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Monitored this issue:

Nuclear priced out of net zero world

by Jonathon Porritt, former director of Friends of the Earth UK

Little wonder that nuclear trade bodies around the world (including the UK's Nuclear Industry Association) felt compelled to write an open letter to governments back in May urging them not to give up on nuclear, and to extend to nuclear generators the same kind of financial support as is made available to 'other low-carbon, clean and sustainable energy technologies'. The whole nuclear enterprise is very much on the back foot at the moment, with accelerated closure programmes in many countries, and declining orders globally.

Old and new nuclear problems

Some of the industry's problems are as old as the industry itself. In more than 50 years, for instance, concerns about proliferation have never been resolved. The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) came into force in 1970 in order to prevent the spread of nuclear weapons – but also 'to promote cooperation in the peaceful uses of nuclear energy'. And there's the rub: it's hard to promote nuclear energy without running the risk of those 'nuclear nations' developing nuclear weapons. Four of them (India, Pakistan, Israel and North Korea) have done precisely that since 1970, joining the Big Five nuclear weapons states of the USA, Russia, China, France and the UK. There are continuing concerns that other nations are intent on joining that nuclear weapons club, including the two most bitter rivals in the Middle East, Iran and Saudi Arabia.

And some problems are much more recent, including growing anxiety about cybersecurity. The recent ransomware attack that closed the largest fuel pipeline in the United States for five days, coming hot on the heels of the cyber-attack on Iran's nuclear complex at Natanz in April (widely believed to have been carried out by Israel), have provided further reminders of potential vulnerabilities here. Some security experts believe it's 'only a matter of time' before a nuclear power plant or other facility is subject to a full-on terrorist-inspired cyber-attack. Who knows? But reassurances from industry leaders that their 'stand-alone' operating systems, with multiple, notionally 'unbreachable' firewalls providing ample protection against even the most sophisticated cyber-attack, sound somewhat hubristic.

Economic performance

These are serious challenges. But most commentators agree that the real Achilles heel of nuclear power is its wretched economic performance. The construction cost of new nuclear reactors has been rising inexorably, year on year, ever since the Fukushima disaster ten years ago. There are any number of reasons for this: cost of capital, additional safety and regulatory requirements, design complexity, and so on.

It's never been easy getting a clear line of sight on the economics of nuclear power, and it still isn't. Countries like China (with by far the biggest investment in new nuclear over the last decade), Russia and India remain extremely secretive about financial issues, making like-for-like comparisons almost impossible. Things are somewhat clearer in the USA and Europe.

The only major construction project under way in the USA is at the Vogtle plant near Augusta in Georgia. Back in 2009, regulators approved two new AP1000 reactors (there are already two PWRs at Vogtle), scheduled to come online in 2016 and 2017 at a combined cost of around $14bn. There is still considerable doubt whether Vogtle 3 will meet the latest deadline of the end of this year (five years late, with Vogtle 4 at the end of 2022), but the combined cost now is much closer to $25bn.

Such massive cost overruns would be very familiar to EDF over on this side of the pond. It currently has three major construction projects under way in Europe – at Olkiluoto in Finland, at Flamanville in France and at Hinkley Point in the UK. Each in its own way is something of a disaster. The power station at Olkiluoto in Finland began construction in 2005, with plans for it to be online in 2009. The earliest it will be operating commercially is now 2022, with an initial budget of €3.2bn that has at least tripled since 2005.

Its power station at Flamanville began construction in 2007, with a view to it being online by 2012. 2023 is now the earliest possible start for commercial operations, and costs have risen from a projected €3.3bn to at least €10bn, and significant additional costs will be incurred at a later date to meet further regulatory demands.

Meanwhile, the current price tag for the two reactors at Hinkley Point C stands at around £23bn – and that's in 2015 prices, which means no account of inflation since then is included in this estimate. Hinkley Point C is widely recognised as the most costly power plant that has ever been constructed. Constantly escalating costs at Hinkley Point hardly inspire confidence with regard to EDF's plans for two new reactors at Sizewell C. It's adamant that it will be able to manage costs at Sizewell C far more effectively, as it would be an identical construction project to Hinkley Point C.

However, despite the Government's assertions in its Energy White Paper in December last year, the funding for Sizewell C is by no means secured. The UK Treasury remains steadfast in its refusal to provide direct subsidies, and third party investors (including both Aviva and Legal & General) have already declined to step into this particular breach. An undisclosed contribution may still be available from the Chinese company CGN (wholly owned by the Chinese Government), as is currently the case with Hinkley Point C, but even that is looking less and less certain.

The Government's favoured solution at the moment is to make use of a device called the 'Regulated Asset Base' (RAB), which means that consumers in the UK will pay up front for an as yet unspecified percentage of the construction costs. This could amount to as much as a £40 per annum surcharge on consumers' bills, for at least five years. Once construction is completed (notionally in 2035), consumers will then have to pay all over again for the very expensive electricity that Sizewell C will be generating.

At the moment, the principal question for Ministers seems to be whether there's any reasonable expectation of getting away with such a monstrous financial boondoggle.

The cost to the consumer of Hinkley Point C is widely recognised as scandalous. By guaranteeing EDF a price of £92.50/MWh (at 2012 prices – which amounts to around £102/MWh in today's prices) for the first five years of output, it's been estimated by the National Audit Office that EDF will be subsidised to the tune of anywhere between £30bn and £100bn during that time – adding somewhere between £10 and £15 to consumers' electricity bills every year

The long and the short of it is that nuclear power is now far more expensive than both solar and wind, as confirmed by the Government's own figures and by detailed Levelized Cost of Energy analysis from both Lazard and Bloomberg New Energy Finance. These cost differentials go on getting worse and worse every year.

SMR's in the UK

It may still be premature to assume that the era of large-scale nuclear in the UK is definitively over, but it's noticeable that both the industry and Government (as is indeed the case in the USA) are now waxing much more lyrical about the prospects for Small Modular Reactors (SMRs) and Advanced Modular Reactors. But here again, the economics look absolutely dire.

The UK Government has committed £250m to promote SMRs – in the hope that industry partners will now match that sum. It's already generously supported Rolls-Royce in its work to come forward with a new design, with the company promising to have a prototype up and running by 2029 at a cost of £2.2bn – with all subsequent reactors (up to 16 of them) being delivered at £1.8bn. The preposterous over-claiming here is doing little to reinforce Rolls-Royce's credibility, with no recognition that the economic case for SMRs only works if it's possible to use the waste heat from the electricity generation process – meaning that they would need to be sited near urban areas or industrial parks. Fat chance of that here in the UK.

I say 'fat chance', not least as Rolls-Royce's SMR is far from 'small': with a projected output of 470MW (as of the latest announcement in February this year), it's actually bigger than all the UK's former Magnox reactors!

Things are somewhat more advanced in the USA. In September 2020, NuScale received design approval for its SMR. However, it's still not licensed for construction with the US Nuclear Regulatory Commission having identified a number of safety concerns – all this after an investment of more than $1bn over the last two decades!

Even Bill Gates, a super-spreader of pro-nuclear propaganda, has failed to crack this 'next generation' challenge. Back in 2008, he set up a company called TerraPower to investigate the feasibility of a new 'travelling wave reactor', using molten salt as a coolant. TerraPower's promotional material is still promising people that its reactors will cost no more than $1bn a pop, with 'hundreds of these reactors around the world solving multiple different energy needs' by 2050. However, 13 years on, he has recently acknowledged that TerraPower is 'still years away from breaking ground' on even a basic prototype.

R. Baker, CC BY-SA 2.0

We can only hope that reality regarding all of these speculative ventures will eventually kick in. In the meantime, these lingering nuclear fantasies are increasingly problematic. When we talk about the costs of nuclear power, we must also take into account the opportunity costs: misdirected investments; time lost; muddled, incoherent policy-making; and an obstinate reluctance to understand the critical importance of maximising the bang for each and every low-carbon buck.

Nuclear too costly

Thirty-five years on from the disaster at Chernobyl, that may be a somewhat insensitive expression, given growing concern at an 'unexplained spike in radioactivity' within the entombed ruins of the Chernobyl complex – likened to 'embers in a barbecue pit' by Professor Neil Hyatt of the University of Sheffield. 'It's a reminder to us that it's not a problem solved; it's a problem stabilised.'

Far fewer people were affected by the disaster at Fukushima, but the financial costs of that disaster are staggering, with the Japanese Government itself acknowledging that the final clean-up bill will exceed $200bn. Independent experts (such as the Japan Centre for Economic Research) estimate that the final figure will be between $470bn and $660bn. Some believe that the combination of direct and indirect cost will top $1tn, making it by far the most costly disaster in human history.

Both Chernobyl and Fukushima serve to remind us of the vulnerability of the industry to these 'high-impact, low-probability' events. If there were no alternatives, one can understand why governments might persist with plans for new nuclear reactors, facing huge challenges associated with getting to a Net Zero carbon economy as fast as possible. Happily, we now know that the combination of renewables, storage and smart grids, all underpinned by an unremitting focus on energy efficiency, provides exactly the kind of ultra-low-carbon alternative on which almost all countries will soon come to depend.

This article is based on the original research done for Jonathon Porritt's new report: 'Net Zero Without Nuclear', which summarises in detail the case against the idea of any new nuclear power in the UK today.'

The small modular reactors and the big ambitions

Dr. G. Kastchiev, former Head of Bulgarian Nuclear Safety Authority

In October last year, the prime minister of Bulgaria surprisingly announced that the government was considering building small modular reactors (SMRs). On February 17 this year, it was reported that Kozloduy NPP - New Capacities and the American NuScale Power have signed a Memorandum of Understanding. The aim is to explore the possibility of building the MMRs (micro modular reactors) developed by NuScale Power. Kozloduy NPP - NM claims that there are no binding clauses in the memorandum, but since it is not publicly available in the media, various comments have appeared.

NuScale Power much more clearly states the company will support Kozloduy NPP - NM in conducting research, including feasibility studies, financial evaluation of the project, various engineering evaluations, planning and licensing, with the potential goal of building a new nuclear power plant with NuScale Power.

Both countries claim the technology is safe, reliable, maneuverable and ideal for Bulgaria. Some supporters of MMR suggest that by 2030 country would have 5-6 GW of such capacity built. Others loudly announced that nuclear modules could be placed even in the center of Sofia?!?

This material provides information on MMP projects and especially those on NuScale Power, and provides an opportunity to assess the validity of these claims.

Large and small reactors

In the initial phase of development of nuclear energy, all reactors had low power. The idea of scaling up was quickly conceived, as it led to significant financial benefits. On the other hand, the huge electricity systems of the main countries taking part in the development, make it possible to include high-power plants. This led to the creation of reactors with a capacity of up to 1650 MW electricity (EPR).

Reactors with an electrical capacity of more than 700 MW are large and those of less than 300 MW are small. From 300 to 700 MW are of average capacity, there is a class of microreactors (less than 10 MW). Most operating reactors in the world are of medium and high power. Those with low power are mainly created as prototypes of larger ones. Microreactors are intended mainly for space missions, in the past they were used by the USSR for satellites. There are ideas to potentially sue microreactors to power military bases, islands, etc.

The Chernobyl and Fukushima accidents have tightened regulatory norms and requirements and have even led to the addition of new safety systems. On the other hand, the huge size has led to problems in design, licensing and especially in construction. As a result, construction time and start-up costs increased sharply, and real prices turned out to be significantly higher than initially estimated.

One of the nuclear industry's ideas to restart was to circle back to designing small reactors. Thus, the reactor island can be simplified, making it more reliable, safer, easier and faster to build and ultimately cheaper and more attractive. However, the small size also leads to a number of negative consequences.

Most companies have focused on developing small modular reactors. In them, as a rule, the core and all components of the primary circuit are integrated in one module. It is prepared in factory conditions and transported for installation on site. Most NPP projects have several modules. It is believed that the construction time will be less, which will reduce interest costs. It is assumed that the construction of the individual modules can be done one by one, depending on the needs and will require less initial costs. In continuous production, the cost of one module will decrease enough. However, many economists believe that even with all the favorable factors, electricity from small reactors will be more expensive than large ones.

In 2005, 50 small reactor projects were under development and now 72 are being developed in 18 countries. 25 of them are with light and heavy water, 11 are fast neutrons with different heat carrier, 11 are high-temperature, 10 -of molten salts, etc. There are 18 projects under development in the United States, 17 in Russia, 9 in China, 8 in Japan and 7 in Canada. Even Denmark, Luxembourg and Saudi Arabia have announced that they are developing such projects.

It is not clear how many of these 72 projects are being worked on and how many will reach license and construction of a prototype stage. Only 10 are in the 4th and 5th design phases and three more designs of NPPs with small reactors are under construction or close to it:

- HTR-PM, China - two modules with high temperature reactors power a steam turbine with a capacity of 210 MW of electricity. Each module has a graphite retardant and helium coolant and a thermal capacity of 250 MW. It is expected to enter operation in 2021-2022.
- CAREM -25, Argentina - NPP with one integrated, light-water reactor, electric power about 30 MW.

NuScale Power

NuScale was founded in 2007 by scientists from the University of Oregon, developing technologies for passive cooling of reactors. Since 2011, the main shareholder in it is the engineering and construction corporation Fluor. A fundamentally new project for a light water reactor with natural circulation of the heat carrier (without pumps) in the primary circuit is being developed. The driving forces are the differences in the density of the heat carrier in the core and in the steam generator, and their height. This greatly simplifies the primary circuit but imposes thermal power limitations.

The lack of pumps and pipelines in the primary circuit allows all components (core, steam generator and pressure compensator) to be integrated into one metal housing. It is mounted in an outer metal housing, which serves as a protective shell (container) and can withstand much higher internal pressure than traditional ones. A small vacuum will be maintained in the container during operation, which will limit heat loss and corrosion of the metal. Cables, pipelines of the systems for water exchange and purification of the primary circuit, steam pipelines and pipelines for return of condensate come out of it. A new type of steam generator with spiral heat exchange tubes has been developed for the project. There is not much information about its reliability, service life, whether it can be repaired, replaced, etc. Critics of the project have expressed concern that it could be damaged by vibrations in emergency processes.

As of 2010, a module with 45 MW of electric power has been developed in principle. However, low power leads to expensive output and, as with the PBMR project, power increases begin. As of 2015, a module with thermal / electric power of 160/50 MW has been developed, which in 2020 has received approval from the regulator.

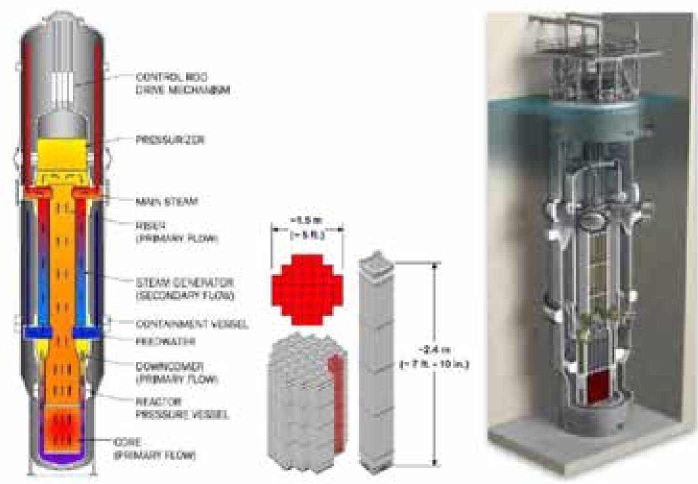
Economic results were still unsatisfactory and by 2019 a module was being developed with thermal power of 200 MW and electric power of 60 MW.

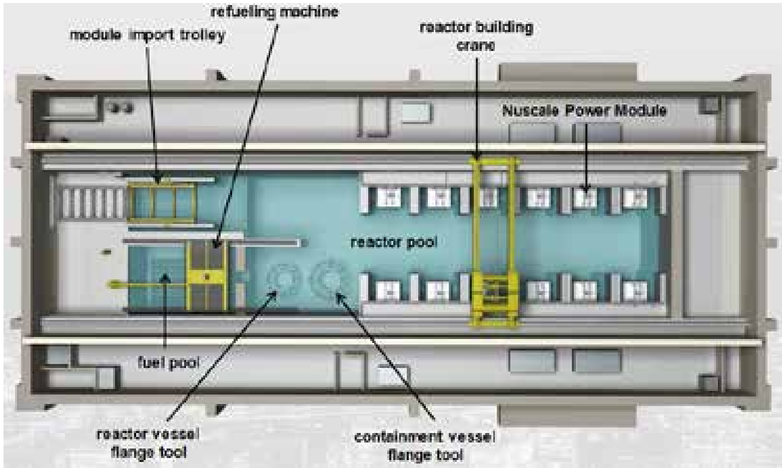
Months ago, NuScale Power announced that it was developing an even more powerful module with 250 MW of heat and 77 MW of electricity. It will be presented for licensing in 2022. The company has developments for NPPs with 4 and 6 modules, but the option with 12 modules is considered optimal. The plan is for the first NPP to have 12 modules of 77 MW and a total gross capacity of 924 MW. As you can see, for efficient operation, a nuclear power plant with MMR must have many modules and huge capacity.

NuScale Power has already invested more than $ 900 million in the development of the MMP, of which $ 317 million is from the government. Through the MDGs, the United States plans to regain its leadership in nuclear energy and to get billions of orders from around the world.

What is NuScale Power MMP?

With a module of 77 MW, the hull has an inner diameter of 2.74 m and its height has been increased to 19.8 m. The containment has an outer diameter of 4.57 m and a height of 23.16 m.





The core will contain 37 standard assemblies of 17 x 17 fuel cells with a ladder height of fuel tablets of about 2 m, which will be prepared by AREVA - France. For comparison - in the core of the AR-1000 there are 157 fuel assemblies, which are twice as high. In large reactors, neutron leakage is negligible and nuclear fuel enrichment may be less. The distribution of neutron flux and energy release in the fuel in them is close to optimal and high combustion is achieved. The situation is reversed with small core size - significant neutron leakage and suboptimal distribution of energy release. Therefore, significantly less energy can be extracted per unit mass of fuel than in large reactors. This means that per unit of energy produced, such a module will generate more fuel. These significant shortcomings are common to all small reactors.

In 16 of the fuel assemblies there will be mobile neutron absorbers, each with its own electromagnetic motor mechanism. A soluble absorber (boron) in the coolant will also be used. Uranium-235 enrichment should be higher than for large reactors but will be below 4.95% (the limit for US civil reactors).

The difference in the water temperatures at the inlet / outlet of the core at 60 MW module is 56 degrees (265 - 320 o), while at large reactors it is below 35 degrees. There is no information on how much it will be with the most powerful module. The low inlet temperature in the core determines low parameters of the steam in the secondary circuit. Combined with higher heat losses, only 31% of the heat will be converted to electricity (77 MW module). Such values (and lower) are typical for small reactors, while for large water reactors they are 34-36%. This also means that per unit of electricity produced, a small reactor requires a larger amount of final heat sink than a large reactor.

From a safety point of view, NuScale's MMP has many advantages over large reactors, which cannot be discussed in detail here. Some examples: Simplifying a project eliminates a whole class of baseline events for accidents; Emergency cooling systems are passive, i.e. no pumps, energy or operator intervention are required. They consist of only two pairs of valves and heat exchangers mounted on the outside of the metal container. In them, the steam-water mixture from the steam generators is cooled by the water in the pool and returned. This can last more than 30 days, and when and if the water in the pool evaporates, cooling with air will suffice.

Nuclear power plant with NuScale Power modules

The plant project is likely to be presented to the regulator in 2023. Licensing is a major challenge, as current standards and rules have been developed for large reactors.

The module of 77 MW of electricity weighs about 700 tons and will be delivered to three segments by road, railway line, or by water from the factory. A common reactor building is envisaged, in which each module will be below ground level, in a huge pool, each of which will be in a separate section. The pool will be over 20 m deep and will contain about 50 thousand tons of water. The reactor building will be able to withstand the impact of an aircraft (no details, probably small). Each module will power a separate steam turbine, with the 12 turbines in two buildings on either side of the reactor. All modules will use several common systems and will be controlled by a common control room with 6 operators, a simulator of which has already been created.

The individual modules will be shut down for 10 days every 24 months for recharging and revision while the others run. 1/3 of the fuel will be replaced with fresh. After stopping a module, all pipelines, steam pipelines, supporting structures, cables, etc. will be disconnected and the whole will be transferred to the audit compartment. There, the upper part of the container and the inner hull will be dismantled with special tools. Such technology has not been implemented so far and its reliability and safety have yet to be proven. The spent fuel is placed in a special compartment of the pool.

The plant will also have a special building, installations for preparation, storage, and purification of boron solutions, for processing and storage of radioactive waste, for dry storage of spent fuel, laboratories, warehouses, administrative building, distribution device, cooling towers, etc. The protected area (behind the fence) will be about 140 acres, and the total much more.

If a NPP with 12 modules operates mainly in base mode, it will maintain a constant net capacity of 880 MW. During recharging of one module - about 816 MW and the need for replacement power will be small, unlike large reactors.

In the natural circulation of the coolant, changes in the heat output of the reactor are not desirable and must be made very slowly. Power increase from 20% to 100% will take more than an hour and a half. However, NuScale modules can vary their electrical power in a wide range by directing part of the steam flow directly to the capacitors. The electric power can be reduced from 100% to 20% in 10 minutes and raised back in 27 minutes (60 MW module), and the reactor will operate at rated power. NuScale Power is exploring the possibilities of using its modules to produce hydrogen, desalinated water, heating, and other purposes, combined with variable electric power mode.

Problems with the licensing of NPPs with many modules include risk analysis of the use of common systems, common staff for all modules, control from one control room, simultaneous operation of some and recharging of other modules, diagnostics, and control of metal in small free volumes, the reliability of steam generators, recharging technology and much more.

Who, where and when will build the first NPP with NuScale modules ?

So far only Utah Associated Municipal Power Systems (UAMPS). It is a structure of the Utah state administration that unites small energy companies on a voluntary basis, including from neighboring states. It deals with the planning, financing, construction, maintenance and operation of energy projects of general interest, as well as with the transmission and distribution of electricity. Delivers to customers about 5.5 billion kWh - about 1/7 of Bulgaria's consumption. In 2015, a project for the construction of a nuclear power plant with MMS of NuScale Power was launched. It aims for the new plant to replace obsolete coal-fired power plants and to be able to work with wind and solar parks.

The government provided a site for the first nuclear power plant with MMR and paid the cost of licensing it (about $ 63 million). It is in the National Laboratory in Idaho (INL) - one of the nuclear complexes in the United States. It is a rocky desert in the neighboring state of Idaho, which has a territory of 217 thousand km² and a population of 1.717 million people. INL has an area of 2310 km², a staff of about 4 thousand people and a budget of 1 billion dollars. At the end of 1951, for the first time in the world, electricity was received from a nuclear reactor (IBR-1), now a museum. INL has designed and built 52 nuclear reactors for various purposes, most of which have been shut down. It is now the leading center for the development of nuclear energy in the United States. INL plans to hire the first MMP in 15 years and use it as a prototype for research.

The plan envisages the construction of a NPP with 12 modules to take place within 4 years after the first concrete is poured. There will be about 1,600 jobs and 1,350 secondary jobs in construction. The plant's staff is expected to be a total of 360 people (10 times less than at Kozloduy NPP now). Against the background of an average of 0.6 people / MW of electricity at the US nuclear power plant, this is too small and leads to accusations of irresponsibility by critics of the project. About 300 additional jobs will be indirectly created in the district.

The deadlines for commissioning have been repeatedly postponed. Initially, 2019 was mentioned, then 2023.… Until recently, the first 60 MW module was planned to be operational in 2026, and the rest in 2027. The deadlines are already 2029 and 2030, which is probably due to the need to license the 77 MW modules. In order for the next modules to be loaded and installed one after the other, the pool will probably need to be emptied and the first module stopped. This shows that the idea of adding modules for those already working is not applicable. Ultimately, the initial investment for all modules will similarly be invested in large reactors and thus no significant savings in interest costs can be achieved.

BWX Technologies, Inc. was chosen to make the modules -- a company that has produced over 400 reactors for military purposes and over 300 steam generators for nuclear power plants. Construction of other NPPs with NuScale Power MMR without federal / state subsidies is very problematic and so far there are no investors and clients for them.

Some conclusions

So far, NuScale Power›s MMP NPP exists on drawings, models and simulators. An assessment of its real economic indicators, construction experience, commissioning, operation and recharging of the modules will be clear several years after the launch of the first NPP. If the project is implemented and the deadlines are not postponed, this will be possible by 2032.

Going back to the beginning - of course, there is no way to place a nuclear power plant with MMR "in the center of Sofia".

Regarding the ideas in our country, to have 5-6 thousand MW of MMR, by 2030, I can say the following - it is good to collaborate with NuScale Power (and others who are developing MMPs) and to monitor developments. However, to go to the planning and construction of a nuclear power plant with MMR in our country before the technology is proven in practice, would be an irresponsible adventure. I hope that even the current government would not go for it.

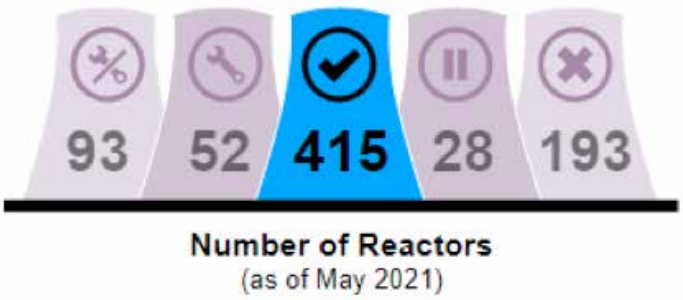
A separate issue is what will be done with the spent nuclear fuel (SNF) from the MMR, given that the authorities demonstratively do not implement their own strategy for SNF reprocessing from Kozloduy NPP, but accumulate it on the site. Thus, they turn it into a nuclear dump and create huge technical problems and financial obligations for future generations.

Whatever new nuclear power plant is decided to be built - with a large reactor or an MMP - it could be operational by 2035. The real debate in the electricity sector must be what will replace the coal-fired power plants, for which the government failed to negotiate work capacity after the middle of 2025.

NUCLEAR NEWS

In comparison to the last edition of the Nuclear Monitor:

- **Two construction starts**; In the last month there were two construction starts. China is going to expand it's nuclear complex at Tianwan with two more reactors, Tianwan-7 and Tianwan-8. Both are Russian-designed reactors of the VVER-1200 type. The planning is to connect the two reactors to grid in 2026-2027.
- **One connection to grid**. At the same Chinese Tianwan complex one new reactor was connected to grid. The construction of the Chinese ACPR-1,000 reactor started in 2016.
- **One closure**. In the US the last Indian Point reactor was closed on April 30. All three reactors, located 50 km north of the city of New York are now closed and will be decommissioned. The now closed reactor has produced electricity in the past 45 years.



Source: https://www.worldnuclearreport.org/

ANTI-NUCLEAR NEWS

Greenland; ORANO, the French government-owned uranium mining company has suspended its exploration activities in Greenland. The reason that it gives is that it is sensitive to the new government's intention to reinstate the ban on uranium mining, which was repealed in 2013.

The public consultation process for the Kvanefjeld EIA and SIA reports continues, although the new government has vowed to shut down the mining project. The government is probably trying to buy some time in order to come up with a political and legal strategy that enables it to close down the uranium and REE mining project without having to pay damages to its owner, the Australian company Greenland Minerals Ltd.

Japan; On April 13, the Japanese government announced a decision to release around 1.25 million tons of treated radioactive wastewater into the Pacific Ocean. The dumping is predicted to continue for over 30 years. The Japanese government claims that the treated wastewater is "safe" enough to drink, but the Multi-Nuclide Removal Facility used for treatment is unable to remove radioactive materials such as tritium. The government argues that dilution is the answer, but this does not change the amount of radioactive material that will be released and could accumulate in parts of the marine environment.

The Pacific accounts for around 58% of the world's fisheries, and many of the region's nations are dependent on these resources. In addition, many of these states have long suffered from the effects of nuclear testing and illicit dumping of nuclear waste. No nukes Asia Forum japan organised an international petition. You can help them by signing on http://chng.it/djybxBBC

USA. No nuclear power in the American jobs plan

Last month the Biden administration announced that it wants to include a massive subsidy for nuclear power plants in the $2.3 trillion American Jobs Plan. Their proposal would create a $200 billion bailout for all 93 currently operating nuclear reactors in the U.S.—and it would slash in half the budget for solar, wind, and other renewable energy.

NIRS started a campaign: We can't let nuclear power block renewable energy—our only real solution to the climate crisis. We can't keep making radioactive waste and risking nuclear disasters that are endangering human health, especially in Indigenous, Black, and Latino communities.

President Biden's American Jobs Plan represents an historic opportunity to build a thriving, just, and equitable clean energy economy—and to finally put the U.S. on the path to fight climate change with the ambition and scale that we need. As the President originally proposed it, the American Jobs Plan would transform our energy system to 100% clean energy by 2035 and create millions of jobs to do it.

But the nuclear industry sees the writing on the wall—**100% clean energy means no more nuclear power**. They are furiously lobbying the White House and Congress to prevent that. If they succeed, the American Jobs Plan will fail.

NIRS started the petition No Nuclear power in the American jobs plan! You can sign at https://nirs.salsalabs.org/national-bailout-action-alert