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Monitored this issue:

New setback for the Kvanefjeld mining project in Greenland

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According to Greenland's Ministry of Nature and Government, the Australian mining company Greenland Minerals Ltd. (GML), owner of the large Kvanefjeld rare earth elements and uranium mining project, has systematically undermined Greenland's environmental standards. In addition to misinforming the authorities, GML has failed to comply with requests and instructions to correct and supplement its environmental impact assessment (EIA) draft reports.

In a decision aimed at GML's Managing Director, John Mair, and co-signed by Greenland's Prime Minister, Kim Kielsen, and the Department of Nature and Environment's Permanent Secretary, Mette Skarregaard Pedersen, the Greenlandic government has rejected a complaint by GML about the length of the EIA review process, which is now in its fourth year.[1]

In the decision, it is established that GML frequently contacted high-ranking civil servants and ministers who have no competence within the EIA review process and that these contacts sought to undermine the authority of Greenland's Environmental Agency for Mineral Resources Activities (EAMRA). The government finds that this behaviour is unacceptable and requests GML to abstain from this practice.

Increasing international interest

A reason for GML's disregard of Greenland's environmental legislation could be increasing international focus on the mining project. Greenland is estimated to hold 38.5 million tons of rare earth oxides, while total reserves for the rest of the world stand at 120 million tons. In addition to containing the second biggest uranium deposit (according to GML)[2] and by far the largest thorium deposits, the Ilimaussaq-complex, of which Kvanefjeld is a part, has the second largest deposits of rare earth elements in the world.

Lately, Kvanefjeld has not only been the object of interest from the Chinese government, but also from the Trump administration. Both have signaled that they want the mining project to move forward. Earlier this year, the Chinese company Chinese National Nuclear Company, CNNC (formerly the Chinese Ministry of Nuclear Industry, which built the first Chinese atomic bomb and hydrogen bomb), formed a joint investment company with another Chinese company, Shenghe Resources Holding, which is the biggest shareholder in GML. Many expect that the Chinese could take over the mining project, if GML is granted a mining license.

Furthermore, the U.S. Geological Survey has carried out explorations in the area and recently the American ambassador to Denmark visited Narsaq – the town located only 6 km from the projected mining site – accompanied by energy experts from the U.S. State Department. According to some sources, GML may even have been involved in the process that led to the Trump administration's offer to buy Greenland.[3]

Lack of documentation

It is expected that the government's rebuttal of GML will prolong the EIA process for some time. GML submitted its application for a mining license to EAMRA in June together with its fourth EIA draft report.[4] The three previous drafts had all been rejected because of lack of documentation. The same month, a Memorandum of Understanding between the Greenland and U.S. governments to explore minerals in Southern Greenland was signed.[5]

Nonetheless, the timing of the submission was surprising, considering that EAMRA had identified a series of issues that had not been sufficiently addressed by the mining company. Among other things, GML is criticised for not providing a comprehensive assessment of the earthquake risk in the region, final results of tests of toxic elements during extraction and processing, final radiological estimates and results of investigations of impacts of radioactive minerals, and for failing to describe the alternatives regarding management of tailings and the shutdown of the tailings facility.[6]

Kvanefjeld's negative environmental impact

For years, the Kvanefjeld project has also been criticized by Greenlandic and Danish NGOs and green groups for not living up to Greenland's environmental standards. Despite the fact that Greenland is not a signatory to the Aarhus Convention and attempts from GML to block their access, they have continuously been able to publish the mining company's EIA draft reports.[7] The consensus is that none of the reports address the concerns of the local population, NGOs, politicians and international environmental and health experts.

Considering that there is no real difference between the latest and earlier EIA draft reports, criticism of the mining project largely remains the same. In 2017, at the request of the NGOs and green groups, Jan Willem Storm van Leeuwen, an expert in technology assessment and life cycle analyses of energy systems in the Netherlands, published an analysis of GML's first draft report[8], which is still valid.

Protest against uranium mining, Greenland, 2018.

Among other things, he concludes that extracting the full resources from Kvanefjeld would generate a tailings volume about ten times larger than in the current design of the mining project. Because the ores also contain thorium in concentrations 3-10 times higher than uranium, the radioactivity of the tailings would be 3-10 times higher than might be expected based on the presence of uranium alone.

The storage of the tailings in the tailings facility in the Taseq basin would generate health hazards due to unavoidable events, even if the dams would behave as planned. This risk would grow with time, the more so after the final closure phase when inspections and maintenance might come to an end.

In addition to authorized discharges, also unintentional, but unavoidable discharges might be expected caused by leaks, spills, seepages and accidents. In the course of years, a vast area around the mine would become contaminated by radioactive and non-radioactive materials from the mine, many of which may be highly toxic. People living in the contaminated area would be chronically exposed to radioactive and other toxic species via drinking water, food and air.

Seafood would become contaminated as well, due to the substantial discharges of wastes into the coastal sea. Bioaccumulation of radionuclides and nonradioactive chemicals in the food chain may also become a serious problem.

Furthermore, according to van Leeuwen, the quality of the uranium ores at the Kvanefjeld is very near the energy cliff, due to the low grade and the mineralogy of the ore. This means that a nuclear energy system using uranium from this ore, measured from cradle to grave, is an energy sink and does not deliver useful energy to the world.

Unlikely to meet environmental and climate requirements

J.W. Storm van Leeuwen's estimates are compounded by more recent assessments. In 2018, the NGOs and green groups involved in the Kvanefjeld campaign asked for an expert opinion on the embankment structures in Kvanefjeld's tailings facility by an independent Austrian expert, heading an engineering office, which among other things deals with the assessment of the stability of dam structures.

After reviewing GML's EIA draft reports, including the latest, and their approximately 70 background documents, he concluded that he could not give an opinion, because there was no plan for or description of the embankment structures. Thus, the project could not be precisely defined and the risks of the project reliably identified[9]. The lack of documentation has been confirmed by EAMRA as well as Greenland's Ministry of Nature and Environment.

Furthermore, the mining project not only violates the Mineral Resources Act's environmental requirements, but also its climate protection requirements, because it significantly increases Greenland's total CO2 emissions.[10] Initially, the CO_2 emissions were expected to increase from currently almost 10 tons CO2 per capita yearly to 16 tons – i.e. more than 60 percent – in the operational period, which could be centuries, considering the size of the uranium deposit. In the latest, EIA report, however, the increase is set at 43 percent, from almost 10 tons CO2 per capita to almost 14 tons per year. Nonetheless, it is projects

like Kvanefjeld that are perceived to have prevented the Greenlandic government from adopting the Paris Agreement and other international climate agreements.

Threatening the Kujataa UNESCO world heritage site

The Kujataa world heritage site[11], which was inscribed on UNESCO's world heritage list in 2017, could also be a nail in the coffin for the Kvanefjeld mining project. The site – a sub-arctic farming landscape – is located very close to the mining area. The property consists of five components, which represent key elements of the Norse Greenlandic and modern Inuit farming cultures.

There have already been calls to put Kujataa on the World Heritage Convention's danger list. Kujataa's unique farming traditions have been a determining factor in designating it as world heritage. However, the Danish Risø National Laboratory has estimated that up to a thousand tons of radioactive dust might be released annually from the open pit mine[12]. A lot of it will be carried by heavy arctic sea winds across the region, where it will affect among others agricultural activities. Currently, the World Heritage Centre is monitoring the site closely and has asked for additional information from the Greenlandic and Danish authorities.[13]

As of now, the World Heritage Committee has a no-mining-policy, and in addition to a no-go policy (no mining on the site) there are efforts to adopt a no-impact policy – no mining which could have an environmental impact on the site.

Also, a campaign has been launched to make the Kujataa world heritage site include the Erik Aappalaartup Nunaa Peninsula itself, where Kvanefjeld is located. One of the participants is Alliance for Nature, an Austrian NGO specializing in defending existing and identifying potential new world heritage sites.

So, what is on the cards? There is no denying that popular sentiments towards the Kvanefjeld project have changed. People in Greenland are not eager to see their mineral resources taken over by China and the U.S. The latest incident involving GML makes it unlikely that any decision on a mining license will be made this year. Furthermore, GML's lack of ability to produce an EIA report that meets the environmental and climate requirements of Greenland's Mineral Resources Act could ultimately stop the mining project in its tracks or at least delay it indefinitely.

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An undeclared ‘organic’ nuclear power phase-out

Author: Jim Green – Nuclear Monitor editor

There was a striking increase in the number of nuclear power reactor construction starts in the late 2000s – 50 from 2006–2010 compared to just 13 in the preceding five years.[1] Some of that momentum spilled over into the post-Fukushima years – 32 construction starts from 2011–2015.[2] But construction starts have dried up dramatically – just 13 from Jan. 2016 to Nov. 2019, averaging 3.1 per year.[2]

In January 2019, the World Nuclear Association expected that 15 power reactors would enter commercial operation this year.[3] But as of early November, only eight have either commenced operation (three) or are expected to by the end of the year (five).[2]

That pattern has been repeated in recent years: delays have been the norm and estimated dates for grid-connections have been pushed back.

In the broad sweep of things, this pattern probably means that the earlier spike in construction starts probably won’t result in a spike (or even a mini-spike) in operational reactors. Instead, for the next decade or so, we’ll likely see a continuation of the stagnation that has been evident for the past quarter-century.[4]

After that, the Era of Nuclear Decommissioning will be upon us, characterized by a decline in the number of operating reactors; an increasingly unreliable and accident-prone reactor fleet as aging sets in; countless battles over lifespan extensions for aging reactors; an internationalization of anti-nuclear opposition as neighboring countries object to the continued operation of aging reactors; and escalating battles over and problems with decommissioning and waste disposal.[5]

Construction starts in recent years have averaged just over three per year but, as discussed on *Nuclear Monitor #871*, there will likely be an average of 8-11 permanent reactor shut-downs per year over the next few decades.[6] The industry will attempt to bridge the gap by increasing the rate of construction starts and by deferring permanent reactor shut-downs. But its efforts will most likely only slow rather than stop what seems an inevitable decline. The aging of the reactor fleet is the elephant in the room: the average age of the fleet has just passed 30 years.[7]

Permanent reactor shut-downs can be deferred – at some cost, and at some additional risk – but they cannot be deferred indefinitely. The International Atomic Energy Agency (IAEA) anticipates 325 gigawatts (GW) of retirements by 2050 – that’s more than 80% of current global capacity.[8] The IAEA estimates the closure of up to 139 GW from 2018–2030 – that’s one-third of current global capacity.[8]

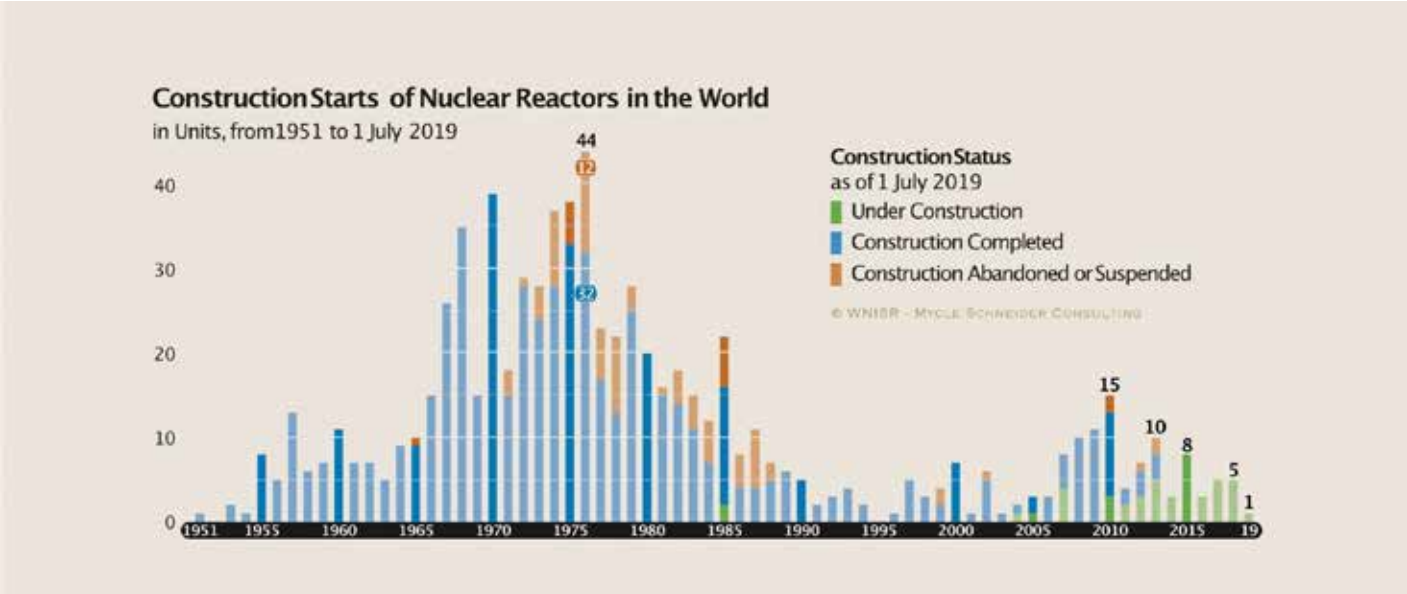
Jim Little, a veteran of the US nuclear industry, put the problem bluntly in mid-2017 with these rhetorical questions:[9]

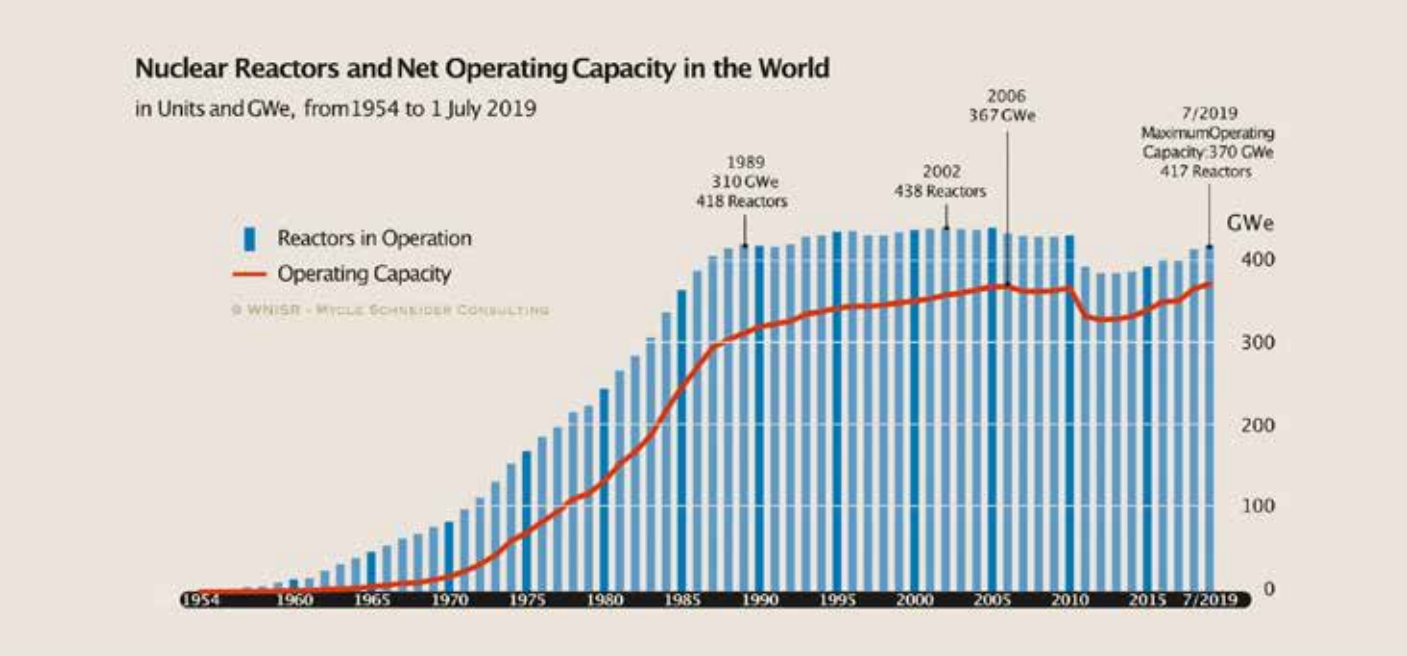
“Would you be willing to continue investing in an established business with flat revenues, increasing costs while competing against an agile field of competitors who enjoy a market advantage of lower costs, quicker deployment schedules and the support of government subsidies and favorable public opinion? Should you stay the course and focus on addressing those challenges or divest? This is the stark choice facing the nuclear power industry today.”

World Nuclear Industry Status Report 2019

Mycle Schneider, coordinator of the World Nuclear Industry Status Report (WNISR) states: “There can be no doubt: the renewal rate of nuclear power plants is too slow to guarantee the survival of the technology. The world is experiencing an undeclared ‘organic’ nuclear phaseout.”[10]

Source: World Nuclear Industry Status Report 2019.





Source: World Nuclear Industry Status Report 2019.

As always, the recently-released edition of the annual WNISR has much of interest and value.[7] Some points of interest from WNISR-2019 are noted here:

Global nuclear operating capacity increased to 370 GW in 2018 (excluding 25 GW in long-term outage). That is a new historic maximum, slightly exceeding the previous peak of 368 GW in 2006. But that just means that the 25-year pattern of stagnation is still in evidence:

- as of mid-2019, there was one less power reactor in operation than in 1989.
- worldwide nuclear electricity generation of 2,563 terawatt-hours (TWh) in 2018 was 3.7% below the historic peak in 2006.
- the number of operating reactors – 417 as of mid-2019 – remains significantly below the historic peak of 438 in 2002.
- the share of nuclear power in the electricity mix (10.15% in 2018) is well down on the peak in 1996 (17.5%)
- the number of power reactors under construction peaked in 1979, while construction starts peaked in 1976.

The number of power reactors under construction globally declined for the sixth year in a row in 2018, from 68 reactors at the end of 2013 to 46 by mid-2019, of which 10 are in China. At least 27 of the 46 units under construction are behind schedule, mostly by several years.

The average age of the world operating nuclear reactor fleet reached 30.1 years by mid-2019, exceeding the figure of 30 years for the first time. A total of 272 reactors, two-thirds of the world fleet, have operated for 31 or more years, including 80 (19%) that have reached 41 years or more.

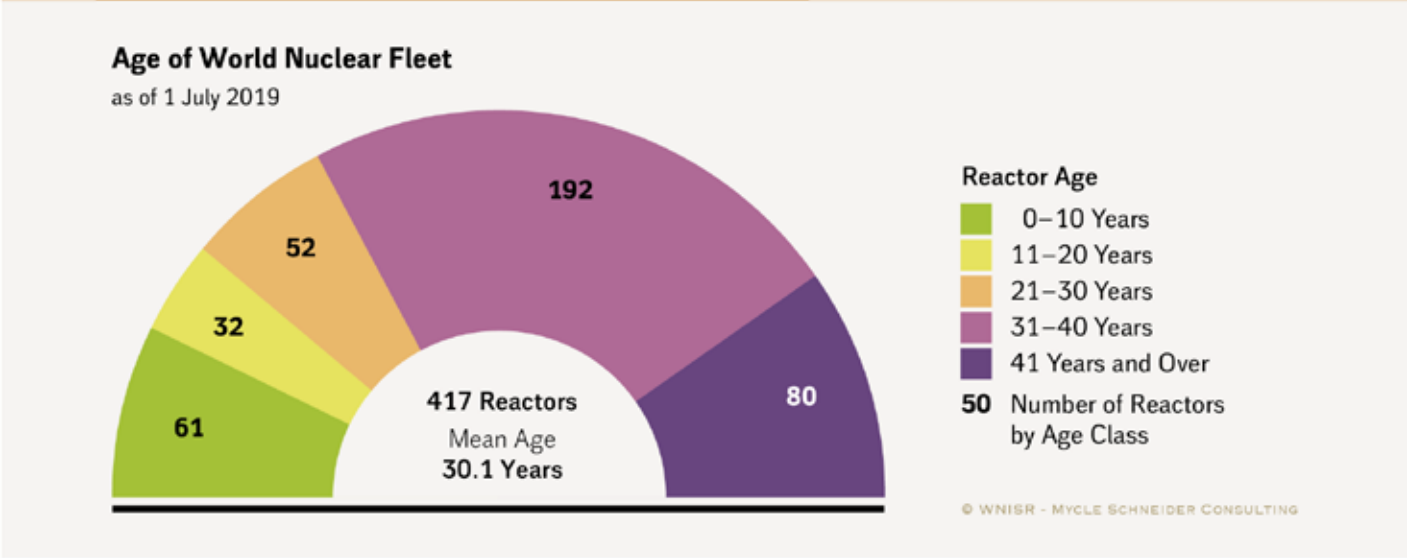
The average construction time of the latest 63 power reactors in nine countries (including 37 in China) that started up since 2009 was 9.8 years.

Between 1970 and mid-2019, a total of 94 (12% or one-in-eight) of all construction projects were abandoned or suspended in 20 countries at various stages of advancement.

As of mid-2019, 162 of the 181 closed power reactors in the world are awaiting or are in various

Figure 14 | Age Distribution of Operating Reactors in the World

Source: World Nuclear Industry Status Report 2019.



stages of decommissioning; only 19 have been fully decommissioned. WNISR-2019 discusses the "soaring costs" associated with decommissioning, with challenges coming to the fore as a growing number of nuclear facilities are being shut down.

China:

- Still no construction start of any commercial reactor in China since December 2016.
- China will by far miss its Five-Year-Plan 2020 nuclear targets of 58 GW installed and 30 GW under construction.
- China spent a record US$146 billion on renewables in 2017 – more than half of the world's total – and saw a decline to US$91 billion in 2018, but still close to twice the U.S., the second largest investor with US$48.5 billion.
- In 2018, electricity production from wind (366 TWh) far exceeded that from nuclear (277 TWh), with solar power catching up quickly (178 TWh). (The same phenomenon is seen in India, where wind power (60 TWh) outpaced nuclear (35 TWh) in 2018, with solar (31 TWh) fast catching up with nuclear.)

Four newcomer countries are building reactors – Bangladesh, Belarus, Turkey and the UAE. The first reactor startup in UAE is at least three years behind schedule. The first unit in Belarus is at least one year delayed. At the Turkish Akkuyu site, cracks were identified in the foundation of the reactor building, leading to replacement work and likely to delays. The project in Bangladesh only started recently.

Small Modular Reactors: The WNISR-2019 chapter on SMRs concludes with these words:

"Although policymakers in many countries continue to be interested in SMRs, it has become evident that they will be even less capable of competing economically than large nuclear plants, which have themselves been increasingly uncompetitive. Thus, even if a few SMR projects get built over the next decade or beyond, typically as a result of massive support from one or more governments, it is unlikely that SMRs could play any significant role in the future electricity sector."

Nuclear power vs. renewables:

- A record 165 GW of renewable capacity were added to the world's power grids in 2018, up from 157 GW added the previous year. Globally, wind power output grew by 29% in 2018, solar by 13%, nuclear by 2.4%.
- Levelized Cost of Energy (LCOE) analysis for the US shows that the total costs of renewables are now below of coal and combined cycle gas. Between 2009 and 2018, utility-scale solar costs came down 88% and wind 69%, while new nuclear costs increased by 23%.
- In 2018, the reported global investment decisions for the construction of nuclear power totaled around US$33 billion for 6.2 GW, which is less than a quarter of the investment in wind and solar individually (US$134 billion in wind power and US$139 billion in solar).
- Ten of the 31 countries operating nuclear power reactors generated more electricity in 2018 from non-hydro renewables than from nuclear power (Brazil, China, Germany, India, Japan, Mexico, Netherlands, Spain, South Africa and the UK). That is one more, South Africa, than in 2017.

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Cyber vulnerability of Kudankulam nuclear plant: risks more pronounced than the current episode reveals

Author: Kumar Sundaram – Editor of DiaNuke.org

October 31 – It has been over 48 hours since Pukhraj Singh, a former officer in the National Technical Research Organisation (NTRO), India's key federal agency that deals with cybersecurity and other intelligence challenges, sounded an alert about a 'domain-controller level access' at the Kudankulam Nuclear Power Plant (KKNPP) located at the country's southernmost tip.[1]

Singh based his claim on a report made public by cyber-security website VirusTotal.[2] He also claims that he had notified the National Cyber Security Coordinator (NCSC) almost two months ago, on September 3rd, about witnessing a massive cyber attack breaching India's crucial infrastructure.[3] This attack apparently included other targets, at least one of which was more frightening than the KKNPP, according to Singh.[4]

Besides getting publicized widely in the media, Pukhraj Singh's attempt to highlight the development was lauded and retweeted by renowned national and international security experts[5], including Google's Security Researcher Silas Cutler.[6] The opposition MP Shashi Tharoor also raised the issue and demanded that the government put out a public explanation.[7]

Meanwhile, online media dug out a few more facts about the episode.[8] The security firm, Kaspersky had stated in September that it had detected a spy-tool named DTrack infiltrating India's financial institutions and research centers. DTrack can be used as a malicious 'Remote Administration Tool (RAT)', Kaspersky said.

Official flip-flop, wordplay and unanswered questions

The immediate response from the Indian authorities was one of outright denial. KKNPP's operator, the government-run Nuclear Power Corporation of India Limited (NPCIL), issued a press statement on October 29 terming the revelation 'false'. The NPCIL claimed that since KKNPP control systems are stand-alone, meaning they are not connected to the network, they are not vulnerable to any such breach.[9] In doing so, the NPCIL skirted two crucial issues – first, stand-alone systems are not immune to intrusions – as was seen in Iran's Bushehr reactor; and second, the NPCIL statement did not rule out the presence of malware in its IT-based 'domain control systems' that are outside the core Power Plant Control Systems and which are still crucial for running the reactors.[10]

Understandably, this denial did not quell the widespread apprehensions, speculations and questions which were being voiced by citizens on social media. Soon, the *Indian Express* quoted 'senior government officials' as having admitted that a recent audit, whose report is yet to be published, had in fact, found a cyber breach.[11]

As the cacophony grew louder, the NPCIL put yet another statement on its website, hyperlinked plainly as 'press release' on its home page, perhaps to purposefully downplay the episode, while admitting to the infiltration by the malware.[12] This press statement raises more questions than it answers. It states for instance, that while a personal computer of a 'user' who was connected to the IT-enabled administrative network had been infiltrated, the critical internet network of the plant itself remained isolated. Cybersecurity company, VirusTotal has dumped the data scraped by it in this case on its Twitter handle where the user has been identified as 'KKNPP administrator'.[13]

While the NPCIL's late admission raises crucial issues about administrative probity and laxity, the more alarming aspect is the admission that "identification of malware in NPCIL system is correct". This might imply, given the NPCIL's habitual wordplay, that not just the KKNPP, but the administrative and domain control systems of all nuclear plants and other facilities run by the NPCIL across India might have suffered from or have been vulnerable to this cyber-attack. An analysis in *Asia Times* claims that the DTrack found in this episode is highly sophisticated and was customized for the KKNPP.[14] However, after the NPCIL's press statement, it cannot be ruled out that the nation-wide administrative network of India's nuclear facilities might have been compromised.

The NPCIL's claim that the breach is confined to the administrative network and the control and safety network remains untouched is hard to digest. Last year, the Nuclear Threat Initiative's (NTI) report underscored that cybersecurity risks to powerplants have multiplied since the Stuxnet episode in 2010.[15] Stuxnet's biggest target was India although the Iranian case attracted more international attention for geopolitical reasons.[16] At the time, *Forbes Magazine* had carried a story suggesting that Stuxnet had killed India's communication satellite.[17]

More recently, a Chatham House report delved deeper into cybersecurity challenges for nuclear plants and highlighted "low levels of cyber incident disclosure, creating a false sense of security" as a crucial challenge for the nuclear sector.[18]

The Indian authorities' flip-flop does not inspire any confidence in this context. The NPCIL has been notorious for its opacity[19] and cover-ups[20]. Within four days of the Fukushima accident in 2011, the NPCIL's top-brass organized a press conference in Mumbai and claimed that "there was no nuclear accident" at Fukushima, even as the accident in Japan took a turn for the worse and the Japanese government had remained tight-lipped.[21]

Kudankulam: Threats beyond Dtrack

While some commentators seem justifiably concerned about the DTrack being ransomware as in Sony's case earlier and being a reason for the unprecedented and frequent shut-downs of the KKNPP ever since it was commissioned in 2013, amid massive grassroots protests, the network-related vulnerabilities of the Russian-imported nuclear plant might run deeper.[22]

All that NPCIL has clarified so far, is that in the current episode, the compromised windows PC, known for its vulnerabilities and Microsoft's voluntary collaborations with US security agencies, was not connected to the KKNPP's internal network system. However, even for the reactor-level information network, the Kudankulam plant uses imported Operating Software (OS) that opens up ways for infiltration and even deliberate manipulation by external forces.

While the automated control systems in Kudankulam have been supplied by the Rosatom affiliate Automated Control Systems (RASU)[23], this subsidiary of Rosatom is just a system integrator – it sources software and systems from other corporations such as Areva, Mitsubishi and Seimens.[24] Areva, the French nuclear giant, has been supplying major Instrumentation and Communication Systems (ICS) to the Russian nuclear industry for a long time.

For the Novovorenzh II reactor in central Russia, which is based on Kudankulam-type VVER design, Rosatom sources Instrumentation and Control Systems from Areva.[25] This suggests that TELEPERM XS, the digital reactor protector system developed by Areva NS is used in the new generation VVERs. Similarly, the German company Siemens has also supplied its SPPA digital systems for VVER type nuclear plants in several countries of the world.[26]

While there might not be anything inherently scandalous in the Indian nuclear operator using foreign-supplied crucial digital systems, the case of Kudankulam and NPCIL begs a series of questions that begin thus: Why is the NPCIL so secretive about the imported digital systems being used in Kudankulam? Making public such information is almost a norm globally, and is meant to instill confidence among citizens.

During the intense people's protests in the run-up to the commissioning of the Kudankulam plants between 2011 to 2013, the local citizens' organization, Peoples' Movement Against Nuclear Energy (PMANE) had filed repeated Right To Information (RTI) queries asking for the safety assessment report and other important documents pertaining to plant safety, and had reiterated its demands when the government initiated a dialogue with citizens which later turned out to be nothing more than an exercise in public relations as well as an attempt to buy more time prior to the regional elections before unleashing brutal violence against the peacefully protesting communities.

Both the NPCIL itself and the official delegation deputed for the purported 'dialogue' had refused to meet this basic demand. India's then Chief Information Commissioner, Sailesh Gandhi, even wrote an open letter to the Prime Minister calling the protesters' demands a fundamental democratic right and expressing dismay over the government's unyielding attitude.[27]

In the KKNPP, either the Russian corporation Rosatom is using Areva's or Siemen's ICT systems or has installed an independent system purely built by itself. The reactors in Kudankulam have been supplied to India on a turn-key basis so it can be assumed that India has not used an indigenous ICT system. Whatever might be the case, the Instrumentation and Control Systems are crucial parts of a nuclear reactor's functioning and any trouble in them can potentially lead to major accidents and even meltdowns. Failures or weaknesses of ICTs can definitely compound any other problems in the power plant and situations can spiral out of control.

It is important to recall that Kudankulam is among the several reactors for which sub-standard equipment was supplied between 2007 and 2010, owing to a major corruption scandal that had blighted the Russian nuclear industry involving a supplier named Zio-Podolsk.[28] This crucial issue was raised by the protesters, independent experts as well as the retired head of India's nuclear regulatory board, Dr. A Gopalakrishnan.[29] Although these concerns were brushed aside by the government then, the companies supplying digital systems for the KKNPP must have taken it into account and may have insisted that they did not want to get embroiled in a future crisis, especially since the Indian Nuclear Liability Act has an exceptional clause holding suppliers liable in case of an accident.

If, in this scenario, the NPCIL has an arrangement with foreign ICT suppliers, which is less-than-formal and discreet and is therefore shrouded in secrecy, it might also lead to issues such as reliability of regular updating of the digital systems in the KKNPP's crucial plant control systems. Cybersecurity is a dynamic challenge and India must ensure that its systems are reliable, upgradable and that, suppliers remain accountable.

On the contrary, the Modi government has been attempting to dilute the Nuclear Liability Act as both the domestic and international nuclear vendors and suppliers have been insisting on a playing field free of liability.[30] Additionally, the Modi government has introduced amendments to the Right to Information Act that will allow the NPCIL to be more opaque.[31] India's nuclear establishment had been militating against the RTI Act ever since it came into existence.[32]

Thus, the NPCIL's opacity has far more serious implications than imagined in the current mainstream discourse. *DiaNuke.org* revealed, back in 2013, the connection between Kudankulam and Stuxnet, and the much deeper cyber vulnerabilities and safety challenges that it implies: "At Kudankulam NPP the same turbines of type K-1000-60/3000, made by Power Machines, are used as they are in Iran's reactor at Busher, the alleged target of the virus. Siemens owns 26% of Power Machines. Software made by Siemens is used to steer these turbines, Stuxnet expert Langner presumes."[33]

To put things in perspective, the Stuxnet infiltration in the Iranian reactor at Bushehr was widely believed to have happened via the Russian nuclear vendor Atomsroyexpert's systems.[34]

The NPCIL must come clear on the larger issue of suppliers and systems involved in the KKNPP. Transparency is a pre-requisite when the safety of millions of Indian citizens is at stake. Also, the foreign control of crucial infrastructure is an important aspect that simply cannot be ignored.

Reprinted from DiaNuke.org, 31 Oct 2019: www.dianuke.org/cyber-vulnerability-of-kudankulam-nuclear-plant-risks-more-pronounced-than-the-current-episode-reveals/

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Nuclear Power – No Solution to Climate Change

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Proposals to expand nuclear power in order to reduce greenhouse emissions are misguided and should be rejected for the reasons discussed below – and others not discussed here, including the risks and impacts of catastrophic accidents.

1. Nuclear Power Would Inhibit the Development of More Effective Solutions

"You can spend a dollar, a euro, a forint or a ruble only once: the climate emergency requires that investment decisions must favor the cheapest and fastest response strategies. The nuclear power option has consistently turned out the most expensive and the slowest." – World Nuclear Industry Status Report project coordinator Mycle Schneider.[1]

Renewable power generation is far cheaper than nuclear power. Lazard's November 2018 report on levelized costs of electricity found that wind power (US$29–56 per megawatt-hour) and utility-scale solar (US$36–46 / MWh) are several times cheaper than nuclear power (US$112–189 / MWh).[2]

Thus the pursuit of nuclear power would inhibit the necessary rapid development of solutions that are cheaper, safer, more environmentally benign, and enjoy far greater public support.

Globally, renewable electricity generation has doubled over the past decade and costs have declined sharply. Renewables account for about 26.2% of global electricity generation.[3] Conversely, nuclear costs have increased massively over the past decade[4] and nuclear power's share of global electricity generation has fallen from its 1996 peak of 17.5% to its current share of 10.15%.[5]

As with renewables, energy efficiency and conservation measures are far cheaper and less problematic than nuclear power. A University of Cambridge study concluded that 73% of global energy use could be saved by energy efficiency and conservation measures.[6]

The 2019 edition of the World Nuclear Industry Status Report includes a chapter on climate change and nuclear power, which concludes with these words:[7]

"Stabilizing the climate needs solutions that are "granular, modular, mass-producible, fungible, quickly installable by diverse actors with little institutional preparation, and – most importantly – propelled by the powerful feedback of increasing returns and learning-by-doing." That describes energy efficiency and modern renewables but not nuclear power. Stabilizing the climate is urgent, but nuclear power is slow. It meets no technical or operational need that these low-carbon competitors cannot meet better, cheaper, and faster.

"Even sustaining economically distressed reactors saves less carbon per dollar and per year than reinvesting its avoidable operating cost (let alone its avoidable new subsidies) into cheaper efficiency and renewables. Whatever the rationales for continuing and expanding nuclear power, for climate protection it has become counterproductive, and the new subsidies and decision rules its owners demand would dramatically slow this decade's encouraging progress toward cheaper, faster options, more climate-effective solutions."

2. Small Modular Reactors vs. Small Modular Renewables

Electricity from small modular reactors (SMRs) will almost certainly be more expensive than power from large reactors because of diseconomies of scale.[8] A 2018 report by the CSIRO and the Australian Energy Market Operator found that power from SMRs would be more than twice as expensive as wind or solar power with storage costs included (two hours of battery storage or six hours of pumped hydro storage).[9] The cost of the small number of SMRs under construction is exorbitant.[10] Both the private sector and governments have been unwilling to invest in SMRs because of their poor prospects.[11]

An article by researchers from Carnegie Mellon University's Department of Engineering and Public Policy, published in 2018 in the *Proceedings of the National Academy of Science*, concludes that to develop an SMR industry in the US, "several hundred billion dollars of direct and indirect subsidies would be needed to support their development and deployment over the next several decades".[12]

The prevailing skepticism is evident in a 2017 Lloyd's Register report based on the insights of almost 600 professionals and experts from utilities, distributors, operators and equipment manufacturers. They predict that SMRs have a "low likelihood of eventual take-up, and will have a minimal impact when they do arrive".[13]

No SMRs are operating and about half of the small number under construction have nothing to do with climate change abatement – on the contrary, they are designed to facilitate access to fossil fuel resources in the Arctic, the South China Sea and elsewhere.[14] Worse still,

there are disturbing connections between SMRs, nuclear weapons proliferation and militarism more generally.[15]

The 2019 edition of the World Nuclear Industry Status Report states:[5]

"As a matter of physics, reactors do not scale down well, so the more-careful analysts acknowledge SMRs – including in China – would initially cost significantly (often about twofold) more per kWh than today's gigawatt-scale reactors. But ... today's new-build reactors already have ~5–10 times the levelized cost of modern renewables (let alone efficiency) per kWh. On durable observed learning curves (which nuclear power has never displayed), renewables will become another twofold cheaper by the time SMRs could be built, tested, and scaled. Two times 5–10 times two is a factor of 20–40 – far beyond any plausible saving from mass production. No nuclear miracle is waiting to emerge.

"Small Modular Renewables, which do scale down well and whose economies of mass production have several decades' head start, have decisively won on cost."

3. A Slow Response to an Urgent Problem

Expanding nuclear power is impractical as a short-term response to climate change. Planning and approvals can take a decade (particularly for nuclear 'newcomer' countries), and construction another decade, and it can take five years or more to repay the energy debt expended in the construction of the reactor. A University of Sydney report states: "The energy payback time of nuclear energy is around 6.5 years for light water reactors, and 7 years for heavy water reactors, ranging within 5.6–14.1 years, and 6.4–12.4 years, respectively."[16]

Taking into account planning and approvals, construction, and the energy payback time, it would be a quarter of a century or more before nuclear power could even begin to reduce greenhouse emissions in a nuclear newcomer country ... and then only assuming that nuclear power displaced fossil fuels.

The 2019 edition of the World Nuclear Industry Status Report states:[5]

"According to a recent assessment, new nuclear plants take 5–17 years longer to build than utility-scale solar or onshore wind power, so existing fossil-fueled plants emit far more CO2 while awaiting substitution by the nuclear option. In 2018, non-hydro renewables outpaced the world's most aggressive nuclear program, in China, by a factor of two, in India by a factor of three.

"Stabilizing the climate is urgent, nuclear power is slow. It meets no technical or operational need that these low-carbon competitors cannot meet better, cheaper, and faster. Even sustaining economically distressed reactors saves less carbon per dollar and per year than reinvesting its avoidable operating cost (let alone its avoidable new subsidies) into cheaper efficiency and renewables."

4. Catastrophic Cost Overruns: The Nuclear Power Industry is in Crisis

Supporters of nuclear power have issued any number of warnings[17] in recent years about nuclear power's "rapidly accelerating crisis" and a "crisis that threatens the death of nuclear energy in the West". They accept that "the industry is on life support in the United States and other developed economies", and they argue with each other about what if anything might be salvaged from the "ashes of today's dying industry".[18]

Consider the following statements, many of them from nuclear industry insiders:

- "I don't think we're building any more nuclear plants in the United States. I don't think it's ever going to happen. They are too expensive to construct." – William Von Hoene, Senior Vice-President of Exelon, 2018.[19]
- Nuclear power "just isn't economic, and it's not economic within a foreseeable time frame." – John Rowe, recently-retired CEO of Exelon, 2012.[20]
- "It's just hard to justify nuclear, really hard." – Jeffrey Immelt, General Electric's CEO, 2012.[21]
- "I don't think anybody's pretending you can take forward a new nuclear power station without some form of government underwriting or support." – Sir John Armitt, chair of the UK National Infrastructure Commission, 2018.[22]
- France's nuclear industry is in its "worst situation ever"[23], a former EDF director said in November 2016 – and the situation has worsened since then.[24]
- Nuclear power is "ridiculously expensive" and "uncompetitive" with solar. – Nobuo Tanaka, former executive director of the International Energy Agency, and former executive board member of the Japan Atomic Industrial Forum, 2018.[25]
- Compounding problems facing nuclear developers "add up to something of a crisis for the UK's nuclear new-build programme." – Tim Yeo, former Conservative parliamentarian and now a nuclear industry lobbyist, 2017.[26]
- "It sometimes seems like U.S. and European nuclear companies are in competition to see which can heap greater embarrassment on their industry." – *Financial Times*, 2017, 'Red faces become the norm at nuclear power groups'.[27]
- "I don't think a CEO of a utility could in good conscience propose a nuclear-power reactor to his or her board of directors." – Alan Schriesheim, director emeritus of Argonne National Laboratory, 2014.[28]
- "New-build nuclear in the West is dead" due to "enormous costs, political and popular opposition, and regulatory uncertainty" – *Morningstar* market analysts Mark Barnett and Travis Miller, 2013.[29]
- "Nuclear construction on-time and on-budget? It's essentially never happened." – Andrew J. Wittmann, financial analyst with Robert W. Baird & Co., 2017.[30]

US nuclear industry insider Jim Little summarizes one thread of the nuclear power crisis:[31]

"One of the more disconcerting and difficult issues facing the industry is a loss of talent and experience right at a time when it is most needed to transfer knowledge to the next generation. The nuclear workforce demographic contains a large percentage of experienced talent reaching retirement age within the next five to ten years. With fewer people entering the industry, addressing the

needs of the operating fleet will become more and more difficult and expensive. Further efforts to reduce costs by trimming workforces would only exacerbate the problem."

It makes no sense to be pinning expectations on nuclear power when the industry is crisis-ridden and incapable of delivering. It does make sense to phase-out nuclear power, as a growing number of countries are doing including Germany, Switzerland, Spain, Belgium, Taiwan and South Korea.

5. Nuclear Weapons Proliferation and Nuclear Winter

"On top of the perennial challenges of global poverty and injustice, the two biggest threats facing human civilisation in the 21st century are climate change and nuclear war. It would be absurd to respond to one by increasing the risks of the other. Yet that is what nuclear power does." – Australian academic Dr. Mark Diesendorf

Nuclear power programs have provided cover for numerous covert weapons programs[32] and an expansion of nuclear power would exacerbate the problem. After decades of deceit and denial[33], a growing number of nuclear industry bodies and lobbyists now openly acknowledge and even celebrate the connections between nuclear power and weapons.[34] They argue that troubled nuclear power programs should be further subsidized such that they can continue to underpin and support weapons programs.[35]

For example, US nuclear lobbyist Michael Shellenberger previously denied power–weapons connections but now argues that "having a weapons option is often the most important factor in a state pursuing peaceful nuclear energy", that "at least 20 nations sought nuclear power at least in part to give themselves the option of creating a nuclear weapon", and that "in seeking to deny the connection between nuclear power and nuclear weapons, the nuclear community today finds itself in the increasingly untenable position of having to deny these real world connections."[36]

Former US Vice President Al Gore has neatly summarized the problem:[37]

"For eight years in the White House, every weapons-proliferation problem we dealt with was connected to a civilian reactor program. And if we ever got to the point where we wanted to use nuclear reactors to back out a lot of coal ... then we'd have to put them in so many places we'd run that proliferation risk right off the reasonability scale."

Running the proliferation risk off the reasonability scale brings the debate back to climate change. Nuclear warfare − even a limited, regional nuclear war involving a tiny fraction of the global arsenal − has the potential to cause catastrophic climate change. The problem is explained by Alan Robock in *The Bulletin of the Atomic Scientists*:[38]

"[W]e now understand that the atmospheric effects of a nuclear war would last for at least a decade − more than proving the nuclear winter theory of the 1980s correct. By our calculations, a regional nuclear war between India and Pakistan using less than 0.3% of the current global arsenal would produce climate change unprecedented in recorded human history and global ozone depletion equal in size to the current hole in the ozone, only spread out globally."

Nuclear plants are also vulnerable to security threats such as conventional military attacks (and cyber-attacks such as Israel's Stuxnet attack on Iran's enrichment plant), and the theft and smuggling of nuclear materials. Examples of military strikes on nuclear plants include the destruction of research reactors in Iraq by Israel and the US; Iran's attempts to strike nuclear facilities in Iraq during the 1980−88 war (and *vice versa*); Iraq's attempted strikes on Israel's nuclear facilities; and Israel's bombing of a suspected nuclear reactor site in Syria in 2007.[39]

6. Climate Change & Nuclear Hazards: 'You need to solve global warming for nuclear plants to survive.'

"I've heard many nuclear proponents say that nuclear power is part of the solution to global warming. It needs to be reversed: You need to solve global warming for nuclear plants to survive." – Nuclear engineer David Lochbaum.[40]

Nuclear power plants are vulnerable to threats which are being exacerbated by climate change.[41] These include dwindling and warming water sources, sea-level rise, storm damage, drought, and jelly-fish swarms. Research by Ensia finds that at least 100 nuclear power reactors built just a few metres above sea level could be threatened by serious flooding caused by accelerating sea-level rise and more frequent storm surges.[42]

At the lower end of the risk spectrum, there are countless examples of nuclear plants operating at reduced power or being temporarily shut down due to water shortages or increased water temperature during heatwaves (which can adversely affect reactor cooling and/or cause fish deaths and other problems associated with the dumping of waste heat in water sources). In the US, for example, unusually hot temperatures in 2018 forced nuclear plant operators to reduce reactor power output more than 30 times.[43]

At the upper end of the risk spectrum, climate-related threats pose serious risks such as storms cutting off grid power, leaving nuclear plants reliant on generators for reactor cooling.

'Water wars' will become increasingly common with climate change − disputes over the allocation of increasingly scarce water resources between power generation, agriculture and other uses. Nuclear power reactors consume massive amounts of cooling water − typically 36.3 to 65.4 million liters per reactor per day.[44] The World Resources Institute noted last year that 47% of the world's thermal power plant capacity – mostly coal, natural gas and nuclear – are located in highly water-stressed areas.[45]

By contrast, the *REN21 Renewables 2015: Global Status Report* states:[46]

"Although renewable energy systems are also vulnerable to climate change, they have unique qualities that make them suitable both for reinforcing the resilience of the wider energy infrastructure and for ensuring the provision of energy services under changing climatic conditions. System modularity, distributed deployment, and local availability and diversity of fuel sources − central components of energy system resilience − are key characteristics of most renewable energy systems."

7. Nuclear Waste

Globally, countries operating nuclear power plants are struggling to manage nuclear waste and no country has a repository for the disposal of high-level nuclear waste. A January 2019 report details the difficulties with high-level nuclear waste management in seven countries (Belgium, France, Japan, Sweden, Finland, the UK and the US) and serves as a useful overview of the serious problems that beset the industry.[49,50]

The United States has a deep underground repository for long-lived intermediate-level waste, called the Waste Isolation Pilot Plant (WIPP). However the repository was closed from 2014–17 following a chemical explosion in an underground waste barrel.[47] Costs associated with the accident are estimated at over US$2 billion.[48] Safety standards fell away sharply within the first decade of operation of the WIPP repository – a sobering reminder of the challenge of safely managing dangerous nuclear waste for millennia.

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Why the nuclear lobby makes stuff up about cost of wind and solar

In Nuclear Monitor #878, we wrote about some of the tactics used by the nuclear industry and its supporters to spin nuclear power's clear economic disadvantage compared to renewables ('Big claims about small nuclear reactor costs'). Giles Parkinson – editor of RenewEconomy.com.au – offers this critique of recent nuclear spin regarding the costs of renewable energy sources.

There was no doubt that – given the opportunity – the ever-optimistic nuclear lobby in Australia would attempt to seize the moment and press the claims of their favoured technology to the parliamentary inquiry[1] gifted to them by the federal government.

The nuclear lobby has largely given up on existing technology, recognising that the repeated cost blow-outs and delays means that it is too expensive, too slow and not suited for Australia's grid.

Instead, they have invested their hopes in a technology that doesn't actually exist yet, small nuclear reactors. But to promote it over the main competitors – wind and solar and storage – it has had to come up with forecasts for its pet technology that are, at best, fantasy, and assessments of wind and solar that are patently false and misleading.

It is generally accepted in the energy industry that the cost of new nuclear is several times that of wind and solar, even when the latter are backed up by storage. The GenCost 2018 report from the CSIRO and the Australian Energy Market Operator (AEMO) puts the cost of nuclear at two to three times the cost of "firmed renewables".[2]

The nuclear lobby, however, has been insisting to the parliamentary inquiry that wind and solar are four to seven times the cost of nuclear, and to try and prove the point the lobby has been making such extraordinary and outrageous claims that it makes you wonder if anything else they say about nuclear – its costs and safety – can be taken seriously.

RenewEconomy has been going through the 290-something submissions and reading the public hearing transcripts, and has been struck by one consistent theme from the pro-nuclear organisations and ginger groups: When it comes to wind, solar and batteries, they just make stuff up.

A typical example is the company SMR Nuclear Technology – backed by the coal baron Trevor St Baker[3] – which borrows some highly questionable analysis to justify its claim that going 100 per cent renewables would cost "four times" that of replacing coal with nuclear.

It bases this on modelling by a consultancy called EPC[4], based on the south coast of NSW, apparently a husband and wife team, Robert and Linda Barr, who are also co-authors of "The essential veterinarian's phone book", a guide to vets on how to set up telephone systems.

The EPC report admits to deliberately ignoring the anticipated cost reductions of wind and solar from AEMO's 2018 integrated system plan. Even worse, the report dials in a completely absurd current cost of wind at A$157/MWh (before transmission costs), which is about three times the current cost in Australia, and A$117/MWh for solar, which is more than double.[5]

The costs of wind and solar are not hard to verify. They are included in the GenCost report, in numerous pieces of analysis, and even in public announcements from companies involved, both buyers and sellers. St Baker could have helped out, as his company has signed two big solar contracts (for the Darlington and Vales Point solar farms) and we can bet he won't be paying A$117/MWh.

Apart from costs, the EPC scenarios for 100 per cent renewables are also, at best, imaginative. For some reason they think there will only be 10GW of solar in a 100% renewables grid and just 100MW of battery storage. Big hint: There is already 12GW of solar in the system and about 300MW of battery storage. But we discovered that assuming wind and solar do not or won't exist, and completely ignoring distributed energy, are common themes of the nuclear playbook.

The delivered cost of energy from wind and solar in the EPC modelling of a 100 per cent renewables grid? A hilariously outrageous sum of A$477/MWh (US$330/MWh).

Contrast this with SMR Nuclear Technology's claims about the cost of a modern small modular reactor – US$65/MWh – even though it admits the technology "has not been constructed", and which leading nuclear expert Ziggy Switkowski points out won't likely be seen for at least another decade. …

The EPC report also forms the basis of the analysis from the Nuclear Now Alliance, which describes itself as a not-for profit group of Australian scientists and engineers that are passionate about the benefits of nuclear "but have no connection to the industry."

Moltex, which says it is "developing" some sort of fission technology (it says it has a design but hasn't actually built anything) uses the same trick as EPC to paint a daunting picture of renewable and storage costs, in this case by multiplying the cost of batteries by the total amount of electricity consumed in a single day. "Australia consumes 627 Gigawatt hours of electricity per day, and

so the battery storage required to cover just one 24 hour period would cost A$138 billion," it proclaims. It is such an incredibly stupid and misleading claim that it simply takes the breath away. …

But that's what the nuclear industry feels it needs to do to make its yet-to-be invented technology sound feasible and competitive.

Let's go to StarCore, a Canadian company that says it, too, wants to manufacture small modular reactors, and claims renewables are "seven times" the cost of nuclear, and which also has a fascination with the Nyngan solar farm. It uses the cost of Nyngan to make the bizarre claim that to build 405 of them would cost A$68 billion, and then compares this to what it claimed to be the "zero upfront capital costs" of one of StarCore's plants.

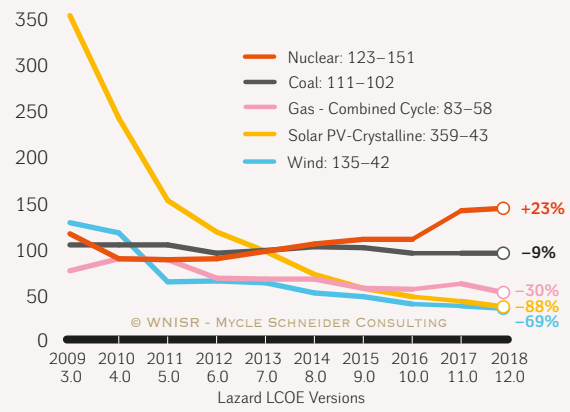
Say what? Does the nuclear plant appear just like that? Solar and wind farms also usually have long-term power purchase agreements, but they still have to be built and someone has to provide the capital to do so. Nuclear with a zero capital cost? Really, you couldn't make this stuff up.

Down Under Nuclear Energy, headed by a former oil and gas guy and a former professor at the University of Western Australia who specialises in mathematical social science and economics, also bases its solar costs on the Nyngan solar farm and makes this bizarre claim about battery storage: "The precipitous decline in solar technology is highly unlikely to be replicated in batteries, a technology already approaching 150 yrs of maturity," it says.

Hey, here's some breaking news. Costs of battery storage have already mirrored solar's fall, down 80 per cent in last decade[6] and utilities like Transgrid predict another 60 per cent fall over next 10-15 years.[7]

And most large-scale storage batteries use lithium, an abundant resource, and this is battery technology that was actually invented just over 40 years ago by the winners of this year's Nobel Prize for Chemistry. As the Nobel citation says: "(Co-winner Stanley) Wittingham developed the first fully functional lithium battery in the 1970s." Not 1870.

Women in Nuclear and the Australian Workers Union both quote the Industry Super report on nuclear, which we debunked a while back[8], which puts the cost estimates of wind and solar plants at 10 times their actual cost.



Source: World Nuclear Industry Status Report 2019, drawing on data from Lazard.

The "capital cost" of the Dundonnel wind farm in Victoria, for instance, is put at A$4.2 billion (try A$400 million) according to their bizarre calculations, while the Darlington solar farm is put at $5.8 billion (try A$350 million). It's pure garbage and the fact that it is being quoted really does beggar belief. …

But all the nuclear submissions have one common trait. They assume that the deployment of renewables is stopped in its tracks, either now of sometime soon. It's more wish than analysis, but in that they will have found a willing fellow traveller in federal energy minister, Angus "there is already too much wind and solar on the grid" Taylor, who thought it a good idea to have the inquiry.

But the reality is that the rest of the energy industry wants to move on. They know that the grid can be largely decarbonised within the next two decades from a combination of renewables and storage.

That's a simple truth that the nuclear lobby cannot accept, and they've passed up the opportunity to have an open and honest debate by promoting utter garbage about renewables, to the point where it would be difficult to believe much of anything else they say.

Abridged from RenewEconomy, 23 Oct 2019, https://reneweconomy.com.au/why-the-nuclear-lobby-makes-stuff-up-about-cost-of-wind-and-solar-46538/

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See also: http://onlineopinion.com.au/view.asp?article=20399&page=0

Joint Statement of the 2019 No Nukes Asia Forum – Taiwan

On Sept. 21-25, 2019, we held 2019 No Nukes Asia Forum – Taiwan.
After 5 day's discussion and visiting, we reached the conclusions and declarations stated below.

From our long experience and from our discussions in this forum, we have come to the following realizations of the current situation:

- Nuclear power is not a wise choice for humanity. It destroys the land and health of this and innumerable future generations. The urgent transition to renewable energy sources is the only credible response to the climate emergency. This transition must be done without causing any harm to Indigenous communities.
- Nuclear power is not a clean, safe, affordable or renewable energy source. It cannot be accepted as a response to climate change simply because it has lower carbon emissions than fossil fuels. It must be considered within the life span of nuclear chain. Beginning form uranium mining to nuclear waste processing and storage, including nuclear power plant construction and fuel processing carbon emission steps should be calculated as a whole. Furthermore, it releases radioisotopes and waste heat and generates radioactive wastes.
- Nuclear power cannot be an energy solution while it is insoluble with its nuclear waste issue and climate crisis makes it more risky because of uncertain access to cooling water. We cannot accept to use our planet's precious water to cool nuclear power plants while the world itself will be experiencing droughts and disasters.
- Nuclear power, nuclear weapons, and chemical weapons are closely entwined; they are a massive threat to the environment and to world peace.
- Indigenous and minority peoples, especially those who live in remote areas and who often have little political power or voice - have long been the victims of radiation contamination from mining, nuclear weapons testing, nuclear power plant operation, and nuclear waste disposal – as seen in Australia, Taiwan, China, India, U.S.A., and the South Pacific. The myth of "economic development" cannot morally justify destruction and death for a minority. Expropriation and contamination of their land must be recognized as both cultural and physical genocide, and rectified not just with monetary compensation, but with restoration of their land rights, improving radiation monitoring, access to health services and comprehensive rehabilitation of the land.
- Many nuclear reactors are now approaching the end of their operational life. This poses serious challenges, including decommissioning, land cleanup, radiation testing, and management of nuclear waste (including so-called temporary storage), must all be subject to rigorous and ongoing independent monitoring.
- Nuclear energy is shrinking in developed countries, while in China, India and other developing countries new plants are being planned and constructed, often under authoritarian governments that readily cover up technical shortcomings. Despite the experience of Fukushima, some countries are planning to restart inactive reactors and revive designs for plants that were shelved. The continued operation of older reactors brings them into a stage of higher risk.
- We need energy democracy. This can be built by improving the transparency of media, government and industry; promoting communication in society; allowing sufficient time and place for education and debate on policy. In citizens' electoral or voting processes, there must be complete disclosure of information, including conflict of interest.

Participants at the 2019 No Nukes Asia Forum.

To meet this situation, we must learn from each other and cooperate with each other, closely share information, and continue joint actions to support the anti-nuclear movements of all countries. The further task is to stimulate citizens and local communities to develop and utilize green renewable energy, with the ultimate goal of a future that is a nuclear-free Asia and nuclear-free earth. Specific actions to be taken at this time are as follows:

- Urge all Asian countries to support, sign and ratify the International Treaty on the Prohibition of Nuclear Weapons.
- Contest the nuclear industry and countries exporting their nuclear plants and technology in order to make a profit from harming the planet and its people.
- Urge IAEA to take responsibility to guide and to convince the countries especially which are very well known with their fault lines, such as India, Taiwan and Turkey, to stop their nuclear projects by learning from lessons such as of earthquake and consequences of Fukushima nuclear disaster.
- Urge all parties and governments to acknowledge, support and compensate the victims of radiation contamination from uranium mining, radioactive waste dumping and nuclear testing, including those in Australia, India, South Pacific, China, Mongolia, Russia, Taiwan, and Japan.
- Urge the people of Taiwan to participate in signing the petition for a referendum on "Abolish Nuclear, Get Renewable". The uncompleted Nuclear Power Plant No. 4 must be fully dismantled while it is still not radioactive. The site should be transformed to renewable energy generation and/or local needs. For the nuclear power plants that must be decommissioned in the near future, nuclear waste must be dealt with responsibly. Burning of low-level nuclear waste should be stopped, and the nuclear waste dump should be removed from Orchid Island.
- We reject the new ICRP draft on radiological protection. Its revision of reference levels for exposure doses suggests that staying in place after an accident poses a lower radiological risk than evacuating.
- We condemn the verdict of the Tokyo District Court, which found three former TEPCO executives not guilty in the criminal lawsuit concerning the Fukushima nuclear accident. We declare our support for the victims of the Fukushima NPP accident.
- We acknowledge that 2020 will be a significant year in Japanese nuclear-free politics with the hosting of the summer Olympics and the 75th anniversaries of the Hiroshima and Nagasaki bombings. The true ideals of the Olympic spirit must not be subverted for partisan or propaganda use to distract from the continuing and unresolved human and environmental impacts of the Fukushima crisis.

For more information on the No Nukes Asia Forum and Taiwan's nuclear debate, see:

- *A video on the 25-year history of the No Nukes Asia Forum: www.youtube.com/watch?v=89BE9kbJpP0*
- *Videos from NNAF 2019: www.youtube.com/user/toach2000/videos*
- *Tony Boys, Oct 2019, 'Can Taiwan Phase out Nuclear Power? – Report on the NNAF 2019 Field Trip to Taiwan's NPPs', http://www.cnic.jp/english/?p=4592*
- *Yesil Gazete, 25 Oct 2019, '10 countries gathered for 'Nuclear Free Asia'', https://yesilgazete.org/blog/2019/10/25/10-countries-gathered-for-nuclear-free-asia/*

Vice President Chen reiterates government's commitment to nuclear-free Taiwan

Vice President Chen Chien-jen said Sept. 23 that the government remains committed to phasing out the use of nuclear power by 2025. At the reception held at the Presidential Office for delegates who had attended the No Nukes Asia Forum (NNAF), Chen said that the government has launched numerous energy transformation policies in recent years, such as promoting renewables and allowing existing nuclear power plants to come to the end of their lifetimes. This progress makes the country an ideal location for the NNAF, he added.

Chen's remarks came while receiving representatives and academic scholars from Australia, China, India, Japan, Korea, Mongolia, the Philippines, Turkey, Vietnam and the U.S.

According to Chen, the government recognizes the importance of listening to different voices in society given the strong opinions on both sides of the nuclear power debate. To achieve sustainable development and ensure the people's safety, however, the use of atomic energy must be phased out, he said.

Founded in 1993, the NNAF is an annual gathering that brings together experts and academics from various groups across Asia to discuss and share their visions on how to end the use of nuclear energy.

Reprinted from: Taiwan Today, 24 Sept 2019, 'VP Chen reiterates government's commitment to nuclear-free Taiwan', https://taiwantoday.tw/

Delegates at the 2019 No Nukes Asia Forum with Taiwan's Vice President Chen Chien-Jen.