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## Monitored this issue:

# India's (im)modest nuclear quest in 2018: The measured 'normalization' of a nuclear state?

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*NM870.4764*

This year marked the 20th anniversary of the May 1998 nuclear tests in Pokhran, the 10th anniversary of the unprecedented exception from the Nuclear Suppliers' Group (NSG) that the Indian government achieved in 2008, and the last effective year of the ultra-nationalist Modi government as it enters its lame-duck phase early next year. An overall look at the nuclear-related developments in India in 2018 reveals no remarkable development this year. Neither have any exceptional acquisitions or advancements been made by the government, nor has any massive anti-nuclear people's mobilization taken place at the grassroots compared to the immediate post-Fukushima years. On all these counts, the observable surface-reality appears less remarkable than what most observers would have expected.

The 20th anniversary of the nuclear tests remained rather low-key, at least in comparison to the chest-thumping frenzy and hyperbole that the Modi government has come to be known for. The release of a commemorative Bollywood movie, insipidly titled *Parmanu* (atom), was announced to coincide with the occasion, but it was silently and inexplicably postponed by a few weeks and the film remained a non-starter despite its overdramatic nationalist treatment of the subject.[1] While in his pre-election rallies prior to 2014, Narendra Modi had promised a radical alteration of India's nuclear posture and the shunning of the country's long-standing policies of 'no-first-use' and 'minimum credible deterrence' with regard to nuclear weapons, his government did not go beyond heightened nuclear rhetoric against Pakistan.

On the nuclear energy front, progress has been tediously slow and prospects for even the revised short and medium-term projections look grim. But the government remains committed to pursuing both imported and locally-designed nuclear plants. This year, the government announced an ambiguous nuclear plan for the year 2030 and beyond, which was widely perceived as a scaling down of its nuclear ambitions.[2] Despite the NSG opening the doors of international nuclear supplies for India in 2008 – and in effect rewarding the country for its 1998 nuclear tests – not a single foreign-imported reactor construction, sanctioned since 2008, has started in India.

However, it is precisely this deceptive calm and seeming indolence on the part of the Indian government that makes it easy to miss the details and the deeply worrying patterns of an unmistakable push for a massive nuclear weaponization and energy expansion that we should all be concerned about.

Even as the international gaze is set firmly on the increased nuclear instability owing to the misadventures of the American President *vis-à-vis* Russia, North Korea, and Iran on the one hand, and desperate attempts by the global nuclear industry to stage a comeback from perhaps its deepest crisis so far, by painting itself as an 'urgent' and 'imperative' solution to climate change, India is engaged in a steady, albeit understated consolidation of its capacities and postures in terms of both its civilian and military nuclear programs.

## The unquestioned 'normalization' of a nuclear state?

The uncharacteristic and confounding absence of hyped official celebrations of the 20th anniversary of India's nuclear weapons tests was met with an equal silence on the part of the political opposition and civil society. Surprisingly, the 2018 Pokhran anniversary did not occasion any protests by either the major left-wing parties or civil society groups. This however, can also be explained by the fact that the political opposition, activists and civil society in India have found themselves unremittingly firefighting other, more immediate issues that have hogged the limelight during the BJP government's tenure – its gross mishandling of the economy and public offices as well as the havoc unleashed by Hindutva groups on the streets almost every other week on ever-newer issues since Modi's ascendance. However, this is definitely a reflection on the fact that nuclear weapons have fallen off the radar of public concern in India. In effect, this has meant an almost unquestioned and matter-of-fact acceptance of nuclear weapons and the relentless pursuit of a maximization of India's nuclear capacities.

India has consistently expanded its missile program, both qualitatively and quantitatively, and has tested as many as eight nuclear-capable delivery vehicles this year alone.[3] In addition, India launched an 'Advanced Area Defense' (AAD) missile this year, capable of intercepting incoming missiles, which the government has claimed as part of the country's home-grown missile defense system.[4] India also operationalized the nuclear-armed submarine Arihant's patrolling in the Indian Ocean. Observers have raised concerns[5] about the Indian nuclear triad[6] – land, sea and air-based nuclear capabilities – further provoking Pakistan, which is already engaged in miniaturizing its nuclear arsenal to make it more 'usable', thus fueling a nuclear arms race in South Asia.[7]

India also figured among the key reasons for the *Bulletin of Atomic Scientists* moving its famed 'Doomsday Clock' closest-ever to midnight since its inception.[8] However, the international response has been far more muted than the outcry on Iran and South Korea. This has also allowed India to maintain its low-key posturing as well as the government's strategy to perpetuate the image of "good nukes" and a "responsible nuclear state", which the US and other big powers have willingly and actively permitted India to adopt and proclaim.

The Nobel prize-winning International Campaign to Abolish Nuclear Weapons (ICAN) has highlighted the very real dangers of such nuclear hypocrisy.[9] Thus the nuclear escalation in South Asia continues unabated and perhaps enjoys far more political consensus than in 1998 when nuclear weapons were tested by India and Pakistan. Questioning the nuclear arms and military build-up has also become rather perilous, since in recent years civil society activists and dissenters of all shades have been unrestrainedly labeled 'anti-national' by the ruling BJP government on the flimsiest of pretexts.

## Nuclear power

Besides the military nuclear sector, the nuclear power industry is also being steadily expanded by India even as it lags behind earlier, ambitious announcements. Even as the global nuclear industry faces bankruptcies and terminal economic crises, the Indian authorities have used the opportunity in the most perverse manner. Rather than occasioning a serious rethink about the viability and risks of nuclear power, the situation has led the Indian government to ask the imperiled nuclear corporations in the West for technology transfers with the outrageous claim that these nuclear projects can be constructed by engaging private domestic companies with absolutely no experience in nuclear construction.

The French nuclear industry, now in a steep decline, has been more than willing to oblige, and Prime Minister Modi has announced 'maximum localisation' of the EPR design that has been questioned across the world and has been a crucial reason for the meltdown of Areva in France.[10]

This year, America's GE also entered the Jaitapur project and signed strategic cooperation agreements with EDF and Nuclear Power Corporation of India Ltd (NPCIL).[11] This patch-work approach to salvage the world's largest nuclear project and promote Modi's 'Make in India' pitch has understandably raised serious concerns.[12] Even as the future of the Jaitapur project on India's western coast remains uncertain, the Indian government in December this year announced the completion of its land acquisition which has meant the forced eviction of villagers and suppression of the local communities' agitation by carrot-and-stick tactics.[13] Despite losing their land, the villagers continue to protest the loss of livelihoods and safety risks that the nuclear project has and will bring to them.[14] In August, hundreds of people in the Jaitapur region courted voluntary arrest ('jail bharo') as a form of protest.[15]

Both the Kovvada and MithiVirdi project sites, allotted to the US corporations GE and Westinghouse since 2008, continue to figure in the government's projections despite running into serious trouble.[16] The ruling party's own Chief Minister in the State of Gujarat has assured the people that the MithiVirdi project will never be started as the safety concerns and farmers' protests are 'legitimate'.[17] After GE's exit[18] from Kovvada in 2015, citing concerns about India's liability law, the government has allotted[19] the site to Westinghouse and the uncertainties[20] of the ongoing negotiations have not stopped the Indian government from pushing ahead with land acquisition.[21]

While the future of the US and French nuclear projects in India remains uncertain, Russia has come to India's rescue. This year, the government signed design contracts[22] with Russia for Units 5 and 6 of VVER reactors in Koodankulam and launched[23] the construction of Units 3 and 4 despite the glaring failures of Units 1 and 2.[24] India has also signed a new nuclear deal with Russia for six more reactors at a new site that remains officially unannounced.[25]

## Domestically-built Pressurized Heavy Water Reactors

Given the complications of starting Western-imported nuclear projects, the Indian government seems to have shifted its focus to the domestically-built 'indigenous' Pressurized Heavy Water Reactors (PHWRs). Last year, the government repackaged plans for 10 such reactors of 700 MW capacity.[26] This year, excavation work started in Gorakhpur[27] and the government has continued[28] land acquisition and environmental clearance efforts for Mahi-Banswara and pre-project activities in Chutka.

The localised nuclear expansion has also included construction of more PHWRs in existing plants like Kaiga where the government recently conducted a farcical public hearing[29] on the Environmental Impact Assessment report, which has been criticized by independent experts.[30] Despite the generally slow growth of the nuclear sector, India has steadily increased its import of uranium fuel from Canada, Kazakhstan and other countries.[31]

## Conclusion

India's nuclear arsenal and missile capabilities continue to grow quietly, under an otherwise grandiloquent and ultra-nationalist regime. And even though the nuclear power sector's growth appears to be painfully slow, the Indian government has firmly set the country on a course of full-spectrum technology-ownership in the nuclear sector and is using every available opportunity – including the decline of international nuclear industry – towards this grandiose ambition.

One might ask then, if it is by design that the Indian government ignores the attendant problems of an unrelenting pursuit of nuclear projects like the EPR, even as the horror of Fukushima continues to unfold before us; and whether the growth of its nuclear sector, no matter how snail-paced, ensures a 'legitimate' and comprehensive growth of nuclear technology which in turn provides India not just military wherewithal but also diplomatic stature and the leverage to enhance its long-term power projection, as well as withstand any sanctions in the future in the event that the country conducts nuclear tests?

As nuclear power in the present situation does not make sense on either financial or safety grounds, it is only this super-power ambition which is plausibly guiding India's overall nuclear strategy. India's chequered nuclear past is reason enough to believe so.


**References:**

1. https://thebulletin.org/2018/06/parmanu-indias-first-nuclear-film/
2. www.dianuke.org/has-india-really-scaled-down-its-nuclear-power-ambition/
3. www.wisconsinproject.org/indias-expanding-missile-force/
4. https://nationalinterest.org/blog/buzz/could-indias-missile-defense-trigger-nuclear-war-pakistan-28107
5. https://nationalinterest.org/blog/buzz/could-indias-missile-defense-trigger-nuclear-war-pakistan-28107
6. www.gcsp.ch/News-Knowledge/Publications/The-South-Asian-Nuclear-Posture-A-Vicious-Nuclear-Arms-Race
7. https://thebulletin.org/2018/06/on-the-20th-anniversary-of-the-1998-nuclear-tests-by-india-and-pakistan/
8. www.dianuke.org/kumar-sundaram-doomsday-clock-closest-ever-midnight-rising-nuclear-tensions-south-asia-figure-statement/
9. www.icanw.org/campaign-news/india-and-russia-test-nuclear-missiles/
10. www.world-nuclear-news.org/NN-Way-forward-agreed-for-Jaitapur-reactors-1203187.html
11. www.genewsroom.com/press-releases/edf-and-ge-sign-strategic-cooperation-agreement-planned-construction-6-eprs-india
12. www.genewsroom.com/press-releases/edf-and-ge-sign-strategic-cooperation-agreement-planned-construction-6-eprs-india
13. www.news18.com/news/india/india-france-review-status-of-jaitapur-nuclear-power-project-1974669.html
14. www.downtoearth.org.in/news/residents-protest-paris-meet-for-jaitapur-nuclear-plant-41248
15. www.asianage.com/metros/mumbai/270818/jail-bharo-jaitapur-stir-today.html
16. https://energy.economictimes.indiatimes.com/news/power/21-nuclear-reactors-with-15700-mw-total-installed-capacity-under-implementation-says-govt/65037502
17. www.dnaindia.com/ahmedabad/report-mithi-virdi-nuclear-power-plant-will-never-start-cm-vijay-rupani-2592136
18. www.dnaindia.com/business/report-ge-says-no-to-nuclear-power-plants-in-india-cites-liability-risks-2127340
19. www.thehindubusinessline.com/economy/policy/gujarats-mithivirdi-nuclear-plant-to-be-shifted-to-ap/article9717922.ece
20. www.world-nuclear-news.org/NN-India-says-French-and-US-vendor-talks-ongoing-2307187.html
21. www.thehansindia.com/posts/index/Andhra-Pradesh/2018-04-12/Govt-on-top-gear-in-acquiring-land-for-Kovvada-N-plant/373487
22. www.firstpost.com/india/india-russia-sign-three-contracts-to-begin-work-on-units-5-and-6-of-kudankulam-nuclear-power-plant-3882735.html
23. https://economictimes.indiatimes.com/news/defence/construction-for-unit-three-of-kudankulam-nuclear-reactor-launched/articleshow/59377322.cms
24. www.dianuke.org/failures-of-kudankulam-nuclear-power-plant-units-1-2-representation-by-environmental-organisation-poovulagin-nanbargal/
25. www.japantimes.co.jp/news/2018/10/06/world/russia-signs-pact-six-nuclear-reactors-new-site-india/#.XBgcNlxKhaQ
26. http://pib.nic.in/newsite/PrintRelease.aspx?relid=180734
27. www.deccanherald.com/content/666424/excavation-work-nuclear-power-plant.html
28. www.nuclearasia.com/news/land-acquisition-securing-environmental-clearances-begin-10-phwrs-india/2385/
29. www.dianuke.org/karnataka-govt-must-reject-the-farcical-eia-report-for-kaiga-nuclear-plants-expansion-shankar-sharma/
30. www.dianuke.org/nuclear-expansion-in-kaiga-is-india-ready-for-the-risk/
31. https://indianexpress.com/article/business/economy/nuclear-power-uranium-shipments-hold-up-but-blip-in-generation-5054024/


**Protest against the Koodankulam nuclear power plant, 2012.**

# French President announces energy roadmap

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*NM870.4765*

French President Emmanuel Macron announced the government's revised energy roadmap on November 27. The plan calls for France to shut its remaining coal-fired power plants by 2022, shut 14 nuclear reactors by 2035, and increase investment in renewables.[1]

The closure of 14 power reactors will reduce nuclear's share of electricity generation to 50%. France's two oldest reactors – at the Fessenheim plant – will close in 2020, two further reactors will be shut down in 2025/26, two more in 2027/28, and the remaining reactors will close by 2035.[2]

The new plan replaces the previous, legislated plan to cap nuclear at 63.2 gigawatts capacity and to reduce nuclear's share to 50% by 2025. The new plan will be legislated and may be modified during that process.

The government wants to make a decision about whether or not to support the construction of new reactors by 2021. Macron said he has asked EDF to "work on the development of a new nuclear programme" including issues such as industrial capacity issues, "economic optimisation" of the EPR reactor design (EPR reactors under construction in Flamanville and Finland are three times over budget and years behind schedule), waste management, financing models, and regulatory and legal issues.[2] He said France needs EPR technology for "sovereignty issues" and that France must maintain an industrial capacity to build new reactors.[3]

The new energy roadmap fell short of EDF's expectations: EDF said during the consultation process that it "envisages certain closures" of nuclear reactors "starting 2029".[4] And the roadmap fell short of environmentalists' expectations. Alix Mazounie, energy campaigner with Greenpeace France, said: "For the umpteenth time, the government is bowing to the nuclear lobby. This incoherent plan resembles, no more and no less, EDF's plan: to play the watch and preserve nuclear power at all costs. All this by obscuring the reality of the French nuclear fleet: aging, poorly, teeming with anomalies, increasingly expensive and increasingly dangerous."[5]

Greenpeace France took aim at the Flamanville fiasco, stating that "the Flamanville EPR now has a delay of more than 7 years, very serious manufacturing defects in the heart of the reactor, a bill of more than 10 billion euros and a cost of production twice that of renewable energies."[5] Greenpeace France also questioned the technical and economic feasibility of securing license extensions for the aging French nuclear reactor fleet – a program with an estimated price-tag of at least €100 billion – while EDF is already heavily indebted.[5]

The average age of France's 58 power reactors was 33.4 years in mid-2018.[5] French nuclear safety expert Yves Marignac, director of WISE-Paris, noted that by the end of 2035, the 44 reactors that still operate will reach an average age of 49.5 years.[6] Energy consultant Mycle Schneider said: "Macron expects that at least three quarters of French nuclear power plants will remain in operation for 50 years or more, an assumption without any technical or regulatory basis."[6]

The World Nuclear Industry Status Report 2018 said in its September 2018 report: "Operating costs have increased substantially over the past years. Investments for life extensions will need to be balanced against the already excessive nuclear share in the power mix, the stagnating or decreasing electricity consumption in France – it has been roughly stable for the past decade – and in the European Union (EU) as a whole, the shrinking client base, successful competitors, and the energy efficiency and renewable energy production targets set at both the EU and the French levels. ... And in a structural overcapacity situation, like throughout Europe, with still continuously increasing renewable energy capacities, competition will only increase. In fact, it seems impossible to exclude today a scenario, where a significant number of reactors will be shut down, as they cannot compete in the market (just as is already happening in the U.S.)."[4]

Macron also said that he wants to continue the French plutonium / reprocessing industry. Schneider responded: "The idea that the ailing La Hague facilities could run until 2040 is downright adventurous. It's not even clear whether the evaporators – a central element of the plant – will last until new ones become available." Schneider noted that numerous other countries have abandoned spent fuel reprocessing for economic reasons.[6]

The World Nuclear Industry Status Report 2018 stated: "Orano (ex-AREVA), in its contribution to the public debate, stipulates that "the number of reactor closures must not exceed the minimum threshold that allows the continued operation of the fuel cycle facilities and to maintain the French technological excellence". An interesting logic: keep operating otherwise not needed power generating plants in order to provide business for otherwise not needed fuel chain facilities. Orano refers here to its plutonium activities, spent fuel reprocessing and uranium-plutonium mixed oxide (MOX) fuel fabrication. Indeed, the twenty-four 900 MW units licensed to operate with MOX fuel are also amongst the oldest reactors in France. Every MOX-absorbing unit closed, means five percent less plutonium absorption

capacity. EDF is now virtually Orano's only client for the La Hague reprocessing plant and buys the vast majority of the MOX fabricated in the MELOX plant in Marcoule."[4]

The World Nuclear Industry Status Report noted that nuclear power is in slow decline in France, accounting for 71.6% of the country's electricity generation in 2017, the lowest share since 1988 and 7% below the peak of 78.5% in 2005.[4] The report noted that "one of the reasons for the continuous decline in nuclear production is the snow-balling effect of ongoing investigations into irregularities in quality-control documentation and manufacturing defects (especially excessive carbon content of steel) of components produced by AREVA's Creusot Forge and a Japanese AREVA sub-contractor, leading to multiple reactor shutdowns, starting in November 2016. The problems continue in 2018. ... In the second quarter of the year, EDF had between 13 and 20 reactors or 14–23 GW off-line (this does not include output reductions), about one third of its fleet, at any point in time."[4]

## EDF restructure

In September 2018, French Environment Minister Nicolas Hulot resigned in frustration over what he said was "sluggish progress" on climate goals and nuclear energy policy.[3] He said the President was not fulfilling his pledge to cut the share of nuclear power to 50% by 2025 and to boost renewable energy, and that investments made in the nuclear industry, like the very expensive bailout of Areva, slow down the development of a renewable energy sector.

Hulot said last year that EDF's structure might have to change to allow it to embrace a transition towards environmentally friendly energy rather than "resist" it.[7] The government plans a restructure of EDF, but it seems the motivation is to prop up the nuclear industry rather than embracing a transition to renewables. The government has asked EDF to make proposals about changes to its structure[7], and the government has flagged increasing its 83.7% stake in EDF.[8] *Reuters* reported: "Financial markets have long speculated that EDF's nuclear activities could be put into a separate legal structure and renationalized, which would allow the state to subsidize the business ..."[8]

## Renewables

Macron announced that support for renewables will increase from the current €5 billion to €7–8 billion per year with the aim of renewables generating 40% of electricity supply by 2035. The plan is to treble onshore wind capacity (and to develop offshore wind power), and to increase solar PV capacity five-fold (from 8.5 GW to 45 GW) by 2030.[1,4]

Michèle Rivasi, nuclear power spokesperson for the Greens/EFA group in the European Parliament, said on November 27: "Today's announcement cannot hide the general nuclear agenda of the French government. President Emmanuel Macron talks about 'nouveau nucléaire' such as the Evolutionary Power Reactor that produce much more expensive electricity than renewable energies and are still difficult to control and risky. Mr Macron needs to do far more if he wants a green and social energy transition. It's time to start taxing carbon emissions and making companies pay their fair share towards a cleaner tomorrow. France has a key role to play in the EU meeting its Paris Climate Commitments, and right now the French government needs to be far more ambitious and more radical if we are to avoid climate catastrophe."[9]

EDF is hedging its bets, pursuing its nuclear agenda while also investing in renewables. EDF's CEO claimed last year that its "renewables and services activities" constitute its "key growth drivers".[10] The World Nuclear Industry Status Report 2018 stated: "EDF's total net installed renewables capacity (excluding large hydro) in the world remains modest with 9.4 GW producing 3 percent of EDF's electricity. However, in December 2017, the group announced a "solar plan" with a target of 30 GW installed over a period of 15 years between 2020 and 2035 for an investment of €25 billion (US$29.5 billion). To put this figure into perspective, China added 53 GW in 2017."[4]

## ADEME report

France's environment ministry ADEME released a report finding that France will save €39 billion (US$44.5 billion) if it refrains from building 15 new nuclear plants by 2060, and instead replaces reactors with renewable energy sources.[11]

France should spend €1.28 trillion over the next four decades, the report states, mostly on clean power production and storage capacities, networks, and imports. If it does this, France would progressively shut down its 58 reactors and renewable energy would comprise 85% of electricity generation by 2050 and 95% by 2060, up from 17% last year.[12]

Bloomberg reported: "Falling costs means that photo-voltaic facilities won't need subsidies from 2030, nor will onshore wind from 2035, the [ADEME] report said. That's assuming that EDF halts 30 percent of its reactors after 40 years of operation and an additional 30 percent when they turn 50. Otherwise, surplus production capacity would undermine the economics of both nuclear power and renewables, ADEME said. The study doesn't take into account the impact on jobs, industry and the environment. However, "we're expecting job creations in renewables and energy efficiency to largely make up for job losses in the nuclear industry," said ADEME Chairman Arnaud Leroy."[12]

ADEME is sceptical about the future of EPR nuclear technology. *Reuters* reported:[13]

*""The development of an EPR-based nuclear industry would not be competitive," ADEME said, adding that new nuclear plants would be structurally loss-making. Building a single EPR in 2030 would require 4 to 6 billion euros of subsidies, while building a fleet of 15 with a total capacity of 24 gigawatt-hour by 2060 would cost the state 39 billion euros, despite economies of scale that could bring down the EPR costs to 70 euros per megawatt-hour (MWh), ADEME said.*

*"Renewables costs could fall to between 32 and 80 euros/MWh, depending on the technology, by 2060.*
*But extending the existing fleet too long, while also building new EPRs, would lead to overcapacity, compromising returns on all generation assets, including renewables.*
*EDF – which generates about 75 percent of French*

*electricity with 58 nuclear reactors – declined to comment.*

*"The ADEME report, which studied energy mix scenarios for 2020-2060, said renewables could account for 85 percent of power generation by 2050 and more than 95 percent by 2060, except if the government pushes through the EPR option anyway. The gradual increase of renewables capacity could reduce the pre-tax electricity cost for consumers – including generation, grids and storage – to about 90 euros per MWh, compared to nearly 100 euros today, ADEME said. ...*

*"In 2015, a ADEME study suggesting that France could switch to 100 percent renewable energy by 2050 at a cost similar to sticking with nuclear was barred from publication for months by the government."*


**References:**

1. Joshua S. Hill, 28 Nov 2018, 'France turns to wind and solar as it plans to exit coal, and phase down nuclear', https://reneweconomy.com.au/france-turns-to-wind-and-solar-as-it-plans-to-exit-coal-and-phase-down-nuclear-93689/
2. World Nuclear Association, 27 Nov 2018, 'Macron clarifies French energy plans', www.world-nuclear-news.org/Articles/Macron-clarifies-French-energy-plans
3. Dan Yurman, 2 Dec 2018, 'Will France Fry Its Nuclear Future for Short-Term Political Gain?', http://neutronbytes.com/2018/12/02/will-france-fry-its-nuclear-future-for-short-term-political-gain/
4. Mycle Schneider, Antony Froggatt et al., Sept 2018, 'The World Nuclear Industry Status Report 2018', www.worldnuclearreport.org/World-Nuclear-Industry-Status-Report-2018-HTML.html
5. Greenpeace France, 27 Nov 2018, 'EPP / SNBC: decryption of Greenpeace France', www.greenpeace.fr/espace-presse/ppe-snbc-decryptage-de-greenpeace-france/
6. Georg Blume, 1 Dec 2018, 'Macron, the nuclear lobbyist', www.spiegel.de/wirtschaft/soziales/emmanuel-macron-der-atomlobbyist-neues-energiekonzept-in-frankreich-a-1240884.html and www.worldnuclearreport.org/Der-Spiegel-Germany-Macron-der-Atomlobbyist.html
7. Financial Times, 27 Nov 2018, www.ft.com/content/42bf2364-f262-11e8-ae55-df4bf40f9d0d
8. Reuters, 27 Nov 2018, 'EDF restructuring expected as France reduces reliance on nuclear', https://uk.reuters.com/article/uk-france-energy/france-to-reduce-reliance-on-nuclear-energy-may-boost-stake-in-edf-idUKKCN1NW14A?rpc=401&
9. EU Reporter, 28 Nov 2018, www.eureporter.co/frontpage/2018/11/28/closure-of-fessenheim-cannot-hide-nuclear-agenda-of-french-government-quote-from-michelerivasi/
10. EDF, "Half-Year Results 2017", Conference call Jean-Bernard Lévy with Analysts and Investors, 28 July 2017, cited in Mycle Schneider, Antony Froggatt et al., Sept 2018, 'The World Nuclear Industry Status Report 2018', www.worldnuclearreport.org/World-Nuclear-Industry-Status-Report-2018-HTML.html
11. ADEME, 10 Dec 2018, 'Étude : Quelle Trajectoire D'évolution du #Mix #Électrique Français D'ici 2060?', https://presse.ademe.fr/2018/12/etude-quelle-trajectoire-devolution-du-mix-electrique-francais-dici-2060.html
12. Francois De Beaupuy, 11 Dec 2018, 'France Would Save $44.5 Billion by Betting on Renewable Energy, Agency Says', www.bloomberg.com/news/articles/2018-12-10/french-power-costs-will-rise-if-renewables-are-sidestepped
13. Geert De Clercq / Reuters, 11 Dec 2018, 'Building new nuclear plants in France uneconomical - environment agency', https://uk.reuters.com/article/france-nuclearpower/building-new-nuclear-plants-in-france-uneconomical-environment-agency-idUKL8N1YF5HC


# New report concludes nuclear "will play no meaningful role" in climate change abatement

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*NM870.4766*

Nuclear power is frequently promoted as a necessary solution to global warming, and a key means to achieve emissions goals. This is a major mistake, according to a new report published by the Rosa Luxemburg Stiftung–New York City. The report – "Nuclear Power and Climate Action: An Assessment for the Future" – presents an industrial analysis of nuclear energy to assess its viability as a climate solution. From real and practical evidence, the report concludes that nuclear power is not a viable tool in the climate solutions toolbox, and that nuclear-free paths to phasing out greenhouse gas emissions are necessary, feasible, and cost-effective.

The report evaluates the technology from all sides: the potential for building new reactors, the prospects for continuing to operate existing reactors, and the commercialization of so-called "advanced reactor designs" in the mid-century timeframe. Analysis shows that nuclear power may not be available in any meaningful capacity by 2050. Existing reactor fleets in most of the world are already reaching the end of their mechanical lives and will mostly phase out within the critical climate timeframe, and strategies to reduce gas reduction must take this into account.

"Those who argue that nuclear power is necessary to reduce GHG emissions are gravely mistaken," said author of the report Tim Judson, Executive Director of the Nuclear and Information and Resource Service (NIRS). "The practical realities about nuclear energy show that it is a failed technology, which is on its way out. We have many more effective and promising tools in the climate action toolbox," continued Judson. "We must not waste time and money on trying to preserve a role for nuclear

power, and align energy policies and investments with rapidly transitioning to renewables, efficiency, and carbon-free, nuclear-free climate solutions."

With the immense threats of climate change, it is tempting to overlook other environmental hazards in the effort to address it. That is a mistake with nuclear power especially, because its environmental impacts are so severe and long-lasting and so many of them intersect with and compound impacts of global warming as well as issues of climate justice. At every stage of its production – from uranium mining to the production of radioactive wastes – nuclear power pollutes the environment with some of the most dangerous, long-lived contaminants in the world and places undue stress on water resources.

Because fossil fuels make up 86% of global energy, decarbonization will require a total transformation of energy systems in most parts of the world. Renewable energies have proven to be the most promising option – complemented by investments in energy efficiency, development of complementary technologies, and integrated reliably and resiliently. Evidence from places like Germany and California shows that nuclear power does not integrate well with renewables and phasing it out is likely to create greater opportunities to accelerate the phaseout of fossil fuels and the transformation of the energy system.

The report includes case studies showing that promotion of nuclear power entails significant climate opportunity costs, wasting time and financial investments that could reduce greenhouse gas emissions and decarbonize energy systems much more rapidly and cost-effectively. For instance, in the United States, the Summer 2 and 3 reactors were cancelled after major cost overruns and construction delays bankrupted their manufacturer, after US$9 billion had already been spent. Had utilities invested in energy efficiency and renewables, the report finds, the utilities would have made substantial reductions in emissions and reduced electricity costs for their consumers.

Similarly, the state of New York in the US decided in 2016 to subsidize four aging, uneconomical reactors, at a projected cost of $7.6 billion by 2029 – three times as much as will be spent to achieve 50% renewable energy standard in 2030. Had New York invested in energy efficiency instead of nuclear, it could achieve greater emissions reductions in 2030, at a cost reduction of $10.6 billion.

"The pursuit of nuclear power in South Africa would have permanently locked us into complicity in putting our country as a radioactive waste zone for centuries," said Makoma Lekalakala, Director, Earthlife Africa Johannesburg, and 2018 awardee of the Goldman Environmental Prize for Africa. "By challenging the secret $76 billion agreement between South Africa and Rosatom, we exposed the role of corruption at the highest level of our government. The agreement would have forced South Africans to pay all the costs of a nuclear disaster, contaminated our environment and water with radioactive waste, and made electricity unaffordable for generations," continued Lekalakala. "We have all of the clean, affordable wind and solar energy we need in South Africa, and overturning the nuclear agreement has put us back on track for a healthy, sustainable future, free of fossil fuels."

"The imperatives of rapidly eliminating greenhouse gas emissions demand greater ambition in the implementation of the Paris Agreement," said Kerstin Rudek of Bürgerinitiative Umweltschutz Lüchow-Dannenberg of Germany, on behalf of the international Don't Nuke the Climate Coalition (a global network working to keep nuclear out of the climate agreements – www.dont-nuke-the-climate.org). "Nuclear power has proved too expensive, too slow, and too unreliable to rapidly reduce emissions, and the vast majority of reactors around the world are likely to retire before 2050. A carbon-free, nuclear-free world is possible, but we can't get there by wasting time, money, and political will on failed technologies and false solutions like nuclear power."

The report concludes that the primary obstacles to rapidly phasing out fossil fuels and greenhouse gas emissions are political, not technological or economic. In particular, deceptive interventions by corporations invested in fossil fuels and nuclear energy have engendered inertia and confused the debate by, alternately, denying the reality of global warming and by presenting false solutions. Mitigating the economic and social impacts of climate action by ensuring a just transition for workers and impacted communities is key to charting a clear vision and building and sustaining the political will to accelerate emissions reductions and the phase-out of greenhouse gas emissions.

*The report is online: Tim Judson, Nov 2018, 'Nuclear Power and Climate Action: An Assessment for the Future', Rosa Luxemburg Stiftung: New York, www.rosalux-nyc.org/wp-content/files_mf/judson_eng.pdf*

# Are thousands of new nuclear generators in Canada's future?

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*NM870.4767*

Canada's government is about to embrace a new generation of small nuclear reactors that do not make economic sense.

Amidst real fears that climate change will wreak devastating effects if we don't shift away from fossil fuels, the idea that Canada should get deeper into nuclear energy might seem freshly attractive to former skeptics. For a number of reasons, however, skepticism is still very much warranted.

On Nov. 7, Natural Resources Canada launched something called the Small Modular Reactor Roadmap.[1] The roadmap was previewed[2] in February of this year and is the next step in the process set off by the June 2017 "call for a discussion around Small Modular Reactors in Canada" issued by Canadian Nuclear Laboratories, which is interested in figuring out the role the organization "can play in bringing this technology to market."[3]

Environmental groups and some politicians have spoken out against this process.[4] A petition signed by nearly two dozen civil society groups has opposed the "development and deployment of SMRs when renewable, safer and less financially, socially and environmentally costly alternatives exist."[5]

SMRs, as the name suggests, produce relatively small amounts of electricity in comparison with currently common nuclear power reactors. The last set of reactors commissioned in Canada is the four at Darlington. These started operating between 1990 and 1993 and can generate 878 megawatts of electricity (although, on average, they only generate around 75 to 85 per cent of that).[6] In comparison, SMRs are defined as reactors that generate 300 MW or less – as low as 5 MW even.[7] For further comparison, the Site C dam being built in northeastern B.C. is expected to provide 1,100 MW and BC Hydro's full production capacity is about 11,000 MW.

Various nuclear institutions, such as Canadian Nuclear Laboratories, Canadian Nuclear Association and the CANDU Owners Group are strongly supportive of SMRs. Last October, Mark Lesinski, president and CEO of CNL announced: "Small modular reactors, or SMRs, represent a key area of interest to CNL. As part of our long-term strategy, announced earlier this year, CNL established the ambitious goal of siting a new SMR on a CNL site by 2026."[8]

Likewise, the CANDU Owners Group announced that it was going to use "their existing nuclear expertise to lead the next wave of nuclear generation – small modular reactors, that offer the potential for new uses of nuclear energy while at the same time offering the benefits of existing nuclear in combating climate change while providing reliable, low-cost electricity."[9]

## A fix for climate change, says Ottawa

Such claims about the benefits of SMRs seems to have influenced the government too. Although Natural Resources Canada claims to be just "engaging partners and stakeholders, as well as Indigenous representatives, to understand priorities and challenges related to the development and deployment of SMRs in Canada," its personnel seem to have already decided that SMRs should be developed in Canada.[10]

"The Government of Canada recognizes the potential of SMRs to help us deliver on a number of priorities, including innovation and climate change," declared Parliamentary Secretary Kim Rudd.[11] Diane Cameron, director of the Nuclear Energy Division at Natural Resources Canada, is confident: "I think we will see the deployment of SMRs in Canada for sure." Such talk is premature, and unwise.[12]

Canada is a late entrant to this game of talking up SMRs. For the most part it has only been talk, with nothing much to show for all that talk. Except, of course, for millions of dollars in government funding that has flown to private corporations. This has been especially on display in the United States, where the primary agency that has been pumping money into SMRs is the Department of Energy.

In 2001, based on an overview of around 10 SMR designs, DOE's Office of Nuclear Energy concluded that "the most technically mature small modular reactor designs and concepts have the potential to be economical and could be made available for deployment before the end of the decade, provided that certain technical and licensing issues are addressed."[13] Nothing of that sort happened by the end of that decade, i.e., 2010. But in 2012 the U.S. government offered money: up to US$452 million to cover "the engineering, design, certification and licensing costs for up to two U.S. SMR designs."[14] The two SMR designs that were selected by the DOE for funding were called mPower and NuScale.

The first pick was mPower and, a few months later, the DOE projected that a major electricity generation utility called the Tennessee Valley Authority "plans to deploy two 180 megawatt small modular reactor units for commercial operation in Roane County, Tennessee, by 2021, with as many as six mPower units at that site."[15]

The company developing mPower was described by the *New York Times* as being in the lead in the race to develop SMRs, in part because it had "the Energy Department and the T.V.A. in its camp."[16]

But by 2017, the project was essentially dead.[17]

## Few if any buyers

Why this collapse? In a nutshell, because there is no market for the expensive electricity that SMRs will generate. Many companies presumably enter this business because of the promise of government funding. No company has invested large sums of its own money to commercialize SMRs.

An example is the Westinghouse Electric Co., which worked on two SMR designs and tried to get funding from the DOE. When it failed in that effort, Westinghouse stopped working on SMRs and shifted its focus to decommissioning reactors that are being shut down at an increasing rate, which is seen as a growing business opportunity.[18] Explaining this decision in 2014, Danny Roderick, then president and CEO of Westinghouse,said: "The problem I have with SMRs is not the technology, it's not the deployment – it's that there's no customers ... The worst thing to do is get ahead of the market."[19]

Many developing countries claim to be interested in SMRs but few seem to be willing to invest in the construction of one. Although many agreements and memoranda of understanding have been signed, there are still no plans for actual construction. Examples are the cases of Jordan[20], Ghana[21] and Indonesia[22], all of which have been touted as promising markets for SMRs, but none of which are buying one because there are significant problems with deploying these.

A key problem is poor economics. Nuclear power is already known to be very expensive.[23] But SMRs start with a disadvantage: they are too small. One of the few ways that nuclear power plant operators could reduce the cost of nuclear electricity was to utilize what are called economies of scale, i.e., taking advantage of the fact that many of the expenses associated with constructing and operating a reactor do not change in linear proportion to the power generated. This is lost in SMRs. Most of the early small reactors built in the U.S. shut down early because they couldn't compete economically.[24]

## Reactors by the thousands?

SMR proponents argue that they can make up for the lost economies of scale two ways: by savings through mass manufacture in factories, and by moving from a steep learning curve early on to gaining rich knowledge about how to achieve efficiencies as more and more reactors are designed and built. But, to achieve such savings, these reactors have to be manufactured by the thousands, even under very optimistic assumptions about rates of learning.[25] Rates of learning in nuclear power plant manufacturing have been extremely low. Indeed, in both the United States[26] and France[27], the two countries with the highest number of nuclear plants, costs went up, not down, with construction experience.

In the case of Canada, the potential markets that are most often proffered as a reason for developing SMRs are small and remote communities and mines that are not connected to the electric grid. That is not a viable business proposition. There are simply not enough remote communities, with adequate purchasing capacity, to be able to drive the manufacture of the thousands of SMRs needed to make them competitive with large reactors, let alone other sources of power.

There are thus good reasons to expect that small modular reactors, like large nuclear power plants, are just not commercially viable. They will also impose the other well-known problems associated with nuclear energy – the risk of severe accidents, the production of radioactive waste, and the linkage with nuclear weapons – on society.[28]

Rather than seeing the writing on the wall, unfortunately, Natural Resources Canada and other such institutions are regurgitating industry propaganda and wasting money on technologies that will never be economical or contribute to any meaningful mitigation of climate change. There is no justification for such expensive distractions, especially as the climate problem becomes more urgent.

*Reprinted from The Tycee, 7 Nov 2018, https://thetyee.ca/Opinion/2018/11/07/Nuclear-Generators-Canada-Future/*

**References:**


1. www.cns-snc.ca/events/g4sr1/
2. www.canada.ca/en/natural-resources-canada/news/2018/02/canada_mapping_astrategyforthenextgenerationofnuclearreactortech.html
3. www.newswire.ca/news-releases/cnl-seeks-input-on-small-modular-reactor-technology-625761224.html
4. www.cpac.ca/en/programs/headline-politics/episodes/65476551
5. www.cela.ca/sites/cela.ca/files/Joint%20Sign-on%20Letter%20-%20No%20to%20SMRs%20in%20Canada.pdf
6. https://pris.iaea.org/pris/CountryStatistics/CountryDetails.aspx?current=CA
7. www.canadianconsultingengineer.com/energy/very-small-nuclear-reactors/1003400412/
8. www.cnl.ca/en/home/news-and-publications/news-releases/2017/cnl-releases-summary-report-on-small-modular-react.aspx
9. www.candu.org/COGNews/SMRs_BoardUpdate_PSA_Summer2018.pdf
10. www.nrcan.gc.ca/energy/uranium-nuclear/21183
11. www.marketwatch.com/press-release/cnl-releases-summary-report-on-small-modular-reactor-rfeoi-2017-10-18-142033454
12. http://magazine.cim.org/en/voices/a-smrt-energy-alternative-en/
13. www.uxc.com/smr/Library%5CGeneral/2001%20-%20Report%20to%20US%20Congress%20on%20SMRs.pdf
14. www.neimagazine.com/features/featurethe-westinghouse-smr
15. www.energy.gov/articles/energy-department-announces-new-funding-opportunity-innovative-small-modular-reactors
16. www.nytimes.com/2013/02/21/business/tva-and-babcock-wilcox-in-nuclear-reactor-deal.html
17. www.forbes.com/sites/rodadams/2017/03/13/bechtel-and-bwxt-quietly-terminate-mpower-reactor-project/#22168da14990
18. http://markets.financialcontent.com/stocks/news/read?GUID=37242900
19. www.post-gazette.com/business/2014/02/02/Westinghouse-backs-off-small-nuclear-plants/stories/201402020074
20. www.sciencedirect.com/science/article/pii/S0301421516301136
21. www.sciencedirect.com/science/article/pii/S2214629616301670
22. https://nautilus.org/napsnet/napsnet-special-reports/prospects-and-challenges-of-nuclear-power-and-small-modular-reactors-in-indonesia/
23. www.lazard.com/perspective/levelized-cost-of-energy-2017/
24. http://spectrum.ieee.org/energy/nuclear/the-forgotten-history-of-small-nuclear-reactors
25. https://acee.princeton.edu/distillates/small-modular-reactors/
26. www.sciencedirect.com/science/article/pii/S0301421507002558
27. www.sciencedirect.com/science/article/pii/S0301421510003526
28. www.sciencedirect.com/science/article/pii/S2214629614000486

# Fukushima Fallout: Updates from Japan

*Compiled by Nuclear Monitor*

*NM870.4768*

## Reactor restarts

There were five reactor restarts in Japan in 2018, but the number of permanent reactor shut-downs continues to grow even faster. *Nuclear Monitor* noted in May 2018 that of Japan's pre-Fukushima fleet of 54 reactors (55 including the Monju fast breeder reactor), eight reactors were operating and 16 had been permanently shut down.[1] As of December 2018, nine reactors are operating and 20 have been permanently shut down.

1. Nuclear Monitor #861, 28 May 2018, 'Reactor restarts and energy policy in Japan', https://wiseinternational.org/nuclear-monitor/861/reactor-restarts-and-energy-policy-japan
2. US Energy Information Administration, 28 Nov 2018, 'Japan Has Restarted Five Nuclear Power Reactors in 2018', www.eia.gov/todayinenergy/detail.php?src=email&id=37633

## Japan's nuclear export industry facing extinction

Japan's nuclear export industry could be dealt a fatal blow if Mitsubishi Heavy Industries pulls out of a massive project to build four large power plants on Turkey's Black Sea coast, as reports have suggested. The Sinop plant project in Turkey was seen as Japan's best chance for an industry – battered and bruised after the 2011 tsunami and triple meltdown at Fukushima – to put together a workable export strategy that did not break the bank of potential international customers.

Meanwhile, it is not just Mitsubishi that may have doubts about the sector. Japan's nuclear export industry has suffered plenty of setbacks in the seven years since Fukushima. Questions about the future of the sector hang over all three main players in the sector – Mitsubishi, Toshiba and Hitachi.

Toshiba, one of Japan's big-three nuclear constructors, recently pulled out of the nuclear power business overseas after incurring huge losses in the United States.

If the export program is to remain viable, it may be in Wales, where the British government is seeking to build a two-reactor nuclear power plant on the island of Anglesey. Among those bidding for the project is Japan's third nuclear constructor, Hitachi, through a subsidiary called Horizon Nuclear. Now, there are worries that Hitachi might pull out of the British project. Chairman Hiroaka Nakanishi was quoted in the Times of London saying his company was "facing an extreme situation," and that a final decision on whether to stay with the project or leave it will be made next year.

*Abridged from Todd Crowell / Asia Times, 16 Dec 2018, 'Sun setting on Japan's nuclear export sector', www.atimes.com/article/sun-setting-on-japans-nuclear-export-sector/*

## Japan must halt returns to Fukushima, says UN rights expert

In March, the Japanese government announced that it had accepted the recommendations made at the United Nations Human Rights Council (UNHRC) on the rights of evacuees from the Fukushima accident.[1] But the government has been slow to act.

In a report released in October, the UN Special Rapporteur on hazardous substances and wastes, Baskut Tuncak, has urged the Japanese Government to halt the ongoing relocation of evacuees who are children and women of reproductive age to areas of Fukushima where radiation levels remain higher than what was considered safe or healthy before the nuclear disaster in 2011.[2]

Tuncak said the Japanese Government's decision to raise by 20 times what it considered to be an acceptable level of radiation exposure was deeply troubling, highlighting in particular the potentially grave impact of excessive radiation on the health and wellbeing of children.

"It is disappointing to see Japan appear to all but ignore the 2017 recommendation of the UN human rights monitoring mechanism (UPR) to return back to what it considered an acceptable dose of radiation before the nuclear disaster," he said.

A representative from the Japanese delegation to the UN said that "the government continues its effort to attain the long-term target for individual additional dose of exposure to radiation per year to within 1 millisievert".[3]

In response, Tuncak reminded the Japanese delegate that the Universal Periodic Review of the Human Rights Council issued a recommendation in 2017 to lower the acceptable level of radiation back down from 20 mSv/yr to 1 mSv, and noted "concerns that the pace at which that recommendation is being implemented is far too slow, and perhaps not at all."

Following the nuclear disaster in 2011, Japan raised the acceptable level of radiation for residents in Fukushima from 1 mSv/year to 20 mSv/year. The recommendation to lower acceptable levels of exposure to back to 1 mSv/yr was proposed by the Government of Germany and the Government of Japan 'accepted to follow up' on it. But in Tuncak's view, the recommendation is not being implemented.

Japan has a duty to prevent and minimise childhood exposure to radiation, Tuncak said. The UN Convention on the Rights of the Child, to which Japan is a Party, contains a clear obligation on States to respect, protect and fulfil the right of the child to life, to maximum development and to the highest attainable standard of health, taking their best interests into account.

This, Tuncak said, requires State parties such as Japan to prevent and minimise avoidable exposure to radiation and other hazardous substances.

In March 2017 housing subsidies stopped for self-evacuees, who fled from areas other than the government-designated evacuation zones. Tuncak said: "The combination of the Government's decision to lift evacuation orders and the prefectural authorities' decision to cease the provision of housing subsidies, places a large number of self-evacuees under immense pressure to return. The gradual lifting of evacuation orders has created enormous strains on people whose lives have already been affected by the worst nuclear disaster of this century. Many feel they are being forced to return to areas that are unsafe, including those with radiation levels above what the Government previously considered safe."

In August 2018, Tuncak and two other UN Special Rapporteurs argued that Japan must act urgently to protect tens of thousands of workers who are reportedly being exploited and exposed to toxic nuclear radiation in efforts to clean up the damaged Fukushima nuclear plant.[4]

"Workers hired to decontaminate Fukushima reportedly include migrant workers, asylum seekers and people who are homeless," said the rapporteurs. "We are deeply concerned about possible exploitation by deception regarding the risks of exposure to radiation, possible coercion into accepting hazardous working conditions because of economic hardships, and the adequacy of training and protective measures. We are equally concerned about the impact that exposure to radiation may have on their physical and mental health."

1. Greenpeace, 8 March 2018, 'Japanese government accepts United Nations Fukushima recommendations - current policies now must change to stop violation of evacuee human rights', www.greenpeace.org/japan/ja/news/press/2018/pr20180308/
2. Baskut Tuncak, 18 Oct 2018, 'Report of the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes', www.ohchr.org/Documents/Issues/ToxicWastes/A_GA73_45821.docx
   See also UN OHCHR, 25 Oct 2018, 'Japan must halt returns to Fukushima, radiation remains a concern, says UN rights expert', www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=23772&LangID=E
3. Ariana King, 26 Oct 2018, 'Japan should not push residents back to Fukushima: UN expert', https://asia.nikkei.com/Politics/Japan-should-not-push-residents-back-to-Fukushima-UN-expert
4. Nuclear Monitor #866, 21 Sept 2018, 'Fukushima clean-up workers, including homeless, at grave risk of exploitation, say UN experts', https://wiseinternational.org/nuclear-monitor/866/nuclear-monitor-866-24-september-2018

## Compensation for Nuclear Damage Act

On November 2, a bill for the partial amendment of the Compensation for Nuclear Damage Act (CND) was submitted to the Diet.

The Asahi Shimbun editorialized:[1]

*"The government is trying to wriggle out of overhauling the way compensation should be paid out for damages caused by a nuclear accident. A working group of the government's Atomic Energy Commission had been considering ways to bolster the system, including raising the amount of losses covered by insurance, but failed to produce a formal proposal. The commission apparently failed to obtain support for these ideas from the electric power and insurance industries.*

*"The panel started reviewing the system in the aftermath of the 2011 Fukushima nuclear disaster. Nearly eight years have passed since the catastrophic triple meltdown at the Fukushima No. 1 nuclear power plant, yet serious problems and flaws remain unaddressed with the current system. The government clearly has no intention of tackling them anytime soon."*

The Tokyo-based Citizens Nuclear Information Center said:[2]

*"The main points of the draft amendment are: 1) Nuclear power plant (NPP) operators are mandated to prepare and publish a new damage compensation implementation policy, 2) Creation of a system for the government to lend funds to the operator for early compensation (provisional payments) to affected persons before the start of the main compensation payments, 3) In the case that alternative dispute resolution (ADR) by the Nuclear Damage Dispute Reconciliation Committee is terminated, it will be deemed that an appeal has been submitted at the time of the request for settlement mediation if the appeal is brought before the court within one month after the notification of termination of ADR, and 4) The compensatory fund is to be left unchanged at 120 billion yen.*

*"It is surprising that 1) is not already being carried out by NPP operators. At the time of the TEPCO Fukushima Daiichi nuclear accident the government had already devised measures similar to 2) for provisional compensation in the Act on Emergency Measures for Damage due to Nuclear Accidents. 3) can be said to be rational since there has been a series of cases in which the nuclear business side has rejected settlement proposals. On the other hand, the content of 4) is strikingly problematic since it does nothing to adjust the astoundingly miserly current compensatory fund of 120 billion yen in the face of the estimated 22 trillion yen in damages for the TEPCO Fukushima Daiichi nuclear accident.*

*"Originally, CND began as an exemption of makers from liability due to nuclear accidents in order to encourage the construction of nuclear power plants. The discussions in the latest series of reviews have progressed with no mention of this point, but in fact we believe the specialist committee should have taken one step further and questioned the liability of nuclear reactor makers. …*

*"CND is directly linked with the problem of the interests of citizens regarding how nuclear energy risks are distributed under the unlimited liability of nuclear business operators. If NPPs are to be operated on just a very small burden, the risk of "cheap NPPs" is essentially borne by the citizens. The bill for the amendment utterly fails to resolve this problem and would allow NPPs to be operated with the citizenry, as ever, bearing the huge risk involved. Implementing deregulation of the power industry*

Clean-up activities in Iitate, 2015.

*while accepting that it is fine to push this enormous risk onto the citizens greatly alleviates the burden on nuclear business operators and will lead to a serious deterioration in the competitive environment."*

1. Asahi Shimbun, 1 Nov 2018, 'Editorial: So who will foot the bill if another nuclear disaster strikes Japan?', ww.asahi.com/ajw/articles/AJ201811010019.html
2. Citizens Nuclear Information Center, Nov/Dec 2018, 'CNIC Statement: Don't push the risk onto citizens with the amendment of the Compensation for Nuclear Damage Act', Nuke Info Tokyo No. 187, www.cnic.jp/english/?p=4253

## Workers' accident compensation insurance payment

The labor ministry said on 12 December 2018 that the thyroid cancer of a male worker, exposed to radiation after the triple meltdown at the Fukushima No. 1 plant, has been recognized as a work-related disease. Following the decision by a labor ministry panel of experts, the labor standards inspection office of Hitachi, Ibaraki Prefecture, reached the conclusion on Monday. The man in his 50s became the sixth person to be granted a workers' accident compensation insurance payment over cancer caused by the March 2011 nuclear disaster at the plant operated by TEPCO. He is the second person to be compensated due to thyroid cancer.

*Japan Times, 13 Dec 2018, ' Tepco-linked firm employee's thyroid cancer caused by work after Fukushima nuclear plant meltdown, labor ministry admits', www.japantimes.co.jp/news/2018/12/13/national/tepco-linked-firm-employees-thyroid-cancer-caused-work-fukushima-nuclear-plant-meltdown-labor-ministry-admits/*

## Treatment and disposal of contaminated soil

Millions of cubic metres of contaminated soil (and other debris) are accumulating in the Fukushima off-site clean-up zone with little hope of a resolution to the problem.

Hideyuki Ban, co-director of the Citizens Nuclear Information Center, discusses changes in the government's 'basic thinking' about the problem:

*"The first "basic thinking" was announced by the Ministry of the Environment (MoE) on June 30, 2016 and has been added to twice since then. The latest version was announced on June 1, 2018 and is available on the MoE website. The official title is "Basic Thinking on the Safe Use of Reclaimed Materials from Removed Soil." 'Removed soil' refers to soil derived from decontamination work. The original plan was to transport this soil to the interim storage facility scheduled to be constructed in the surroundings of the Fukushima Daiichi Nuclear Power Station and then transport it outside Fukushima Prefecture after 30 years.*

*"When it became clear that contaminated soil in Fukushima Prefecture would reach 22 million cubic metres (m3), however, it was thought that "final disposal of the total amount would be unrealistic from the viewpoint of securing, etc. the necessary final disposal sites," and the "basic thinking" turned to recycling. Since the outlook for attaining agreements to construct final disposal sites outside Fukushima Prefecture is bleak, this was a makeshift plan to reduce, as far as possible, the volume of contaminated soil.*

*"Transport of the soil outside Fukushima Prefecture after 30 years was already enshrined in law, but considering that it was nigh on impossible to agree on where it should go, we can therefore say that reducing the amount to be disposed of through recycling is simply a means for straightening out the official story. The "Technological Development Strategy for Volume Reduction and Recycling of Removed Soil in Interim Storage,"*

*announced in April, ahead of the "basic thinking," clearly stated the target of reducing the volume of contaminated soil to be transported outside Fukushima Prefecture after 30 years to about 10% of the original amount. …*

*"[T]he technological development for soil treatment is thought to consist of 1) grading sand and gravel from the fine-grain component of the soil (silt and clay) that easily adsorbs cesium and then separating the cesium adhering to the sand and gravel, 2) a chemical treatment method whereby cesium is firstly eluted from the soil by a strong acid, etc., after which the cesium is recovered by an adsorbing agent, and 3) heat treatment, where cesium is volatilized by heating, then cooled and trapped. Each of these has problems and a technological development roadmap has been produced, according to which the basic technological development for all methods is to be completed over a period of ten years. Of these, the grading treatment is a technology that is already available and is positioned as the technological development that will be undertaken first.*

*"The general idea is that the amount of soil of 8,000 Bq/kg and below will be increased using the technologies developed and then recycled. The use of the removed soil for recycling, at or less than 8,000 Bq/kg, is to be "limited to embanking materials, etc. as component materials for structural foundations in public works, etc."*

Hideyuki Ban goes on to note that 100 Bq/kg is the clearance level for recycling materials from the demolition of nuclear power facilities, 80 times lower than the 8,000 Bq/kg proposed for contaminated soil in Fukushima Prefecture. The higher figure had been used as a clearance level for waste disposal, not recycling, but it "has been slowly turned on its head until 8,000 Bq/kg has become the standard for reuse. … These measures to straighten out the official story are making double standards the normality. In fact, there is the fear that the current clearance standards will be relaxed for certain uses. This creeping relaxation is totally unacceptable."

Three 'demonstration projects' have been proposed in Fukushima Prefecture. One – a contaminated soil recycling project in Nihonmatsu City – has already been cancelled due to local opposition. There are still two demonstration projects being implemented in Fukushima Prefecture, one in Minamisoma City (soil grading) and one in Iitate Village (an unpromising proposal to lay down contaminated soil on farmland and cover it over with 50 cm of uncontaminated soil).

Outside Fukushima Prefecture, projects are positioned as burial demonstration projects, and these are to take place at two locations, Nasu Town, Tochigi Prefecture and Tokai Village, Ibaraki Prefecture.

*Hideyuki Ban, 2 Oct 2018, 'Treatment and Disposal of Contaminated Soil', www.cnic.jp/english/?p=4225*

## Contaminated water continues to accumulate at Fukushima

Still no solution to the problem of what to do with contaminated groundwater, reactor cooling water and rainwater at the Fukushima nuclear plant. The volume continues to grow, albeit at a slower rate than in previous years. The government's preferred plan – diluting contaminated water then dumping it into the ocean – continues to be strongly resisted.

As of March 2018, about 1.05 million cubic metres (m3) of water were being stored in over 1,000 tanks, with an annual rate of increase of about 50,000 to 80,000 m3.[1] Currently, the storage tanks have a capacity of about 1.13 million tons and TEPCO plans to secure 1.37 million tons of storage capacity by the end of 2020.[2]

The 'Advanced Liquid Processing System' (ALPS) supposedly removes all radionuclides other than tritium. However, as the Citizens Nuclear Information Center noted in October, many citizens were surprised and angered when it was reported that other nuclides besides tritium were also present, sometimes at concentrations exceeding the notification concentration.[1]

*The Telegraph* reported on October 16:[3]

*"Water that the Japanese government is planning to release into the Pacific Ocean from the crippled Fukushima Dai-Ichi nuclear plant contains radioactive material well above legally permitted levels, according to the plant's operator and documents seen by The Telegraph.*

*"The government has promised that all other radioactive material is being reduced to "non-detect" levels by the sophisticated Advanced Liquid Processing System (ALPS) operated by the nuclear arm of Hitachi Ltd. Documents provided to The Telegraph by a source in the Japanese government suggest, however, that the ALPS has consistently failed to eliminate a cocktail of other radioactive elements, including iodine, ruthenium, rhodium, antimony, tellurium, cobalt and strontium. ...*

*"A restricted document also passed to The Telegraph from the Japanese government arm responsible for responding to the Fukushima collapse indicates that the authorities were aware that the ALPS facility was not eliminating radionuclides to "non-detect" levels. That adds to reports of a study by the regional Kahoko Shinpo newspaper which it said confirmed that levels of iodine 129 and ruthenium 106 exceeded acceptable levels in 45 samples out of 84 in 2017. ...*

*"Tepco has now admitted that levels of strontium 90, for example, are more than 100 times above legally permitted levels in 65,000 tons of water that has been through the ALPS cleansing system and are 20,000 times above levels set by the government in several storage tanks at the site.*

*"Dr Ken Buesseler, a marine chemistry scientist with the US Woods Hole Oceanographic Institution, said it was vital to confirm precisely what radionuclides are present in each of the tanks and their amounts. "Until we know what is in each tank for the different radionuclides, it is hard to evaluate any plan for the release of the water and expected impacts on the ocean", he told The Telegraph. ...*

*"Shaun Burnie, a nuclear specialist with Greenpeace, also disputes Tepco's claims that tritium is effectively harmless. "Its beta particles inside the human body are more harmful than most X-rays and gamma rays", he said, adding that there "are major uncertainties over the long-term effects posed by radioactive tritium that is absorbed by marine life and, through the food chain, humans.""*

Aileen Mioko-Smith from Kyoto-based Green Action Japan said last year: "This accident happened more than six years ago and the authorities should have been able to devise a way to remove the tritium instead of simply announcing that they are going to dump it into the ocean. They say that it will be safe because the ocean is large so it will be diluted, but that sets a precedent that can be copied, essentially permitting anyone to dump nuclear waste into our seas."[4]

To determine what to do with ALPS-treated water, the Japanese government created the Tritiated Water Task Force in December 2013 and it operated until June 2016.[1] The Task Force evaluated five options: geological disposal, land burial (solidified in concrete), oceanic release, atmospheric release (as steam) and a second type of atmospheric release (as hydrogen). It held public hearings in August 2018 to get a broad overview of the views of Japan's citizens on the problem of reputational damage.

Nobuko Tanimura from the Citizens Nuclear Information Center argues that it would not be possible to force through oceanic releases right away.[1] A firm decision may be some time away and a final resolution to the problem even further away. If a decision is made to proceed with ocean dumping, it would take another 2–3 years to prepare for the water's release into the ocean according to Nuclear Regulation Authority chair Toyoshi Fuketa.[5]

*Nikkei Asian Review* summarized the situation facing fishers in a November 2018 article:[6]

*"Since a catastrophic nuclear accident seven years ago, Fukushima fishermen have made painstaking efforts to rebuild their livelihood, assiduously testing the radioactivity levels of their catches to ensure safety. Now, rapidly accumulating wastewater from the crippled power plant is again threatening this hard-won business recovery.*

*"Faced with the prospect that there will be no more space to store tanks containing radioactive water leaking from the Fukushima Daiichi nuclear power plant, operator Tokyo Electric Power Co. Holdings and the Japanese government are considering diluting the water and dumping it into the ocean.*

*"Even though Fukushima's fishery has been recovering, the haul throughout the entire prefecture amounted to about 3,300 tons last year, just 10% of the average prior to the 2011 disaster. And even reaching there has not been easy. Fish markets in the prefecture now house testing rooms filled with equipment. Staff members mince seafood caught every morning to screen for radioactivity. Such painstaking efforts gradually enabled fishermen to return to the sea, with all fishing and farming operations resuming in February this year. But the trend could reverse if the government goes through with plans to release nuclear wastewater into the sea. ...*

*"Resolving the wastewater issue is a key step in achieving a sustainable fishing revival in Fukushima, according to Shuji Okuda, an official in charge of decommissioning and wastewater management at the Ministry of Economy, Trade and Industry's Agency for Natural Resources and Energy.*

*"I understand that we should cooperate for revival," one Fukushima fisher said. "But I'm afraid of the damage to our reputation," this fisher said. "I don't want them to dump anything into the ocean." ...*

*"At Tokyo's Toyosu market, wholesale prices for fish caught in the prefecture sell for about 30% cheaper than product from neighboring areas, according to a major wholesaler. Some distributors do not stock up on the prefecture's seafood for fear of driving away customers. ...*

*"In turn, domestic lobbying groups are resisting plans to discharge nuclear wastewater into the ocean – at least not until there is consensus at home and abroad that the practice is safe. "As a national representative of fishers, we oppose it," said JF Zengyoren, the nationwide federation of fishing cooperatives. "The reputational risk is still at hand," said Tetsuji Suzuki, managing director at the Fukushima Prefectural Federation of Fisheries Co-operative Associations."*


1. Nobuko Tanimura, 2 Oct 2018, 'The Fukushima Daiichi Nuclear Accident: Current State of Contaminated Water Treatment Issues and Citizens' Reactions', www.cnic.jp/english/?p=4219
2. The Yomiuri Shimbun, 19 May 2018, 'Storage capacity for radioactive water at Fukushima power plant nears limit', http://the-japan-news.com/news/article/0004451987
3. Julian Ryall, 16 Oct 2018, 'Japan plans to flush Fukushima water 'containing radioactive material above permitted levels' into the ocean', www.telegraph.co.uk/news/2018/10/16/japan-plans-flush-fukushima-water-containing-radioactive-material/
4. The Telegraph, 14 July 2017, 'Fishermen express fury as Fukushima plant set to release radioactive material into ocean', www.telegraph.co.uk/news/2017/07/14/fishermen-express-fury-fukushima-plant-set-release-radioactive/
5. Japan Times, 11 Jan 2018, 'Regulator urges Tepco to release treated radioactive water from damaged Fukushima No. 1 nuclear plant into the sea', www.japantimes.co.jp/news/2018/01/11/national/regulator-urges-tepco-release-treated-radioactive-water-damaged-fukushima-no-1-nuclear-plant-sea/

   Takumi Sasaki, 4 Nov 2018, 'Radioactive water threatens Fukushima fishery's fragile gains', https://asia.nikkei.com/Economy/Radioactive-water-threatens-Fukushima-fishery-s-fragile-gains

# NUCLEAR NEWS

## Taiwan's goal to become nuclear free remains unchanged: President Tsai

Taiwan's President Tsai Ing-wen said her administration's goal of making Taiwan a nuclear-free homeland remains unchanged, despite the November 24 referendum which saw 59% of voters calling on the government to abandon the 2025 deadline for the closure of all power reactors.[1]

President Tsai said the goal of phasing out nuclear power in Taiwan is part of the Basic Environment Act. "Therefore, that goal remains unchanged," she said.[1]

The ruling Democratic Progressive Party (DPP) legislated the 2025 nuclear-free deadline in 2016 but has now repealed the relevant passage in the Electricity Act.[2]

Ten referendum question were put to voters on November 24. All 10 proposals were supported by the opposition Kuomintang (KMT) party and opposed by the government. Voters supported all 10 propositions, and also dealt the DPP serious losses in local government elections on the same day. Other referendum propositions – all of them successful – included stipulating that thermal power plants should cut their output by at least 1% per year on average; that Taiwan not build any new coal-fired plants; and that restrictions should be maintained on the importation of foods from areas of Japan affected by the 2011 Fukushima disaster (supported by 77% of voters).[3]

Cabinet spokesperson Kolas Yotaka said the Executive Yuan respects the referendum result regarding the 2025 deadline and will work with relevant ministries to re-evaluate the country's energy policies.[4] Minister of Economic Affairs Shen Jong-chin said the policy review will be complete in two months.[5]

The anti-nuclear group National Nuclear Abolition Action Platform said that not all those who voted in favor of stopping the nuclear phase-out are unconditional supporters of nuclear power, but rather some lack confidence in Taiwan's energy transformation.[6]

Nuclear power generated 9.3% of Taiwan's electricity in 2017.[7] Two aging reactors were permanently shut down this year (Chinsan-1 reached its 40-year limit in October and Chinsan-2 was nearing its 40-year limit). The 40-year operating licenses for Taiwan's remaining four reactors will expire in 2021, 2023, 2024 and 2025. That fate of all six reactors will be contested in the coming period, as will the partially-completed Lungmen nuclear plant. Construction of the two Lungmen reactors was suspended in 2014 and 2015, with 55% public support for the suspension.[8]


1. Lu Hsin-hui and Evelyn Kao, 29 Nov 2018, 'Taiwan's goal to become nuclear free remains unchanged: President Tsai', http://focustaiwan.tw/news/aipl/201811290014.aspx
2. Cat Thomas, 26 Nov 2018, 'Govt Sidesteps Energy Referendums as Pro-Nuclear Group Mulls Further Action', https://international.thenewslens.com/feature/bluewave/108946
3. Jens Kastner, 7 Dec 2018, 'Taiwan's Voters Pull Plug on Energy Sources', www.asiasentinel.com/econ-business/taiwan-voters-pull-plug-energy-sources/
4. Ku Chuan and Ko Lin, 27 Nov 2018, 'Taiwan scraps nuclear-free deadline in wake of referendum', http://focustaiwan.tw/news/aipl/201811270027.aspx
5. 3 Dec 2018, 'Taipower withholds returning fuel rods pending new energy policy', http://focustaiwan.tw/news/aeco/201812030019.aspx
6. 25 Nov 2018, 'Anti-nuclear group undeterred by passing of pro-nuclear referendum', http://m.focustaiwan.tw/news/aipl/201811250029.aspx
7. https://pris.iaea.org/PRIS/CountryStatistics/CountryDetails.aspx?current=TW
8. www.world-nuclear.org/information-library/country-profiles/others/nuclear-power-in-taiwan.aspx


**Anti-nuclear protest in Taipei, 2014.**

Photo: Reuters

## Langer Heinrich 'dodged' N$219 million tax

*The Namibian* reported on December 12:[1]

*"The Namibian government lost N$219 million [US$15.4 million] in taxes from the sale of shares in one of the world's largest uranium mines, Langer Heinrich, because the country's tax avoidance law is not up to scratch.*

*"An investigation by The Namibian and UK-based journalism organisation Finance Uncovered revealed that the Australian multi-national mining corporation, Paladin Energy, pocketed N$665 million [US$46.7 million] after selling shares in the Langer Heinrich mine through a Mauritius-based offshore company.*

*"Paladin argues that using an offshore holding company means they are not liable to pay tax in Namibia. Tax on the proceeds of the sale would have amounted to N$219 million.*

*"When presented with details of the joint investigation, the Namibian tax office said they were unaware of the Langer Heinrich deal, but in their view, taxes should have been paid on the proceeds. Tax bosses admitted that problems with legislation mean they are unable to enforce the law on offshore transactions like that of Langer Heinrich.*

*"Conducting transactions through Mauritius as a way to avoid paying taxes on the profits when assets are sold, is a well-known tax avoidance loophole used by many companies around the world. ... According to Tax Justice Network Africa executive director Alvin Mosioma, companies like Paladin have been involved in "aggressive tax planning schemes" that leave most countries unable to collect enough revenue, primarily through Mauritius which has countless tax treaties with most countries."*

Similar accusations have been made about Paladin's Kayelekera uranium mine in Malawi (both Langer Heinrich and Kayelekera are in care-and-maintenance). United Nations' Special Rapporteur Olivier De Schutter noted in a 2013 report that "revenue losses from special incentives given to Australian mining company Paladin Energy, which manages the Kayelekera uranium mine, are estimated to amount to at least US$205 million (MWK 67 billion) and could be up to US$281 million (MWK 92 billion) over the 13-year lifespan of the mine."[2]

Paladin's environmental and social record has also been the source of ongoing controversy and the subject of numerous critical reports.[3]

And Paladin isn't the only Australian mining company embroiled in controversy in Africa. A 2015 report by the International Consortium of Independent Journalists found that that since 2004, more than 380 people have died in mining accidents or in off-site skirmishes connected to Australian mining companies in Africa.[5] The report further stated: "Multiple Australian mining companies are accused of negligence, unfair dismissal, violence and environmental law-breaking across Africa, according to legal filings and community petitions gathered from South Africa, Botswana, Tanzania, Zambia, Madagascar, Malawi, Mali, Cote d'Ivoire, Senegal and Ghana."

1. George Turner, Lazarus Amukeshe and Shinovene Immanuel, 12 Dec 2018, 'Langer Heinrich dodged N$219 million tax', www.namibian.com.na/73926/read/Langer-Heinrich-dodged-N$219-million-tax
2. 22 July 2013, 'End of mission statement by the Special Rapporteur on the right to food', www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=13567&LangID=E
3. Nuclear Monitor #847, 21 July 2017, 'Paladin Energy's social and environmental record in Africa', www.wiseinternational.org/nuclear-monitor/847/paladin-energys-social-and-environmental-record-africa
4. www.icij.org/project/fatal-extraction
5. www.icij.org/investigations/fatal-extraction/key-findings-11/

**The Langer Heinrich uranium mine in Namibia.**

Greenpeace action at Belgium's Tihange nuclear plant.

## Belgium: call to close Tihange-1 reactor

Greens member of the European Parliament Rebecca Harms has called for the decommissioning of Belgium's oldest nuclear reactor, Tihange 1, as it no longer meets international safety standards.

Harms' demand coincides with the publication of a damning new study on the risks of the continued operation of Tihange 1. The author of the study is Prof. Manfred Mertins, an expert in nuclear engineering and former member of the German Nuclear Safety Authority. He presented the findings at a news briefing in the European Parliament. The academic came to the conclusion that the continued operation of Tihange 1 due to "outdated reactor design, inadequate safety management and the accumulation of frequent unplanned events represents a potential danger for the site and its surroundings." It was particularly critical "that the results of international tests and current safety standards are not adequately taken into account."

Prof. Mertins said in the exhaustive study, which was commissioned by the Greens/EFA group, that: "It should be noted that the Tihange 1 nuclear power plant does not meet the requirements of reliable hazard and accident protection. The Tihange 1 nuclear plant provides only limited basic protection. Its design does not consistently cover the state-of-the-art requirements for protection against overarching external effects. This applies in particular to protection against airplane crashes, which, given the proximity to the airport at Bierset-Liège, is a highly safety-relevant factor. The crash of an airplane – larger than a sporting aircraft – would have a catastrophic impact on the site and its surrounding area."

Harms, who is nuclear energy spokesperson for the Greens/EFA group, said: "The frequent problems in recent years is an indication of the deficiencies and risks arising from the ageing of the [Tihange 1] plant. The Belgian authorities' handling of the problems of the Belgian reactor fleet, which is characterised by covering up and downplaying the risks, further increases the loss of confidence. The definitive closure of the oldest Belgian reactor could be a much-needed sign that the well-known problems are taken seriously. The authorities in neighbouring countries must also take action. The 43-year-old nuclear reactor Tihange 1 is threatening not only the safety of Belgian citizens but also of the citizens in neighbouring countries."

*Abridged with light editing from: Martin Banks, 11 Dec 2018, 'Rebecca Harms: Decommission 'hopelessly outdated' Belgian nuclear reactor', www.theparliamentmagazine.eu/articles/news/rebecca-harms-decommission-hopelessly-outdated-belgian-nuclear-reactor*