran Khan has been on expeditions to Beijing, Washington and the Gulf emirates. In fact, so happy was Khan after the US released a few measly millions for the Pakistani military that upon his return from Washington DC he said, like a gushing bride, “It doesn’t feel like I have come back from overseas, it feels like I have come back with the World Cup.**

**Nuclear Capabilities:** Before we analyse the Pakistani nuclear bogey, let's do an inventory check of its arsenal. Pakistan has cranked up the production of nuclear weapons in a bid to pull ahead of India in the South Asian version of the nuclear arms race.

The SIPRI puts the Pakistani arsenal at around 120 warheads. According to the International Panel on Fissile Materials, an independent group that estimates worldwide nuclear production, "Pakistan may have a stockpile of material sufficient for more than 200 weapons and could currently be producing material for about 12-21 weapons per year. It has a capacity to increase this production rate to 14-27 weapons per year when two under construction reactors become available."

Judging by the pace at which Pakistan's doomsday stockpile is growing, the Islamic country could overtake France to become the fourth-largest nuclear weapons state by around 2024. Since the *raison d'être* of the Pakistani nuclear weapons programme is to counter India's conventional might, should India be worried? A difference of 10 or 20 nuclear weapons is hardly alarming. Even if Pakistan overtakes France's total of 300 warheads and the Indian tally is, say, 200, it will matter little in a nuclear exchange. Even 100 is overkill - for, there just aren't enough targets in all of Pakistan.

**Islamabad's Nuclear Dilemma:** From Pakistan's point of view, the dilemma is bigger. It can keep producing as many nuclear warheads as it wants to, but whether it can actually use them is a totally different matter. While the Indian strategic forces can erase Pakistan off the map with a dozen well-

aimed warheads, India is too big to be decapitated by a first strike.

**Judging by the pace at which Pakistan's doomsday stockpile is growing, the Islamic country could overtake France to become the fourth-largest nuclear weapons state by around 2024. Since the *raison d'être* of the Pakistani nuclear weapons programme is to counter India's conventional might, should India be worried.**

Islamabad cannot expect New Delhi would sit idle and suffer a nuclear strike without massive retaliation. So basically, if Pakistan goes for the nuclear trigger first, it commits suicide. If India goes for first-use, Pakistan still ceases to exist. It's lose-lose for Pakistan in every situation. As US strategic analyst, Ralph

Peters, the author of *Looking for Trouble*, explains, "Pakistan's leaders know full well a nuclear exchange would leave their country a wasteland. India would dust itself off and move on."

In fact, New Delhi called Islamabad's nuclear bluff during the Kargil War, when it launched a ferocious offensive to push back the Pakistanis from the Himalayan heights. The Pakistanis had assumed India would not dare to risk nuclear war, believing they would use nuclear weapons early on in a conflict. According to Kapila, the myth of Pakistan's low nuclear threshold is planted

**Islamabad cannot expect New Delhi would sit idle and suffer a nuclear strike without massive retaliation. So basically, if Pakistan goes for the nuclear trigger first, it commits suicide. If India goes for first-use, Pakistan still ceases to exist. It's lose-lose for Pakistan in every situation.**

by US academia or probably officially inspired to keep India's political leadership in awe of the fearful consequences of a nuclear war.

In January 2000, India's then defence minister George Fernandes observed that in precipitating the Kargil War, Pakistan "had not absorbed the real meaning of nuclearisation - that it can deter only the use of nuclear weapons, but not all and any war".

**Who Else Faces the Pakistani Nuclear Threat?**

Ironically, the biggest threat from the Pakistani nukes is not to India, which has developed adequate countermeasures, but to the West, which winked at Islamabad's clandestine nuclear programme during the Cold War. There is a

possibility that radicalised Pakistani military officers with access to nuclear weapons could collaborate with the Pakistani Taliban, al-Qaeda or even members of the Islamic State of Iraq and the Levant to launch a nuclear attack on the West or Israel. A compact Pakistani battlefield nuke smuggled into New York, Riyadh or Tel Aviv is the ultimate jihadi wet dream. The ease with which terrorists are able to penetrate well-defended strategic targets in Pakistan such as military bases, ports and airports highlights the threat that these groups might even launch an assault against nuclear weapons depots.

**There is a possibility that radicalised Pakistani military officers with access to nuclear weapons could collaborate with the Pakistani Taliban, al-Qaeda or even members of the Islamic State of Iraq and the Levant to launch a nuclear attack on the West or Israel. A compact Pakistani battlefield nuke smuggled into New York, Riyadh or Tel Aviv is the ultimate jihadi wet dream.**

**Imploding Economy:** The India-Pakistan arms race is driven by the same set of fears and misinformation that sparked the ruinous arms race between the Soviet Union and the US during the Cold War. The Manhattan Project scientists estimated 100-200 nuclear weapons would have been more than enough to defend America. But driven by the fear its own deterrent was not enough and that the Russians had more, the US went on a nuclear buildup, peaking at 31,255 warheads in 1967.

**Producing nuclear fissile materials is an extremely complicated and expensive process. Maintaining a growing arsenal and then securing it round the clock also requires massive manpower and a huge expenditure outlay. Unlike India, Pakistan cannot sustain production and maintain the arsenal without driving itself into bankruptcy.**

Not to be outdone, the Soviets decided they must overtake the US in both conventional and nuclear weapons. The Russian arsenal stood at an astounding 45,000 nuclear warheads. The Soviets were ahead by miles, and yet all that firepower couldn't help them when an internal revolution broke up the country. It wasn't the arms race per se that weakened the Soviet Union's economy; rather it was the desire to overtake the US - whose economy was several times bigger - that exhausted the Soviets.

Pakistan is making the same strategic mistake. Its plan to achieve at least nuclear parity with India and then overtake its giant neighbour will only spell doom for its economy. For, Pakistan is a dirt-poor country, which is dependent on handouts from the West and the Gulf states.

Producing nuclear fissile materials is an extremely complicated and expensive process. Maintaining a growing arsenal and then securing it round the clock also requires massive manpower and a huge expenditure outlay. Unlike

India, Pakistan cannot sustain production and maintain the arsenal without driving itself into bankruptcy. With the acquisition of nuclear weapons, Pakistanis may feel cockier as they can now threaten nuclear Armageddon on the planet. Visions of a full-blown nuclear exchange (say, 50-

100 nuclear explosions) in South Asia are enough to get the world's attention. The problem is Islamabad has been doing this since the 1980s and most astute observers are aware these are empty threats with no intention to deliver - and little courage to push the doomsday button. The only people who continue to

amplify Pakistan's threats are the left-liberal media in the West and India.

*Source: <http://www.businesstoday.in>, 08 September 2019.*

#### **OPINION – Mark Thompson**

#### **The Broken Leg of America's Nuclear Triad**

The Pentagon insists it needs its Cold War-era nuclear triad of bombers, submarines, and land-based missiles to ensure at least one of those legs will survive following a surprise enemy attack. That's so the US can respond to such a bolt-out-of-

the-blue strike with an atomic rejoinder of its own. It's a long-standing, although dubious, refrain.

"We found that the Soviet threat to the weapon systems of the land and sea legs had ... been overstated," a top Government Accounting Office official at the time told Congress 26 years ago. "For the sea leg, this was reflected in unsubstantiated allegations about likely future breakthroughs in Soviet submarine detection technologies." The Pentagon's logic undergirding the triad, such as it is, is in danger of falling apart: The US military is on the cusp of putting all of those nuclear eggs into a single basket.

Northrop Grumman is developing the Air Force's B-21, the nation's only new strategic bomber, as well as the motors that power the nuclear missiles launched by Navy submarines. And now, it is the lone American company seeking to build a new generation of land-based ICBMs. That's the day Boeing, which has built the nation's ICBMs for 60 years, announced it was junking its bid to build the newest such missiles. It contends that Northrop's 2018 purchase of Orbital ATK, the maker of the nation's largest rocket motor, gives it an unfair advantage.

Why we're here—and how we got here—is a tale of a once-massive military-industrial complex melting down into a handful of firms. That has made competition, which too often proves scarce when it comes to military procurement, an even rarer commodity. And, as it stands right now in the case of the nuclear triad, non-existent.

If you're a true hawk—or even just a taxpayer—this is no way to prepare for nuclear war.

Boeing's decision to abandon its effort to build the next generation ICBM sent a jolt through the nation's rocket business. It signals an apparent end to Boeing's critical role in the production of ICBMs. It has built all three generations of the Minuteman, the first of which was deployed during the Kennedy administration. It has also played a key role in keeping them ready to launch within five minutes of a presidential order ever since.

For decades, the Pentagon has named its various ICBM forces after their missiles—Atlas, Titan, Minuteman I, II, and III, along with the MX Peacekeeper (only 400 Minuteman IIIs, buried in silos near Air Force bases in Montana, North Dakota, and Wyoming, remain on duty). But the ICBM force now under development is known, grandiosely, as the Ground Based Strategic Deterrent (GBSD), kind of

like a newborn human baby without a name. ("Right now, the GBSD procurement is open, so I'm not going to comment on that," chief Pentagon weapons buyer Ellen Lord said August 26 when asked what impact Boeing's withdrawal from the ICBM competition might have.)

The GBSD is part of the Pentagon's mammoth plan to replace all three legs of the nuclear triad. In addition to the roughly \$100 billion price tag on the new crop of ICBMs, the US military wants to

replace its B-52 and B-2 bombers with Northrop's new B-21 Raider (estimated cost: \$100 billion). It is retiring its Ohio-class "boomer" subs with a new Columbia-class fleet (estimated cost: \$128 billion), both of which are outfitted with the Northrop-powered Trident missiles. The cost of buying and operating these weapons is estimated

**Boeing's decision to abandon its effort to build the next generation ICBM sent a jolt through the nation's rocket business. It signals an apparent end to Boeing's critical role in the production of ICBMs. It has built all three generations of the Minuteman, the first of which was deployed during the Kennedy administration. It has also played a key role in keeping them ready to launch within five minutes of a presidential order ever since.**

**In addition to the roughly \$100 billion price tag on the new crop of ICBMs, the US military wants to replace its B-52 and B-2 bombers with Northrop's new B-21 Raider (estimated cost: \$100 billion). It is retiring its Ohio-class "boomer" subs with a new Columbia-class fleet (estimated cost: \$128 billion), both of which are outfitted with the Northrop-powered Trident missiles.**

at an eye-watering \$1.7 trillion between now and 2046, according to the independent Arms Control Association.

The Pentagon's acquisition strategy "must address the unfair advantage that Northrop holds as a result of its control of solid rocket motors, the essential component of the GBSD missile system," Leanne Caret, chief of Boeing's defense division, told the Air Force in a July 23 letter. "We lack confidence in the fairness of any procurement that does not correct this basic imbalance between competitors."

Over the past 24 years, the number of American companies producing such motors has fallen from six to two. Aerojet Rocketdyne is the only other US firm making solid-rocket motors. The motors represent roughly 90 percent of an ICBM's mass, and about half its cost. This outcome shouldn't come as a shock. "In the very near future all the large SRMs [solid-rocket motors] for strategic missiles and space launch will be produced by OATK [Orbital ATK]," the Pentagon warned Congress in a 2017 formal report on the dwindling number of suppliers of key military technologies (Northrop has since renamed Orbital ATK as Northrop Grumman Innovation Systems). "This potentially leaves the US with a single large SRM supplier, which can lead to cost increases due to lack of competition, decreases in internal research and development efforts, and risk of security of supply if a catastrophic accident should occur."

The Pentagon has pegged the program's cost as high as \$100 billion, 61 percent more than the Air Force's initial \$62 billion estimate, for 666 missiles. The Air Force, according to then-Pentagon cost czar Jamie Morin, used older data to develop its lower estimate. "They used a

**The Pentagon has pegged the program's cost as high as \$100 billion, 61 percent more than the Air Force's initial \$62 billion estimate, for 666 missiles. The Air Force, according to then-Pentagon cost czar Jamie Morin, used older data to develop its lower estimate.**

**They are redundant because invulnerable submarine-launched ballistic missiles are sufficient for deterring other countries from attacking the US. They are dangerous because they operate on hair trigger alert, with launch decisions needing to be made in some cases within minutes. This increases the risk of an accidental nuclear war.**

blended model that looked at strategic launch vehicles from 1960 to I think about 1990," Morin told Defense News in 2016. "The newest data is 25 years old. So it turns out there has been cost increases in a lot of the segments, a lot of the industries that we are talking about here from the 1990s to present. So we are introducing some of the more current stuff tended to push our estimate up."

Imagine that. In April, three months before Boeing quit the program, a top Air Force general said he was counting on the head-to-head competition between Boeing and Northrop to shave "billions" off the program's cost. Never mind. If the 21st century need for the 20th century triad is questionable, the ICBM procurement pickle the Air Force now faces makes it even more challenging. "Delays and increasing costs will ... provide grist for those who would cancel the program entirely," Rick Berger of the American Enterprise Institute wrote on the Defense One website on August 5. Congressional opposition, he added, "intends to throw enough sand in the program's gears so that a Democratic president might kill it in 2021." Besides, he added, the new ICBM program is not all that costly: "Even at the high end of its cost estimate, the entire GBSD program would cost less than Americans spend annually on fast food or beer."

But other outside experts insist there is no need for brand-new, land-based missiles. "ICBMs are redundant and dangerous," says William Hartung, director of the Arms and Security Project at the non-profit Center for International Policy. "They are redundant because invulnerable submarine-launched ballistic missiles are sufficient for deterring other countries from attacking the US."

They are dangerous because they operate on hair trigger alert, with launch decisions needing to be made in some cases within minutes. This increases the risk of an accidental nuclear war.”

Even former defense secretary William Perry has said they’re no longer needed. “Any reasonable definition of deterrence will not require that third leg,” he told me in 2015. “Deterrence is deterrence, and you can achieve it with an asymmetrical force, and you can achieve it with fewer numbers.” Experts also say ICBMs are “uniquely destabilizing, uniquely dangerous,” in Perry’s words, because their fixed location makes them sitting ducks, strategically speaking. Unlike moving subs and bombers, their locations are known. That’s why the Pentagon spent so much time and effort in the 1980s to develop mobile ICBMs—railcars for MX missiles and trucks for Midgetman missiles. An ICBM “is destabilizing because it invites an attack.”

A shift to a “deterrence only” strategy could allow for cuts in the US nuclear arsenal, converting it from a war-fighting tool into a smaller force intended only as a second-strike force. Global Zero, a non-profit group pushing for worldwide nuclear disarmament, says such a force requires about 1,100 nuclear weapons (roughly a two-thirds’ cut, but still an amazing number) aboard submarines and bombers. Such a scaling back could “save hundreds of billions of dollars over 30 years otherwise spent on force modernization, maintenance and operations, and warhead work by the Department of Energy’s nuclear facilities,” Global Zero’s Bruce Blair wrote last September.

If the additional deterrence provided by the ICBM leg of the triad is dubious, the jobs and commerce it provides are real. Backers of the new ICBMs include the Senate Intercontinental Ballistic Missile Coalition. Not surprisingly, its members hail from states where the missiles are deployed

or Utah, where the Air Force’s program office, and much of its contracting, is based. “While we represent strong local interests in the ICBM mission, we also possess, by virtue of our close relationship to the ICBM force, years of accumulated experience on strategic matters,” the coalition said in a 2016 paper. “The ICBM leg of the nation’s nuclear triad plays a critical role in deterring 21st Century threats but must be modernized to ensure it is both effective and credible for the next several decades.”

**A shift to a “deterrence only” strategy could allow for cuts in the US nuclear arsenal, converting it from a war-fighting tool into a smaller force intended only as a second-strike force. Global Zero, a non-profit group pushing for worldwide nuclear disarmament, says such a force requires about 1,100 nuclear weapons (roughly a two-thirds’ cut, but still an amazing number) aboard submarines and bombers.**

Although some members of the coalition have left the Senate due to retirement (Orrin Hatch, a Utah Republican, who retired in 2018) or defeat (Heidi Heitkamp, a North Dakota Democrat, who lost to GOP challenger Kevin Cramer in 2018), newcomers get with the program pretty quickly. “Congress must make the modernization of our nuclear deterrent a high

priority—which includes standing up the Ground Based Strategic Defense Program at Utah’s Hill Air Force Base,” Senator Mitt Romney(R-UT) (who took Hatch’s seat in January) said in a tweet following a hearing where he pushed for the program.

The choices facing the Air Force range from bad to worse. Betting everything on Northrop, as it now stands, will lead to a costly program relying on a single bidder. That’s sure to raise congressional concerns. It may also spark questions from the Federal Trade Commission, which required Northrop to provide rocket motors to competitors on “a non-discriminatory basis” as part of the federal approval for its purchase of Orbital ATK. But despite such safeguards, Boeing wasn’t interested. The Air Force could tweak the rules for the competition to lure Boeing back in. Or the two companies might work out some kind of a teaming deal to preserve as least a modicum of competition. Yet such changes would undoubtedly delay the program, now slated to

become operational in about a decade.

Then again, the Pentagon could simply decide to upgrade its Minuteman III ICBMs. "The Minuteman III was put in the ground in 1973 with a plan to do two life extensions," Air Force General Paul Selva, then the vice chairman of the Joint Chiefs of Staff, said in April (he retired in July). "We are now on the third and may have to do a fourth before we can get its replacement in the ground."

Center for Strategic and International Studies defense budget expert Todd Harrison, an Air Force veteran with a pair of Massachusetts Institute of Technology degrees in aeronautics, said in a 2017 report that steps can be taken to keep the current ICBM force up and running. "The missiles could go through another propellant replacement program, as they did in the 2000s, to re-core the missiles and extend their lives for another 30 years," Harrison said.

In fact, Minuteman ICBMs have been around so long that elements have been turned into museums not far from South Dakota's Mount Rushmore. "Learn what it was like to have the awesome responsibility of thermonuclear war at your fingertips," the National Park Service says on its website. You can visit a missile silo for free, but touring an underground launch center, where missileers controlled 10 ICBMs, will cost \$12. That's a lot less than the \$100 billion slated for its replacement, but it only goes to show: there's no such thing as a free launch.

Source: <http://www.pogo.org>, 09 September 2019.

OPINION – James Conca

**Nuclear Power and the 2020 Presidential Candidates**

With very serious issues like health care, gun control, Russian tampering and prison reform, it's unlikely a narrow issue like a candidate's stance on nuclear power will sway votes. However, since

**Then again, the Pentagon could simply decide to upgrade its Minuteman III ICBMs. "The Minuteman III was put in the ground in 1973 with a plan to do two life extensions," Air Force General Paul Selva, then the vice chairman of the Joint Chiefs of Staff, said in April (he retired in July). "We are now on the third and may have to do a fourth before we can get its replacement in the ground."**

**All of the candidates, except Trump, want to rejoin the Paris Agreement and want to price carbon in some way. While most candidates are for keeping existing nuclear open to take advantage of their carbon-free energy, many keep saying new nuclear needs to be safer and have the waste issue resolved, even though nuclear is the safest form of energy we have, and spent fuel doesn't pose any serious risk.**

all the leading climate scientists say we cannot address climate change without significant nuclear power, supporting nuclear power — or not — is a clear signal about how serious a candidate is about climate change and how serious that candidate is about supporting science over mere activism. Many candidates are clearly OK with using nuclear power for addressing climate change. Some clearly are not. Six of the remaining democratic candidates to make the debate stage support nuclear in some way, one does not, and one is unclear.

On the Republican side, President Donald Trump doesn't seem to care and William Weld, former governor of Massachusetts, looks more like a Democrat on climate but likes nuclear, a relic of his previously being a Libertarian. Former US Congressman Joe Walsh, from Illinois, believes climate change is real and impacted by human activities, and appears fine with nuclear. Former South Carolina Governor Mark Sanford has yet to officially enter the race.

All of the candidates, except Trump, want to rejoin the Paris Agreement and want to price carbon in some way. While most candidates are for keeping existing nuclear open to take advantage of their carbon-free energy, many keep saying new nuclear

needs to be safer and have the waste issue resolved, even though nuclear is the safest form of energy we have, and spent fuel doesn't pose any serious risk.

Sen. Bernie Sanders is rabidly anti-nuclear and would phase out existing plants already re-licensed as safe for the next 20 years by the NRC. He doesn't even like the new small modular reactors that can't melt down and that have solved all of those safety issues.

Former HUD Secretary Julian Castro wants no new plants and doesn't believe nuclear is safe but, along with Indiana's South Bend Mayor Pete Buttigieg, doesn't call for closing existing plants. Former Vice President Joe Biden has a \$5 trillion climate plan which includes nuclear energy.

Inslee is no longer in the race but was pro-nuclear. In May, he signed a clean energy bill that commits Washington State to 100% carbon-free electricity by 2045, and paves the way for further development of nuclear energy in the state. Senators Cory Booker of Vermont and Amy Klobuchar of Minnesota and Andrew Yang, an entrepreneur, support existing and new nuclear plants as necessary to address climate change. Yang has also promised to make thorium molten salt reactors as part of his climate plan for achieving net-zero emissions by 2050, pretty forward thinking for a non-scientist. Yang also wants to explore solar geoengineering, also pretty forward thinking.

Sen. Elizabeth Warren seemed open to nuclear but during the CNN Climate Town Hall stated she was against nuclear completely because the risks outweigh the benefits. Unfortunately, she has no idea what the risks are. Along with Sanders and California Senator Kamala Harris, Warren is also against Yucca Mt., and says we need a coherent national plan. The reporting on Harris is confusing.

On the one hand Politico says she supports new technologies, but USA Today reports that she is against it.

Former Rep. Beto O'Rourke, of Texas, has been unclear, but has a \$5 trillion dollar energy plan for the US to get to net-zero emissions by 2050 and supported the Clean Energy Plan of President Obama, which allowed nuclear in. Many of those candidates who are on the fence about nuclear

because of unwarranted fear should welcome the passage of S. 512, the Nuclear Energy Innovation and Modernization Act signed by the President in January. It is a bill supporting new nuclear development.

Another bill, S. 903, Nuclear Energy Leadership Act, passed out of the Senate Energy and Natural Resources Committee in July, and aims to restore US leadership in the civil nuclear industry by helping

to develop a range of advanced reactor technologies that are clean, safe and reliable, even though existing ones already are. The Nuclear Energy Renewal Act, was introduced by a bipartisan group of senators Aug. 1st and aims to extend the life of the country's existing nuclear fleet.

*Source: <http://www.tri-cityherald.com>, 08 September 2019.*

**Another bill, S. 903, Nuclear Energy Leadership Act, passed out of the Senate Energy and Natural Resources Committee in July, and aims to restore US leadership in the civil nuclear industry by helping to develop a range of advanced reactor technologies that are clean, safe and reliable, even though existing ones already are. The Nuclear Energy Renewal Act, was introduced by a bipartisan group of senators Aug. 1st and aims to extend the life of the country's existing nuclear fleet.**

**OPINION – Oliver McPherson-Smith**

**Fear Mongering Deprives Consumers of Low-Emissions Affordable Nuclear Energy**

Both federal and state lawmakers are grappling with the challenge of ensuring that businesses and consumers have affordable and reliable electricity, while limiting greenhouse gas emissions that will exacerbate climate change. Despite the hysteria around nuclear power, the facts show that nuclear is one of the safest and cheapest low-emission forms of energy.

Nuclear energy generation produces next to no emissions, making it a clear alternative to traditional forms of renewable energy like solar and wind. However, unlike its renewable competitors, nuclear power is generated even when the sun doesn't shine, or the wind doesn't blow. The US Energy Information Administration highlights that seasonal variations can have dramatic effects on the ability of wind turbines to generate energy. Similarly, the efficiency of solar panels is affected by both hot and snowy weather. Businesses and consumers benefit when their costs are transparent and predictable, and the year-round consistency of nuclear power meets that need.

According to the Energy Information Administration's Annual Energy Outlook 2019, nuclear power in the coming years will remain price competitive with traditional rivals, such as natural gas turbines, albeit without the higher emissions of greenhouse gasses they generate. Furthermore, the development of small modular reactors is poised to shift the nuclear industry away from expensive, large installations. These smaller reactors would be more flexible in their deployment and would lower the overall cost of energy even further.

Despite all of these advantages, nuclear power suffers from a public relations problem. From "The China Syndrome" to the recent HBO series "Chernobyl," pop culture has long been rife with a narrative that nuclear power can only end in disaster. However, this culture of fear is wholly divorced from the reality of the nuclear power industry in America.

In stark contrast to the 1,000 workers who have died in the domestic shale industry over the last 10 years, the American nuclear industry is remarkably safe for both workers and consumers. Even after the worst nuclear accident in American

history, the Three Mile Island incident in 1979, local residents were subjected to only additional radiation equivalent to that of 1/6th of a chest X-ray. Despite countless studies, researchers have failed to identify adverse health outcomes in the surrounding areas that can be attributed to the incident.

This is a stellar safety record, given that the US is the world's largest nuclear energy producer. Rather than a harbinger of a radioactive disaster, researchers at NASA and Columbia University estimated that approximately 1.8 million lives have been saved since the 1970s by using nuclear power rather than traditional fossil fuels.

The fear of nuclear energy is costing consumers, investors and communities billions of dollars in lost opportunities. A 2011 study by the US Chamber of Commerce highlighted how "Not-In-My-Back-Yard" opposition, spurious lawsuits and onerous regulations have hindered the development of almost two dozen nuclear projects

— and countless other renewable and conventional energy developments. The facts are clear: a well-regulated, competitive nuclear power industry can provide more affordable and reliable energy.

For nuclear power to succeed, we need to recognize its limits. With the full benefit of hindsight after the Fukushima disaster in 2011, it now seems common-sense not to place a reactor in an area that may be subject to both earthquakes and tsunamis. Similarly, the industry in America

**Even after the worst nuclear accident in American history, the Three Mile Island incident in 1979, local residents were subjected to only additional radiation equivalent to that of 1/6th of a chest X-ray. Despite countless studies, researchers have failed to identify adverse health outcomes in the surrounding areas that can be attributed to the incident.**

**For nuclear power to succeed, we need to recognize its limits. With the full benefit of hindsight after the Fukushima disaster in 2011, it now seems common-sense not to place a reactor in an area that may be subject to both earthquakes and tsunamis. Similarly, the industry in America has succeeded because of its stringent safety standards, which must continually be updated to account for the latest research on nuclear safety.**

has succeeded because of its stringent safety standards, which must continually be updated to account for the latest research on nuclear safety. Much like with climate change, we should rely on the facts and science when it comes to nuclear energy. A more honest approach to diversifying the energy mix would result in lower prices for consumers, as well as lower emissions for the world.

Source: <http://www.insidesources.com>, 09 September 2019.

**OPINION – Matthew Gault**

**Experts Want to Give Control of America’s Nuclear Missiles to AI**

When it comes to nuclear weapons and the Cold War, everything old is new again. Old treaties against the creation of long range nuclear weapons are dead and Russia is working on new nukes it promises can strike the US in record time. Two experts have an idea how to counter the new Russian threat—turn over control of America’s nuclear weapons to artificial intelligence. It’s a terrible idea.

In an article for the national security blog War on the Rocks, nuclear policy wonks turned college professors Adam Lowther and Curtis McGiffin, proposed making it easier for the President to launch nukes and advocating for an American, artificially intelligent “Dead Hand.” “Dead Hand” is a Russian fail-deadly (like a fail-safe, but everyone dies), first deployed during the Cold War that ensures Russia’s nukes fly if the country is attacked, even if no one exists to launch them Nuclear deterrence hinges on the theory that no country is willing to launch a nuke because it knows that rival countries will retaliate in kind. That’s the idea behind Mutual Assured Destruction.

Lowther and McGiffin suggest that, thanks to Russia’s new nuclear weapons, the credible fear that America could retaliate with a nuclear strike

is disappearing. The solution is to give control of nuclear weapons to AI. “Time compression has placed America’s senior leadership in a situation where the existing [command and control] system may not act rapidly enough,” they wrote. “Thus, it may be necessary to develop a system based on artificial intelligence, with predetermined response decisions, that detects, decides, and directs strategic forces with such speed that the attack-time compression challenge does not place the US in an impossible position.”

A 2018 report from the RAND Corporation suggested that AI might, in fact, make the world less safe from nuclear war.

**A 2018 report from the RAND Corporation suggested that AI might, in fact, make the world less safe from nuclear war. The report asked several experts to weigh in on how AI might change nuclear deterrence and the results were inconclusive. Some of RAND’s experts believed AI would make the world safer, and others believed it would radically destabilize the current balance of nuclear power.**

The report asked several experts to weigh in on how AI might change nuclear deterrence and the results were inconclusive. Some of RAND’s experts believed AI would make the world safer, and others believed it would radically destabilize the current balance of nuclear power.

“AI needs only to be perceived as highly effective to be destabilizing—for example, in the tracking and targeting of adversary launchers. Threatened with potential loss of its second-strike capability, an adversary would be pressured into a preemptive first strike or into expanding its arsenal, both undesirable outcomes,” the report said.

The War on the Rocks blog has spread widely among people nuclear weapons experts, some of whom think it’s a dangerous idea. The Bulletin of Atomic Scientists covered the idea earlier. “Its, uh, quite the article,” Peter W. Singer, a Senior Fellow at the New America Foundation, said of the War on the Rocks blog in an email. Singer admitted Lowther and McGiffin proposed some good ideas, such as increasing investment in reconnaissance. “Then some ideas cross into bad science fictionland.”

Singer says the use of artificial intelligence in America's nuclear command and control systems set off alarm bells, but it wasn't the worst thing the pair suggested. "For me the stand out was proposing a change in 'first-strike policy that allowed the president to launch a nuclear attack based on strategic warning,'" Singer said. "We have a President who just anger-tweeted Grace from Will & Grace and pondered nuking hurricanes and you're proposing that we should LOWER the threshold for the use of nuclear weapons? Read the room." The post-Cold War detente and slow draw down of the world's nuclear arsenal is over. Russia is working on new nuclear weapons it claims will give it an edge in a nuclear war. But none of those weapons have been deployed.

The history of nuclear weapons is a history of paranoia, accidents, and human intervention preventing a global disaster. Before the development of intercontinental ballistic missiles, the US kept a fleet of nuclear bombers flying in the skies across the world 24 hours a day. The strategy resulted in several crashes and lost nuclear bombs, including the contamination of Greenland in 1968.

In Britain, which has nuclear weapon-equipped submarines, Submarine captains rely on a letter of last resort to instruct them in the event of a nuclear war that destroys London. Every new Prime Minister must personally write a letter instructing the captain of how to proceed should the United Kingdom be destroyed by nuclear fire and the submarine left at sea. Every PM has to decide—if I'm dead, should the nukes fly or not?

Artificial intelligence won't solve these problems, and it might make them worse. In 1983, Soviet Lieutenant Colonel Stanislav Petrov prevented a nuclear war. He was monitoring the USSR's radar and noted saw what appeared to be American missiles headed for his country. Instead of

readying the USSR for war, he waited, assuming it to be a technical glitch. He was right, and he prevented a disaster. There's no way to know what happens if we cede control of these systems to an artificial intelligence, but we do know the likelihood of a person like Petrov stepping in to stop the madness plummets.

Source: <http://www.vice.com>, 03 September 2019.

**OPINION – John Quiggin**

**Nuclear Power should be Allowed in Australia – but Only with a Carbon Price**

Looking at the state of policy on energy and climate change in Australia, it's tempting to give in to despair. At the national level, following the abandonment of the National Energy Guarantee last year, we have no coherent energy policy and no serious policy to address climate change.

In this context, the announcement of two separate inquiries into the feasibility of nuclear power (by the New South Wales

and federal parliaments) could reasonably give rise to cynicism. The only possible case for considering nuclear power, in my view, is that it might provide a way to decarbonise our electricity supply industry. Yet many of the keenest boosters of nuclear power have consistently opposed any serious measure to address climate change, and quite a few have rejected mainstream science altogether.

Yet in a situation which all responsible people view as a climate emergency, we can't afford the luxury of despair. For this reason, rather than dismissing these inquiries as political stunts, I made a submission to the federal inquiry setting out the conditions required to allow for any possibility of nuclear power in Australia.

The submission was picked up by the national media, which largely focused on my proposal to

**In Britain, which has nuclear weapon-equipped submarines, Submarine captains rely on a letter of last resort to instruct them in the event of a nuclear war that destroys London. Every new Prime Minister must personally write a letter instructing the captain of how to proceed should the United Kingdom be destroyed by nuclear fire and the submarine left at sea.**

lift the state ban on nuclear power and implement a carbon price. The reception from commentators on the right, who want the ban lifted, and from renewables advocates, who want a price on carbon, suggests a middle ground on nuclear power may be achievable.

**The Three Big Problems with Nuclear Power:**

Three fundamental problems arise immediately when considering the prospect of nuclear power in Australia. First, the technology is expensive: more expensive than new fossil-fuelled power stations, and far too expensive to compete with existing fossil fuel generators under current market conditions.

Second, given the time lags involved, any substantial contribution from nuclear power in Australia won't be available until well beyond 2030.

Third, given the strong public opposition to nuclear power, particularly from the environmental movement, any attempt to promote nuclear power at the expense of renewables would never get broad support. In these circumstances, any investor in nuclear power would face the prospect of losing their money the moment the balance of political power shifted.

On the first point, we have some evidence from the contract agreed by the UK government in for the construction of the Hinkley C nuclear power plant. This was the first new nuclear construction project to be approved in an OECD country for a number of years. The agreement to construct Hinkley was based on a guaranteed "strike price" of £92.50/ MWh, in 2012 prices, to be adjusted in line with the consumer price index during the construction period and over the subsequent 35-year tariff period. At current exchange rates, this price corresponds to approximately A\$165.

Prices in Australia's National Electricity Market have generally averaged around A\$90/MWh. This implies that, if new nuclear power is to compete with existing fossil fuel generators, a carbon price must impose a cost of A\$75/MWh on fossil fuel generation. Assuming emission rates of 1.3 tonnes/MWh for brown coal, 1 tonne/MWh for black and 0.5 tonnes for gas, the implied carbon price ranges from A\$50/tonne (to displace brown coal) to \$150/tonne (to displace gas). On the basis that nuclear power is most plausible as a competitor for baseload generation from brown coal, I considered a price of A\$50/tonne.

**If new nuclear power is to compete with existing fossil fuel generators, a carbon price must impose a cost of A\$75/MWh on fossil fuel generation. Assuming emission rates of 1.3 tonnes/MWh for brown coal, 1 tonne/MWh for black and 0.5 tonnes for gas, the implied carbon price ranges from A\$50/tonne (to displace brown coal) to \$150/tonne (to displace gas). On the basis that nuclear power is most plausible as a competitor for baseload generation from brown coal, I considered a price of A\$50/tonne.**

**A Blueprint for Reform:** The central recommendations of my submission were as follows:

**Recommendation 1:** A carbon price of A\$25/tonne should be introduced immediately, and increased at a real rate of 5% a year, reaching A\$50/tonne by 2035.

**Recommendation 2:** The government should

immediately adopt the recommendations of its own Climate Change Authority for a 40% to 60% reduction in emissions by 2030, relative to 2000 levels, and match other leading OECD countries in committing to complete decarbonisation of the economy by 2050.

**Recommendation 3:** The parliament should pass a motion:

- affirming its confidence in mainstream climate science and its acceptance of the key conclusions of the United Nations' Intergovernmental Panel on Climate Change;
- legislating a commitment to emissions reductions;
- removing the existing ban on nuclear power.

**Let's All Meet in the Middle:** Rather to my

surprise, this proposal received a favourable reception from a number of centre-right commentators. Reaction from renewables proponents, on social media at least, was cautious. But it did not indicate the reflexive hostility that might be expected, given the polarised nature of the debate.

There are immediate political implications of my proposal at both the state and federal level. It will be more difficult for the Coalition-dominated committees running the two inquiries to bring down a report favourable to nuclear power without addressing the necessary conditions – including a carbon price. If the government's hostility to carbon pricing is such that a serious proposal for nuclear power cannot be considered, it will at least be clear that this option can be abandoned for good.

In the admittedly unlikely event that the Coalition government shows itself open to new thinking, the focus turns to Labor and the Greens. Given the urgency of addressing climate change – a task that is best addressed through a carbon price – it makes no sense to reject action now on the basis that it opens up the possibility of nuclear power sometime in the 2030s. And, if renewables and storage perform as well as most environmentalists expect, nuclear power will be unable to compete even then.

Political hardheads will doubtless say that this is all impossible, and they may be right. But in a world where Donald Trump can win a US presidential election, and major investment banks support UK Labour leader Jeremy Corbyn over Prime Minister Boris Johnson, "impossible" is a big claim. In the absence of any prospect of progress on either energy or climate,

the grand bargain I've proposed is at least worth a try.

Source: <http://theconversation.com>, 13 September 2019.

**OPINION – Kyle Mizokami**

**Israel: A 'Secret' Nuclear Weapons State?**

In a private email leaked to the public in September of 2016, former secretary of state and retired U.S. Army general Colin Powell alluded to Israel having an arsenal of "200 nuclear weapons." While this number appears to be an exaggeration, there is no doubt that Israel does have a small but powerful nuclear stockpile, spread out among its armed forces. Israeli nuclear weapons guard against everything from defeat in conventional warfare to serving to deter hostile states from launching nuclear, chemical and biological warfare attacks against the tiny country. Regardless, the goal is the same: to prevent the destruction of the Jewish state.

Israel set off to join the nuclear club in the 1950s. David Ben-Gurion was reportedly obsessed with developing the bomb as insurance against Israel's enemies. Although an ambitious goal for such a small, initially impoverished country, Israel did not have any security guarantees with larger, more powerful states—particularly the United States. The country was on its own, even buying conventional weapons off the black market to arm the new Israeli Defense Forces. Nuclear weapons would be the ultimate form of insurance for a people that had suffered persecution but now had the means to control their own destiny.

**Given the urgency of addressing climate change – a task that is best addressed through a carbon price – it makes no sense to reject action now on the basis that it opens up the possibility of nuclear power sometime in the 2030s. And, if renewables and storage perform as well as most environmentalists expect, nuclear power will be unable to compete even then.**

**Israel set off to join the nuclear club in the 1950s. David Ben-Gurion was reportedly obsessed with developing the bomb as insurance against Israel's enemies. Although an ambitious goal for such a small, initially impoverished country, Israel did not have any security guarantees with larger, more powerful states—particularly the United States.**

Ben-Gurion instructed his science adviser, Ernst David Bergmann, to direct Israel's clandestine nuclear effort and set up and chair the Israel Atomic Energy Commission. Shimon Peres, who later went on to serve as president and prime minister of Israel, cultivated contacts with a sympathetic France that resulted in the latter agreeing to supply a large, heavy water nuclear reactor and an underground plutonium reprocessing plant, which would turn spent reactor fuel into the key ingredient for nuclear weapons. The reactor was built at Dimona in the Negev desert.

By the late 1960s the United States assessed Israeli nukes as "probable," and U.S. efforts to slow the nuclear program and get Israel to join the Nuclear Nonproliferation Treaty went nowhere. Finally in September 1969, Nixon and Israeli Prime Minister Golda Meir reportedly reached a secret agreement that the United States would cease its demand for inspections and Israeli compliance with antiproliferation efforts, and in return Israel would not declare or test its nuclear weapons.

Israel didn't have long to wait for its first nuclear crisis. The 1973 Yom Kippur War saw Arab armies achieve strategic surprise, sending Israeli ground forces reeling in both in the Sinai desert and the Golan Heights. Israeli nuclear weapons were placed on alert and loaded onto Jericho I surface-to-surface missiles and F-4 Phantoms. Determined Israeli counteroffensives were able to turn the situation on both fronts around, and the weapons were not ultimately used.

Not much is known about early Israeli weapons, particularly their yield and the size of the stockpile. The strategic situation, in which Israel was outnumbered in conventional weapons but had no nuclear adversaries, meant Israel likely had smaller tactical nuclear weapons to destroy masses of attacking Arab tanks, military bases and military airfields. Still, the relatively short ranges between Israel and its neighbors meant that the Jericho missile, with only a three-hundred-mile range, could still hit Cairo and Damascus from the Negev desert.

**The strategic situation, in which Israel was outnumbered in conventional weapons but had no nuclear adversaries, meant Israel likely had smaller tactical nuclear weapons to destroy masses of attacking Arab tanks, military bases and military airfields. Still, the relatively short ranges between Israel and its neighbors meant that the Jericho missile, with only a three-hundred-mile range, could still hit Cairo and Damascus from the Negev desert.**

Israel does not confirm nor deny having nuclear weapons. Experts generally assess the country as currently having approximately eighty nuclear weapons, fewer than countries such as France, China and the United Kingdom, but still a sizeable number considering its adversaries have none. These weapons are spread out among Israel's version of a nuclear "triad" of land-, air- and sea-based forces scattered in a way that they deter surprise nuclear attack.

**Israel's first nuclear weapons were likely gravity bombs delivered by fighter aircraft. The F-4 Phantom is thought to be the first delivery system; as a large, twin-engine robust fighter, the Phantom was probably the first aircraft in the Israeli Air Force capable of carrying a first generation nuclear device. A new, smaller generation of nuclear gravity bombs likely equips F-15I and F-16I fighters.**

Israel's first nuclear weapons were likely gravity bombs delivered by fighter aircraft. The F-4 Phantom is thought to be the first delivery system; as a large, twin-engine robust fighter, the Phantom was probably the first aircraft in the Israeli Air Force capable of carrying a first generation nuclear device. A new, smaller generation of nuclear gravity bombs likely equips F-15I and F-16I fighters. While some might argue a gravity bomb is obsolete in light of Israeli advances in missile technology, a manned aircraft allows a nuclear strike to be recalled right up to the last minute.

Israel's first land-based nuclear weapons were based on Jericho I missiles developed in cooperation with France. Jericho I is believed to have been retired, replaced by Jericho II and -III ballistic missiles. Jericho II has a range of 932 miles, while Jericho III, designed to hold Iran and other distant states at risk, has a range of at least 3,106 miles. The total number of Israeli ballistic missiles is unknown, but estimated by experts to number at least two dozen.

Like other nuclear-armed nations, the Israeli Navy has reportedly deployed nukes to what is generally agreed to as the most survivable seagoing platform: submarines. Israel has five German-built Dolphin-class submarines, which experts believe are equipped with nuclear-tipped cruise missiles. The cruise missiles are reportedly based off the Popeye air-to-ground missile or the Gabriel antiship missile. This ensures a so-called "second-strike capability"—as long as one submarine is on patrol, some portion of Israel's nuclear deterrent remains invulnerable to a nuclear first strike, guaranteeing the ability to launch a nuclear counterattack.

The establishment of a nuclear triad demonstrates how seriously Israel takes the idea of nuclear deterrence. The country will likely not declare itself a nuclear power any time soon; ambiguity over ownership of nukes has served the country very well. The 2015 Joint Comprehensive Plan of Action and general instability across the Middle East has ensured that Israel will likely remain the only nuclear-armed state in the region for the foreseeable future, but a collapse of the agreement or some new nuclear program could easily change that. In the meantime, Israel's ultimate insurance policy isn't going anywhere.

Source: <https://nationalinterest.org>, 12 September 2019.

## NUCLEAR STRATEGY

### RUSSIA

#### Russian Nuclear Missile with 'Unlimited' Range to be Ready by 2025

Despite a slew of unsuccessful tests, Russia's nuclear-powered missile with so-called unlimited range will be ready for war within the next six years, a slightly accelerated timeline than previously reported, according to a U.S. intelligence assessment.

The revelation of the new, more ambitious timeline for the missile comes even though the Kremlin has yet to secure a successful test over multiple attempts, according to sources with knowledge of a U.S. intelligence report. It also comes on the heels of a mysterious explosion off Russia's northern coast that killed five scientists and sparked fears Moscow had tested the missile in question, called Burevestnik. A U.S. intelligence assessment found that the Aug. 8 explosion occurred during a recovery mission to salvage a lost Burevestnik from the ocean floor.

Last March, Russian President Vladimir Putin unveiled several hypersonic weapons, as well as Burevestnik. Putin said it was nuclear powered and had unlimited range. Burevestnik, also known as Skyfall, has been tested once earlier this year and prior to that, the weapon was tested four times between November 2017 and February 2018, each resulting in a crash.

The U.S. determined that the longest test flight lasted just more than two minutes, with the missile flying 22 miles before losing control and crashing. The shortest test lasted four seconds and flew for five miles. The tests apparently showed that the nuclear-powered heart of the cruise missile failed to initiate and, therefore, the weapon was

**The tests apparently showed that the nuclear-powered heart of the cruise missile failed to initiate and, therefore, the weapon was unable to achieve the indefinite flight Putin bragged about. Putin had claimed that the "invincible" weapon had a proven capability. However, CNBC reported in March that the Kremlin will only produce a few of these weapons because the program has yet to complete a successful test and is too expensive to develop.**

unable to achieve the indefinite flight Putin bragged about. Putin had claimed that the “invincible” weapon had a proven capability. However, CNBC reported in March that the Kremlin will only produce a few of these weapons because the program has yet to complete a successful test and is too expensive to develop.

Source: Amanda Macias, <https://www.cnn.com>, 11 September 2019.

## **BALLISTIC MISSILE DEFENCE**

### **INDIA**

#### **India will Receive S-400 Air Defence Missile Systems in 18-19 Months**

India will receive five S-400 air defence missile systems “in strict accordance” with the schedule, Russian deputy prime minister Yuri Borisov said. India had signed a \$5.43-billion deal to buy five S-400s, Russia’s most advanced long-range surface-to-air missile defence system, in October 2018 despite the risk of US sanctions under CAATSA. CAATSA impacts, among other things, making payments in US dollars.

According to the state-run Tass news service report, the Russian Federal Service for Military-Technical Cooperation said in June 2019 that the delivery of the S-400 to India is planned to start after 2020 and “issues with payment have been resolved. “The advance payment has been received and everything will be delivered in strict accordance with the schedule, within about 18-19 months” Borisov said, according to state-owned broadcaster Rossiya-1.

Senior Trump administration officials had

**The Russian Federal Service for Military-Technical Cooperation said in June 2019 that the delivery of the S-400 to India is planned to start after 2020 and “issues with payment have been resolved. “The advance payment has been received and everything will be delivered in strict accordance with the schedule, within about 18-19 months.**

cautioned India that the S-400 deal could attract sanctions under CAATSA law that restricts defence purchases from Russia, Iran and North Korea. A Chinese military agency was sanctioned under CAATSA in 2018 for buying S-400s and Turkey, a NATO ally, has been told it will be denied F-35s, the most advanced

fighter jets in the armoury of the military alliance, if it went ahead with its S-400 purchases.

India has said in the past that it meets the criteria for a waiver from US sanctions on the deal with Russia for the S-400 system and New Delhi cannot “wish away” its long-standing defence relations with Moscow. It has also told the US that it does not intend to give up the deal for the purchase of Russian-made systems. In June, external affairs minister S Jaishankar told his American counterpart Mike Pompeo in New Delhi that India will go by its national interest while dealing with

other countries, including with sanctions-hit Russia from whom New Delhi is procuring the S-400 missile defence systems.

The S-400 missile system is capable of engaging targets independently as well as after receiving data from other radars. It is ground-based and it can detect, track and shoot

down multiple targets including cruise missiles, ballistic missiles, aircraft, drones, UAVs. It can target ballistic missiles in their terminal (descent or reentry) phase. The entire system consists of a multifunction radar, autonomous detection and targeting systems, anti-aircraft missile systems, launchers, command and control centre.

Source: <http://www.hindustantimes.com>, 09 September 2019.

**The S-400 missile system is capable of engaging targets independently as well as after receiving data from other radars. It is ground-based and it can detect, track and shoot down multiple targets including cruise missiles, ballistic missiles, aircraft, drones, UAVs. It can target ballistic missiles in their terminal (descent or reentry) phase.**

**NUCLEAR ENERGY**

**GENERAL**

**IAEA Releases New Projections for Nuclear Power Through 2050**

The IAEA has released its latest projections for energy, electricity and nuclear power trends through 2050. The annual report offers a mixed estimate of nuclear power's future contribution to global electricity generation, depending in part on whether significant new capacity can be added to offset potential reactor retirements.

The 39th edition of Energy, Electricity and Nuclear Power Estimates for the Period up to 2050 provides detailed global trends in nuclear power by region. Its projections for nuclear electrical generating capacity are presented as low and high estimates, reflecting different driving factors that have an impact on the worldwide deployment of this low carbon energy source.

The new projections to 2030 see generating capacity declining by some 8% in the low case and increasing by 25% in the high estimate. By 2050, it's seen falling by 6% in the low scenario and rising by 80% in the high case. Compared with last year, the new estimates to 2050 are down by 33 GW(e) in the high case and up by 15 GW(e) in the low case.

The 2019 projections contain fewer uncertainties compared with previous years due to recent announcements on the future of the existing fleet in some regions and long term plans for expansion. Significant new capacity may be needed to offset possible reactor retirements due to age, competitiveness or other factors. "Global

electricity demand is expected to rise sharply in coming years as countries need more power for development," said IAEA Deputy Director General Mikhail Chudakov, Head of the Department of Nuclear Energy. "Without a significant increase in the deployment of nuclear power, it will be difficult for the world to secure sufficient energy to achieve sustainable development and to mitigate climate change."

In 2018, nuclear power produced about 10% of the world's electricity,

accounting for around one third of all low carbon electricity. As of today, the world's 450 operating nuclear power reactors have a near record level of 399.7 GW(e) total net installed capacity. In some regions, over the short term the low price of natural gas and the impact of subsidized renewable energy sources are expected to continue to affect nuclear power's growth prospects. Still, interest in nuclear power remains strong in several regions, particularly in the developing world, and commitments agreed under the Paris Agreement and other initiatives have the potential to support its development.

**The new projections to 2030 see generating capacity declining by some 8% in the low case and increasing by 25% in the high estimate. By 2050, it's seen falling by 6% in the low scenario and rising by 80% in the high case. Compared with last year, the new estimates to 2050 are down by 33 GW(e) in the high case and up by 15 GW(e) in the low case.**

**In 2018, nuclear power produced about 10% of the world's electricity, accounting for around one third of all low carbon electricity. As of today, the world's 450 operating nuclear power reactors have a near record level of 399.7 GW(e) total net installed capacity.**

Source: <https://www.iaea.org>, 10 September 2019.

**INDIA**

**Kaiga Nuclear Power Plant Expansion Gets Green Nod**

The Ministry of Environment, Forests and Climate Change (MoEF) has given its approval for setting up fifth and sixth units at Kaiga nuclear power station near here, despite the stiff opposition by the locals and the environmentalists. In a public hearing meeting, December last, the villagers and the environmentalists had severely opposed the expansion plans.

NPCIL Director BC Pathak had sent a proposal to the Centre for expansion of Kaiga nuclear plant. The Economic Advisory Council (EAC), in its May 24 meeting, approved the expansion plan albeit with 17 specific and 19 general conditions. Additional Director of MoEF Dr Shruthi Rai Bharadwaj has written to the NPCIL director, on Sept 5, informing about the clearance issued to the expansion plan.

The letter states: Most of the villagers are in favour of expansion as they believe that new units will generate more employment and augment local infrastructure while a few have expressed fear that expansion would increase pollution and thereby decrease agriculture productivity. The Economic Advisory Council has taken note of these issues. Over 8,700 trees on 120 hectares will face the axe for the project. In order to compensate tree loss, the competent authorities should develop 732 hectares of forests in Mandya and Chamarajanagar districts, the council had informed the NPCIL. Also, as per one of the conditions laid down by the EAC, half of the power generated by the new units should be supplied to Karnataka.

**Centre Suspected of Tweaking KSPCB Report:** Meanwhile, environmentalist Anant Hegde Ashisara has charged that the Ministry of Environment, Forests and Climate Change has not considered the public opinion while giving its clearance for the Kaiga expansion plans. "In the public meeting held on Dec 15, 2018, the locals and the environmentalists had severely opposed the proposed expansion of Kaiga nuclear plant. The issue of tree felling did not come up in the meeting. Also, there are doubts about the Centre tweaking the report submitted by the Karnataka State Pollution Control Board (KSPCB) on the said project," alleged Hegde Ashisara of Vrikshalaksha Andolan.

Source: <http://www.deccanherald.com>, 07 September 2019.

## URANIUM PRODUCTION

### SAUDI ARABIA

#### Saudi Arabia Wants to Enrich Uranium for Nuclear Power

Saudi Arabia wants to have uranium production and enrichment in future for its planned nuclear power programme that will begin with two atomic reactors, the kingdom's new energy minister said.

"We are proceeding with it cautiously ... we are experimenting with two nuclear reactors," Prince Abdulaziz bin Salman said at a conference in Abu Dhabi. Saudi Arabia has said it wants to tap nuclear technology for peaceful uses. But enrichment of uranium is a sensitive step in the nuclear fuel cycle because it can open up the possibility of military uses of the material, the issue at the heart of Western and regional concerns over Iran's atomic work.

**Most of the villagers are in favour of expansion as they believe that new units will generate more employment and augment local infrastructure while a few have expressed fear that expansion would increase pollution and thereby decrease agriculture productivity. The Economic Advisory Council has taken note of these issues. Over 8,700 trees on 120 hectares will face the axe for the project. In order to compensate tree loss, the competent authorities should develop 732 hectares of forests in Mandya and Chamarajanagar districts.**

**Reducing Oil Output:** The minister reportedly endorsed curbing oil output to address an oversupply, as major producing nations prepare to deliberate fresh cuts. In his first comments since being appointed by his father King Salman, the minister signalled no major change in approach in Saudi Arabia, the de facto leader of OPEC which pumps about a third of the cartel's oil. "The pillars of our oil policy are pre-determined and will not change," he said according to Saudi broadcaster Al Arabiya.

The prince is in Abu Dhabi to attend the World Energy Congress, followed by a meeting of the OPEC+ alliance's Joint Ministerial Monitoring Committee (or JMMC), which monitors a supply cut deal reached in 2018. The ministers will consider fresh cuts, even though analysts are

doubtful such a move would succeed in bolstering crude prices which have been badly dented by the US-China trade war. However, Prince Abdulaziz appeared to swing his support behind further output reductions to rebalance the crude market. "Cutting output will benefit all members of OPEC," he reportedly said.

Source: <http://www.trtworld.com>, 10 September 2019.

**NUCLEAR COOPERATION**

**IRAN-EU**

**Iran's Nuclear Chief: EU has Failed to Fulfil 2015 Deal Commitments**

Iran's nuclear chief said the European parties to the 2015 nuclear deal have failed to fulfil their commitments under the pact, a day after Tehran announced further breaches of limits on its nuclear activity set by the accord. The deal curbed Iran's disputed nuclear programme in exchange for relief from sanctions, but has unravelled since the US withdrew last year and acted to strangle Iran's oil exports to push it into a broader security agreement. France, Germany and Britain have tried to launch a barter trade mechanism with Iran protecting it from US sanctions but have struggled to get it off the ground, and Tehran set a 60-day deadline for effective European action.

"Unfortunately the European parties have failed to fulfil their commitments .... The deal is not a one-way street and Iran will act accordingly as we have done so far by gradually downgrading our commitments," said Ali Akbar Salehi, director of Iran's nuclear energy agency. "Iran will continue to reduce its nuclear commitments as long as the other parties fail to carry out their commitments," Salehi said, speaking after meeting the acting head of the IAEA, Cornel Feruta, in Tehran.

Feruta, whose inspectors monitor Tehran's nuclear

programme, also met Iranian Foreign Minister Mohammad Javad Zarif who told him that Iran's breaches were permitted under Paragraph 36 of the nuclear accord, the semi-official Fars news agency reported. Paragraph 36 of the nuclear pact spells out the dispute resolution mechanism. "Zarif underscored the need for IAEA to respect professional principles, maintain confidentiality, and carry out its duties impartially", the official Iranian news agency IRNA reported.

**Reversible Steps:** Iranian officials say the paragraph allows one party to the deal to cut its commitments if others do not live up to theirs. Iran says its retreat from terms of the deal is reversible if European signatories manage to restore its access to foreign trade promised under the nuclear deal but blocked by the reimposition of US sanctions.

**The deal curbed Iran's disputed nuclear programme in exchange for relief from sanctions, but has unravelled since the US withdrew last year and acted to strangle Iran's oil exports to push it into a broader security agreement. France, Germany and Britain have tried to launch a barter trade mechanism with Iran protecting it from US sanctions but have struggled to get it off the ground, and Tehran set a 60-day deadline for effective European action.**

Feruta stressed that the IAEA's safeguards activities are conducted in an impartial, independent and objective manner, and in accordance with standard safeguards practices, according to a press release on the IAEA website. The IAEA's 35-nation Board of Governors will discuss Iran at a quarterly meeting.

Since May, Iran has begun to breach caps on its nuclear capacity set by the deal in retaliation for US pressure on Iran to negotiate restrictions on its ballistic missile programme and support for proxy forces around the Middle East. "The actions they have taken are negative but not definitive. They can come back (to full compliance) and the path of dialogue is still open," French Foreign Minister Jean-Yves le Drian said. Upping the ante in its stand-off with Washington, Tehran said it was now capable of raising uranium enrichment past the 20% level of fissile purity and had launched advanced centrifuge machines in further breaches of the deal.

IAEA inspectors reported in July that Iran had cranked up enrichment to 4.5% purity, above the 3.7% cap suitable for civilian energy generation set by the 2015 accord. Under the deal, Iran is allowed limited research and development on advanced centrifuges, which accelerate the production of fissile material that could, if enriched to the 90% threshold, be used to develop a nuclear bomb.

Source: <http://www.af.reuters.com>, 08 September 2019.

## USA–SAUDI ARABIA

### US Energy Head to Discuss Nuclear Power with Saudis

US Energy Secretary Rick Perry said he will meet the new Saudi energy minister and likely discuss plans Saudi Arabia has to build nuclear reactors. Perry did not say where he would meet Energy Minister Prince Abdulaziz bin Salman, who took over from Khalid al-Falih. But a US official said the meeting would likely take place on the sidelines of an IAEA meeting in Vienna.

The kingdom has so far resisted agreeing to standards that would block its ability to enrich uranium and reprocessing of plutonium, possible pathways to making an atomic weapon. Prince Abdulaziz said the kingdom wanted to enrich uranium for its nuclear power programme, potentially complicating talks with the Trump administration on the atomic pact and the role of US companies. Perry told reporters at department headquarters the kingdom must agree to so-called “123” nonproliferation standards before coming to any agreement. ...

Source: <https://www.aljazeera.com/>, 13 September 2019.

## NUCLEAR NON-PROLIFERATION

### CHINA–USA

#### China Unfazed by US Blacklisting its Nuclear Firms

The US made the controversial decision to blacklist one of China’s most significant state-owned nuclear power companies. According to an announcement on the US Federal Register, China General Nuclear Power Group (CGN) and three of

its subsidiaries were placed on the US Department of Commerce’s “entity list”, meaning that CGN will no longer be able to obtain technology, parts or materials from the US, unless they are able to secure a (very rarely-granted) license to do so.

This move comes in response to accusations that Chinese nuclear power companies including CGN have been stealing US technology and misappropriating it for military use. CGN is a considerable force in the Chinese nuclear industry, with nine running nuclear power plants with 28 reactors mostly centered around the Guangdong province, making the blacklisting of the company a real blow to the Chinese energy sector. According to reporting by the *Asia Times*, a US Commerce Department probe “concluded that the advanced US technology and components for civilian use transferred to the Shenzhen-based nuclear energy juggernaut had fallen into the clutches of the People’s Liberation Army.”

While the particulars of the Commerce Department probe have not been made public, it has been reported that the issue likely centers around Small Modular Reactors technology. The compact reactors, built by

**IAEA inspectors reported in July that Iran had cranked up enrichment to 4.5% purity, above the 3.7% cap suitable for civilian energy generation set by the 2015 accord. Under the deal, Iran is allowed limited research and development on advanced centrifuges, which accelerate the production of fissile material that could, if enriched to the 90% threshold, be used to develop a nuclear bomb.**

**This move comes in response to accusations that Chinese nuclear power companies including CGN have been stealing US technology and misappropriating it for military use. CGN is a considerable force in the Chinese nuclear industry, with nine running nuclear power plants with 28 reactors mostly centered around the Guangdong province, making the blacklisting of the company a real blow to the Chinese energy sector.**

Pennsylvania's Westinghouse Electric Company, "could be instrumental to CGN's partnership with shipbuilding SOEs to trial what is called 'floating nuclear reactors' to drift in the South China Sea to light up reclaimed islands and power military installations there" *The Asia Times* goes on to say that "rumors are also rife as to how China can leverage its experience and talent pool of civilian nuclear technology to design and construct its first shipborne reactor to propel the future super-carriers of the Chinese Navy.

Blacklisting Chinese tech and energy giants through the Department of Commerce has become one of the latest weapons used by US President Donald Trump in his yearlong trade war with China's Xi Jinping. The US used the same tactic with the massive Chinese telecommunications company Huawei in May, angering Beijing and thereby escalating the trade war. Now, reports the *Financial Times*, "the Trump administration has heightened efforts to block the export of US technologies to Chinese companies on national security grounds, angering Beijing that has decried the measures and accused Washington of unfair practices."

*The Financial Times* article goes on to point out that this most recent blacklisting of CGN is not the first we're hearing of the US' suspicions that China is stealing their technologies for military use. "After a policy review, the US energy department in October 2018 placed new curbs on exports to China to prevent the 'illegal diversion of US civil nuclear technology for military' use," says the *Times*. "There would be a 'presumption of denial' for new licences and extensions to sell to CGN, the department said at the time, due to a 2016 indictment against the

company for conspiring to steal US nuclear technology."

**Blacklisting Chinese tech and energy giants through the Department of Commerce has become one of the latest weapons used by US President Donald Trump in his yearlong trade war with China's Xi Jinping. The US used the same tactic with the massive Chinese telecommunications company Huawei in May, angering Beijing and thereby escalating the trade war.**

While the blacklisting of CGN did not come out of left field, however, it has caused considerable outcry in China, where the nuclear industry has pledged to keep moving forward despite what they see as an unfair attack on the sector, while warning that in the end US companies will be harmed as well. As paraphrased by

the South China Morning Post, the top official at China's National Nuclear Safety Administration Liu Hua "condemned the US blacklisting of Chinese nuclear firms," but implied that ultimately China will come out on top, intimating that "US multilateralism and protectionism behind the move would harm the interests of companies in both countries, but could strengthen Chinese firms' research and development and improve their creativity."

China has also been sure to point out that they are not reliant solely on the US when it comes to trade and energy tech, asserting that they have plenty of other friends in high places. *The South China Morning Post* goes on to say that Liu "also pointed out that the market for nuclear cooperation was wide, and that other countries, besides the US, were already involved in China's nuclear industry" and that "France and Russia

**Liu "also pointed out that the market for nuclear cooperation was wide, and that other countries, besides the US, were already involved in China's nuclear industry" and that "France and Russia were among China's nuclear cooperation partners and cooperative projects, including nuclear power facilities and reprocessing plants, were making progress.**

were among China's nuclear cooperation partners and cooperative projects, including nuclear power facilities and reprocessing plants, were making progress." To date, Beijing has denied all accusations of misappropriating nuclear energy tech for military purposes.

Source: <http://www.oilprice.com>, 07 September 2019.

NUCLEAR PROLIFERATION

IRAN

**Iran Threatens Expanded Nuclear Activities, but Europe Continues to Resist US Strategy**

Iranian officials issued fresh warnings about their plans to expand upon recent violations of the nuclear deal that was negotiated with six world powers in 2015. The relevant statements come in the midst of escalating tensions between Iran and the US, which have created uncertain divisions among international community, with some countries struggling to maintain friendly relations with both sides while also maintaining pressure for change from one or the other.

US President Donald Trump withdrew in 2018 from the agreement that had been spearheaded by his predecessor Barack Obama. But since then, the White House has been seeking to compel the Islamic Republic to renegotiate terms that were deemed inadequate by serious critics of the theocratic regime.

Toward that end, the Trump administration has maintained that its own withdrawal from the agreement did not give Iran license to abandon its own commitments. But Tehran has taken the position that in absence of American participation, the remaining signatories must do more to counteract the effects of US sanctions and improve Iran's economic prospects. In order to pressure them toward making such concessions, Iran began to reduce its commitments under the Joint Comprehensive Plan of Action in July, and the regime has repeatedly threatened to continue doing so if there are no new guarantees concerning its own interests.

The UN' agency in charge of monitoring JCPOA compliance, the IAEA, confirmed that Tehran was still in violation. The latest report showed that Iranian stockpiles of low-enriched uranium continued to grow and that the nation was still

enriching that material to a level slightly above the 3.67 percent allowed under the agreement. No new violations were recorded, but previous reports indicated that the Islamic Republic had installed up to 33 new enrichment centrifuges, potentially putting it on course to dramatically increase enrichment levels and stockpile quantities in the near future.

This is in keeping with various threats that Iranian officials have issued since before they formally began violating the deal. Figures such as the head of the Atomic Energy Organization of Iran have typically insisted that they can exceed pre-JCPOA enrichment levels in as little as three days. But

for those who were already critical of the 2015 nuclear deal, such commentary raises additional questions about its real effect on Iran's "breakout time" for a nuclear weapon.

But the latest indications from Europe is that those questions are not widely shared among persons who are in a position to assist

the Trump administration in exerting pressure on Iran for expanded restrictions on its nuclear program or on other aspects of the regime's malign or destabilizing behavior. On one hand, the European Union's foreign policy chief, Federica Mogherini, indicated on that she would welcome expanded terms under the JCPOA. But on the other hand, she also made it clear that the focus of European policy remained the preservation of the existing deal, with or without supplemental provisions.

Other European officials such as German Foreign Minister Heiko Maas joined Mogherini in welcoming the prospect of direct talks between Iran and the US while reaffirming their commitment to the JCPOA as it currently exists. At a meeting in Helsinki, other European foreign and defense ministers took the opportunity to outline their perspectives on broader tensions surrounding the Islamic Republic, whose

**The UN' agency in charge of monitoring JCPOA compliance, the IAEA, confirmed that Tehran was still in violation. The latest report showed that Iranian stockpiles of low-enriched uranium continued to grow and that the nation was still enriching that material to a level slightly above the 3.67 percent allowed under the agreement.**

paramilitary Revolutionary Guard Corps is still holding a British-flagged commercial vessel, after having previously shot down a US drone and staged or sponsored attacks on at least six tankers in the Gulf of Oman.

The French position in the midst of these tensions was underscored in August by President Emmanuel Macron's decision to invite Iran's Foreign Minister Javad Zarif to Biarritz, where Macron was hosting the latest summit of leaders from G-7 nations. That invitation was preceded, days earlier, a direct meeting between Macron and Zarif as the latter visited Paris after leaving a tour of Scandinavia. The Foreign Minister's entire tour was met with protest by Iranian expatriate communities, especially those affiliated with the National Council of Resistance of Iran.

These protests placed little emphasis on the nuclear dispute, and instead the French-headquartered NCRI sought to bring renewed attention to Zarif's tendency to deny Iranian human rights violations and terrorist activities. An international rally organized outside Paris by the NCRI was the target of a thwarted Iranian bomb plot in June 2018, but the French newspaper Le Monde reported in late July that Macron had ordered his own intelligence chiefs to avoid making noise over the incident in the run-up to diplomatic negotiations with the Iranian government.

Foreign Minister Zarif came under sanction from the US Treasury around the time of that report, with the White House explaining that his role largely resembled that of a propaganda minister working on behalf of Supreme Leader Ali Khamenei and the Revolutionary Guard. Several IRGC commanders and the supreme leader came under sanction themselves about a month earlier, whereas the measures targeting Zarif were delayed until after he had rejected a request for

direct talks with the Trump administration, thereby undermining expectations that the nuclear agreement might be restored and/or expanded.

However, this apparent rejection of diplomacy is unique to Iran's response for talks with the US. Iranian officials including President Hassan Rouhani have generally maintained that they would only entertain the prospect of such talks if the US first agreed to remove all economic pressure. But talks with the likes of President Macron have proceeded at a steady pace in the wake of his efforts to conceal last year's incidence of Iranian terrorism. It is not possible to say with certainty how closely these two facts are related, but Macron's instructions to his intelligence service have naturally aroused concerns about the potential for broader conciliation by his government.

**Iranian officials including President Hassan Rouhani have generally maintained that they would only entertain the prospect of such talks if the US first agreed to remove all economic pressure. But talks with the likes of President Macron have proceeded at a steady pace in the wake of his efforts to conceal last year's incidence of Iranian terrorism.**

These concerns were given additional fuel when it was reported that Macron and Rouhani had spoken by phone for roughly two hours, leading to a narrowing of the gap between their views on nuclear issue. Media reports were vague about the implications of this claim and whether the

change represented a French shift in the direction of the Iranian position, or vice versa. But the close proximity of this conversation to Tehran's latest threats of additional JCPOA violations may provide a clue.

In any event, it reportedly remains the case that France and the other two European signatories of the nuclear deal are working to find ways of granting Iran economic incentives without violating US sanctions. Paris is specifically said to be exploring the idea of granting Iran a 15 billion dollar line of credit for oil sales, though it seems unlikely that the US would grant approval even for this alternative to direct transactions.

The ongoing American commitment to maximum

pressure was underlined when the US government blacklisted the Adrian Darya, a ship carrying an estimated two million barrels of Iranian oil which had previously been held for six weeks at Gibraltar after being seized by British Royal Marines on suspicion of violating EU sanctions on transactions with the Assad regime in Syria. The ship, formerly known as the Grace 1, was released over American objections after its operators provided assurances that it would not sell its merchandise to Syria. But its alternative intended destination remains unknown and the ship has been unable to make landfall while being continually monitored by the US.

The British decision to release the vessel and the American effort to block it from carrying on its mission arguably reflect the different approaches being taken on either side of the Atlantic to the Iranian nuclear issue. But the Adrian Darya's blacklisting is not strictly related to that specific effort. Rather, the US has declared it "blocked property" under an "anti-terror order," in line with the Trump administration's conclusion that any proceeds from the sale of its oil would go toward financing the paramilitary activities of the IRGC. Despite the disruption of terrorist plots on European soil in 2018, the EU and its member states appear to be placing less emphasis on such paramilitary activities than on the goal of preventing Iran from stepping up its violations of the JCPOA. But the Trump administration is expected to keep up pressure for a broader approach to dealing with the Islamic Republic.

Source: <http://www.irannewsupdate.com>, 07 September 2019.

## **Iran Accuses US of Violating Nuclear Modernization Treaty**

Iran's UN ambassador is accusing the US of violating the Nuclear Nonproliferation Treaty by modernizing its nuclear weapons instead of moving toward disarmament. Ambassador Majid Takht Ravanchi cited progress in achieving a universal ban on nuclear explosions and the broader objective of nuclear disarmament but said "unfortunately, currently, there are two alarming races: new nuclear arms race and nuclear arms modernization race."

He told the UN General Assembly's commemoration of the International Day Against Nuclear Tests that "irresponsible policies" like those of the US "are detrimental to all international efforts towards nuclear disarmament and non-proliferation, and therefore must come to an end." Ravanchi stressed that voluntary moratoriums on nuclear testing "cannot substitute for a comprehensive universal and verifiable legally binding prohibition on all types of nuclear explosions, including in alternative ways." He urged redoubled effort to pursue "the noble objective of the total elimination of nuclear weapons."

Source: <http://www.dailysabah.com>, 09 September 2019.

## **NORTH KOREA**

### **US: 'Failure to Denuke N. Korea' to Prompt Asia's Nuclear Armament'**

US Special Representative for North Korea Stephen Biegun said in a lecture that if talks to

**The ongoing American commitment to maximum pressure was underlined when the US government blacklisted the Adrian Darya, a ship carrying an estimated two million barrels of Iranian oil which had previously been held for six weeks at Gibraltar after being seized by British Royal Marines on suspicion of violating EU sanctions on transactions with the Assad regime in Syria.**

**US Special Representative for North Korea Stephen Biegun said if talks to denuclearize North Korea fail, countries in Asia including South Korea and Japan will demand nuclear armament. Citing former US Secretary of State Henry Kissinger's remarks "If efforts to denuclearize North Korea fail, the world will come to face the challenge of proliferation of nuclear weapons across the entire Asia region.**

denuclearize North Korea fail, countries in Asia including South Korea and Japan will demand nuclear armament. Citing former US Secretary of State Henry Kissinger's remarks "If efforts to denuclearize North Korea fail, the world will come to face the challenge of proliferation of nuclear weapons across the entire Asia region." Biegun said that Asian allies shelved nuclear programs due to their trust in Washington's deterrence of nuclear proliferation, but if threat continues, they will begin to ask if they need to be considering their own nuclear capabilities.

The scenario of "nuclear domino" stemming from the North's nuclear armament is nothing new. As the US-North Korea negotiations stalled, the US Congress and experts have urged not only redeployment of tactical nuclear weapons on the Korean Peninsula but also sharing of nuclear weapons with South Korea and Japan. The latest remarks have been made by a senior Trump administration official and Washington's chief negotiator for North Korean denuclearization talks, whom Pyongyang has been relatively friendly with. The remarks cannot be taken lightly, since they constitute a warning that even Washington cannot insist forever on a policy to block the proliferation of nuclear weapons in the face of growing threat of Pyongyang's nuclear weapons.

Biegun's statement also reminds "the idea of South Korea and Japan's nuclear armament," which President Donald Trump mentioned during the 2016 presidential election. The Trump administration has been denying the (US') role of "global police" and is thoroughly pursuing the "realism of America first," which requires countries to take responsibility for their own regional security. Some pundits in the US already suggested "offshore balancing" strategy, in which

**The Trump administration has been denying the (US') role of "global police" and is thoroughly pursuing the "realism of America first," which requires countries to take responsibility for their own regional security. Some pundits in the US already suggested "offshore balancing" strategy, in which Washington would allow Seoul and Tokyo to seek nuclear armament.**

Washington would allow Seoul and Tokyo to seek nuclear armament as measures of checks and balance to counter China's military rise as well as the North's nuclear threat.

The idea of Asia's nuclear armament is targeted at not only North Korea but also China, which stands behind it. It is implicit pressure on China, which is extremely opposed to the domino nuclear armament in Northeast Asia, indicating that if Beijing blindly seeks to back Pyongyang, China will end up being surrounded by countries armed with nuclear weapons. Biegun even suggested a deadline, saying that significant progress should be made

within a year. The timeline is very tight for the parties to be able to conduct practical negotiations, reach agreement, and achieve practical denuclearization, and Washington cannot afford to wait further. It is time that China should take action in order to avoid a

nightmare that will become a reality sooner rather than later.

Source: <http://www.donga.com>, 09 September 2019.

## NUCLEAR DISARMAMENT

### GENERAL

#### **Bringing Nuclear Test Ban Treaty into Force Central Pillar of Global Disarmament Push: UN Chief**

UN Secretary General Antonio Guterres has said the legacy of nuclear testing is "nothing but destruction," and in a world of rising tensions, our collective security depends on bringing a global treaty into force that bans nuclear explosions. Mr. Guterres in his message for the International Day Against Nuclear Tests said, I reiterate my call for all States that have not yet done so, to sign and ratify the CTBT, especially those whose

ratification is needed for the treaty's entry into force.

The treaty, known worldwide by the acronym CTBT, is a central pillar of international efforts to advancing nuclear disarmament. However, despite being widely supported — with 184 signatories and 168 ratifying States — it has not yet entered into force, more than two decades after its adoption. Honouring those victims requires bringing nuclear testing to a permanent end, said the Secretary-General, stressing that yet, an effective and legally-binding prohibition remains one of the longest unfulfilled goals of nuclear disarmament. The UN chief stressed that the CTBT is vital to ensuring there are no more victims; it is also essential to advancing nuclear disarmament.

The International Day against Nuclear Tests marks the closing, in 1991, of the nuclear test site in Semipalatinsk, Kazakhstan, the largest in the former Soviet Union. More than 450 tests took place there, with impacts still being felt decades later. ... CTBTO will be tasked with verifying the ban and will operate therefore a worldwide monitoring system and may conduct onsite inspections. The Preparatory Commission for the CTBTO, a UN partner forum, was set up in 1997 and consists of a plenary body composed of all States signatories to the Treaty and a Provisional Technical Secretariat.

Lassina Zerbo, Executive Secretary of the CTBTO and Beibut Atamkulov, Minister of Foreign Affairs of Kazakhstan, also issued a joint statement to mark the International Day. Kazakhstan and the CTBTO encourage States and the civil society to join forces to put an end to nuclear testing through advancing the much needed entry into force of the CTBT, they said.

The joint statement further mentioned the Nazarbayev Prize for a Nuclear-Weapons-Free World and Global Security, which to be awarded to CTBTO and late Director General, Yukiya Amano, of the IAEA. Saying that it is "high time" to bring the treaty into force, the joint statement

urged countries to take the last steps of this long journey and finish one of the longest sought international instruments in the area of non-proliferation and disarmament.

Source: <http://www.thehindu.com>, 30 August 2019.

## NUCLEAR SAFETY

### FRANCE

#### France Flags Welding Fault at Five or More EDF Nuclear Reactors

At least five nuclear reactors operated by French utility EDF might have problems with weldings on their steam generators, a fault which has raised fears of closures, France's nuclear regulator was quoted as saying. State-controlled EDF, whose shares were down 0.9%, had said it had identified issues with weldings of some existing reactors, sparking a stock price fall of nearly 7%. ...

A spokesman for EDF said that there was no plan to shut down the reactors involved for the time being, but the situation could

change and it would be for ASN to decide. The spokesman added that EDF could also decide to halt the affected reactors. ... Reactor closures, if they were to happen ahead of winter when power consumption rises, would impact power generation in France, which depends heavily on nuclear power, and, potentially in European countries that import electricity from France. French and the wider European forward power prices firmed in wholesale trade on concerns over French nuclear availability, while gains in carbon emissions permit and gas prices provided support, a London-based trader said.

France's baseload electricity contract for year-ahead delivery rose 0.4% to 53.75 euros a MWh. The contract hit an eight-week high of 55.25 euros/MWh. French December delivery power contract surged 11 percent or 7 euros to 70 euros/MWh. Germany's year-ahead delivery price, the European benchmark power contract added 0.4% to 50.40 euros/MWh. The ASN said it had put EDF's Flamanville 1 and 2 reactors under increased

**France's baseload electricity contract for year-ahead delivery rose 0.4% to 53.75 euros a MWh. The contract hit an eight-week high of 55.25 euros/MWh. French December delivery power contract surged 11 percent or 7 euros to 70 euros/MWh.**

surveillance following a series of shortcomings in maintenance and contractor oversight.

Source: <https://www.reuters.com>, 12 September 2019.

## USA

### Hurricane Dorian could be a Test for Nuclear Plant on Florida's Treasure Coast

Florida's Treasure Coast is home to a Club Med resort, the popular Jonathan Dickinson State Park and 17th century shipwrecks that attract divers from all over the world. It's also where two of South Florida's four nuclear reactors are located — just across State Road A1A from a beachfront stretch of South Hutchinson Island that remained in fierce Hurricane Dorian's cone of uncertainty.

While tourists and divers will likely stay away from the area this Labor Day week, workers at the St. Lucie nuclear plant were battening down the hatches and making sure that flood-control systems and generators were ready to go before Dorian nears the coast. Though Dorian grew in power overnight, reaching Category 4 strength with 150 mph sustained winds, the threat of a direct hit seemed to lessen as forecasters shifted the track offshore. Still, even a brush along the Treasure Coast could bring ripping winds, massive rainfall and potentially destructive storm surge, which could worsen with the king tide forecast.

St. Lucie, which started operation in 1976 and is owned by Florida Power & Light, was built to withstand hurricanes. But Dorian's projected intensity looms as a test for a facility built right off the Atlantic Ocean. "If it's a large system, and the current forecasts are pointing to a large, slow-moving storm, St. Lucie would be on the side

where storm surge is worse, north of the storm," said Edwin Lyman, a senior scientist and acting director of the Nuclear Safety Project at the Union of Concerned Scientists. "FPL has to consider both

storm surge and heavy precipitation at the same time when implementing its strategy to deal with the hurricane."

Like most nuclear power facilities in the US, St. Lucie has steel-enforced concrete structures that are considered some of the most solid in the country. It went through numerous

extreme storms in its lifetime without sustaining significant damage. And it was built 20 feet above sea level, with its reactor vessels and emergency generator buildings elevated slightly more than the 20 feet, said Peter Robbins, director of nuclear communications at FPL. "We designed the plant beyond the worst hurricanes that have ever been experienced," Robbins said, adding that enhancements made to generator and pump systems after the 2011 Fukushima nuclear

disaster improved the plant's capacity to operate in case of flooding.

Robbins said FPL may decide to shut down both of St. Lucie's reactors as a safety measure, not so much due to a risk of damage to the reactors themselves, which he said was low, but because other

structures around the plant, such as transmission lines, could be affected by the storm. Another reason to shut down the reactor is to conserve energy for the nuclear plant's cooling systems.

FPL could close the reactors a day before hurricane-force winds are set to reach the facility, Robbins added. Halting the reactors wouldn't significantly affect power supply during the storm as energy consumption usually drops due to damage to distribution lines. A failure of cooling systems for reactors and used or "spent" fuel

**The US, St. Lucie has steel-enforced concrete structures that are considered some of the most solid in the country. It went through numerous extreme storms in its lifetime without sustaining significant damage. And it was built 20 feet above sea level, with its reactor vessels and emergency generator buildings elevated slightly more than the 20 feet.**

**A failure of cooling systems for reactors and used or "spent" fuel storage pools is the biggest concern for nuclear power plants. Overheated fuel in the reactor core or storage pools potentially could melt, which could lead to explosions and the potential leak of radioactive material.**

storage pools is the biggest concern for nuclear power plants. Overheated fuel in the reactor core or storage pools potentially could melt, which could lead to explosions and the potential leak of radioactive material. FPL has multiple generator systems and backup equipment ready to respond to the cooling demands of St. Lucie's reactor and fuel cooling systems, Robbins said.

Nearby residents also seem to be confident the nuclear plant can weather the huge storm. Pete Tesch, who lives on Hutchinson Island, said the community dodged bullets before with hurricanes Matthew and Irma. He said he was encouraged after 100 mile-per-hour wind gusts measured at the power plant during Irma didn't cause any problems. "It held up," he said.

When Hurricane Irma threatened South Florida in 2017, FPL shut down one of the two reactors at its Turkey Point nuclear plant in south Miami-Dade as a safety move. It left one reactor running because hurricane-force winds lost intensity as the storm approached the state. Even with the shutdown during Irma, other non-nuclear plants powered by fossil and natural gas generated enough to power to make up for losses.

Before that, last time a major hurricane had hit the Turkey Point nuclear power plant was during Hurricane Andrew in 1992; it caused \$90 million in damage but left the nuclear reactors along southern Biscayne Bay unscathed. The reactors were shut down for a week, and cooling systems ran on generators for six days.

Source: <http://www.miamiherald.com>, 31 August 2019.

**NUCLEAR WASTE MANAGEMENT**

**CHINA**

**China Earmarks Site to Store Nuclear Waste Deep Underground**

**last time a major hurricane had hit the Turkey Point nuclear power plant was during Hurricane Andrew in 1992; it caused \$90 million in damage but left the nuclear reactors along southern Biscayne Bay unscathed. The reactors were shut down for a week, and cooling systems ran on generators for six days.**

China has chosen a site for an underground laboratory to research the disposal of highly radioactive waste, the country's nuclear safety watchdog said. Officials said work would soon begin on building the Beishan Underground Research Laboratory 400 metres (1,312 feet) underground in the northwestern province of Gansu. Liu Hua, head of the National Nuclear Safety Administration, said work would be carried out to determine whether it was possible to build a repository for high-level nuclear waste deep underground.

"China sees radioactive waste disposal as a very important part [of the development nuclear energy]," Liu said. "To develop nuclear energy, we must have safe storage and disposal of nuclear waste." The Chinese authorities see nuclear power as an important source of energy to help curb carbon emissions and pollution as well as reduce its dependence on fuel imports. But while the country has made great strides in the development of nuclear power, it needs to find a safe and reliable way of dealing with its growing stockpiles of nuclear waste.

Liu said the Gansu site was identified as a possible location for a deep nuclear waste store after years of searching. Once the laboratory is built, scientists and engineers will start experiments to confirm whether it will make a viable underground storage facility. "Based on the data of the experiments, we can then decide if we are going

**Work would soon begin on building the Beishan Underground Research Laboratory 400 metres (1,312 feet) underground in the northwestern province of Gansu. Liu Hua, head of the National Nuclear Safety Administration, said work would be carried out to determine whether it was possible to build a repository for high-level nuclear waste deep underground.**

to pick this as the final site," he added. Chinese officials usually stay tight-lipped about how nuclear waste is disposed of mainly because of fears that any discussion of the topic would trigger safety fears, although in recent years more efforts have been made to inform the public to win support. Scientists say nuclear waste can be divided into three categories, depending on the level of radioactivity.

Low-level waste consists of minimally radioactive materials such as mop heads, rags, or protective clothing used in nuclear plants, while intermediate-level waste covers things such as filters and used reactor components. High-level waste, however, is generated by the reprocessing of spent nuclear fuel and scientists generally agree that the safest way to dispose of it is to bury it deep underground in areas where the geology means it will have a minimal impact on the environment while it decays over thousands of years.

Some Chinese scientists said the country had the chance to lead the world in this area of research but others have expressed concerns about safety. Jiang Kejun, a senior researcher at the National

Development and Reform Commission's Energy Research Institute, said very few countries in the world were studying this form of nuclear waste disposal. "It gives China an opportunity to be a leader in research in this area, plus China has the technology and financial means," Jiang said.

Despite broad scientific support for underground disposal, some analysts and many members of the public remain sceptical about whether it is really safe. Lei Yian, an associate professor at Peking University's school of physics, said there was no absolute guarantee that the repositories would be safe when they came into operation. "Leakage has happened in [repositories] in the US and the former Soviet Union. ... It's a difficult problem worldwide," he said. "If China can solve it, then it will have solved a global problem." China is also building more facilities to dispose of low and intermediate-level waste. Officials said new plants were being built in Zhejiang, Fujian and Shandong, three coastal provinces that lack disposal facilities. At present, two disposal sites for low and intermediate-level waste are in operation in Gansu and Guangdong provinces.

*Source: <http://www.scmp.com>, 05 September 2019.*



Centre for Air Power Studies

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

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](mailto:capsnetdroff@gmail.com)

Website: [www.capsindia.org](http://www.capsindia.org)

**Edited by: Director General, CAPS**

**Editorial Team: Dr. Sitakanta Mishra, Hina Pandey, Dr. Poonam Mann, Sreoshi Sinha, Zoya Akhter, Carl Jaison**

**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.