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1. EDF's Failing Reactor Fleet

Hinkley Point B's reactor 3 shut down for a graphite inspection outage on 8th June. It isn't expected to go back on-line until at least 14th December. Reactor 4 has already been offline for a similar inspection since February and isn't expected back until November. Both reactors are scheduled to close for good in 2023, but there are doubts over how much it can keep generating in the meantime. (1)

Hinkley's sister reactors at Hunterston B (all 4 reactors have operated since 1976) have both been closed for much of the past two years. Reactor 3 has been offline for more than two years, since March 2018. Reactor 4 was first shutdown on 2nd October 2018 but was allowed a trial operation between August 2019 and 10th December 2019. The safety case for restarting Reactor 3 was finally been submitted to the Office for Nuclear Regulation (ONR) for its assessment in mid-May and for Reactor 4 on 29th May. EDF now says it is hoping that Reactor 3 can restart on 13th July 2020 and Reactor 4 on 27 July 2020. (2)

EDF may be hoping to restart the two reactors in July but there are increasing concerns regarding revelations the graphite cores have begun to crumble as cracks spread. At least 58 fragments and pieces of debris have broken off the graphite bricks that make up the reactor cores. According to the Office for Nuclear Regulation (ONR) there is "significant uncertainty" about the risks of debris blocking channels for cooling the reactor and causing fuel cladding to melt. Such a disaster could result in a radiation leak and contamination right across the central belt of Scotland. Small wonder then that many local residents are pressing ONR to refuse EDF permission to restart these decrepit 44-year old reactors. (3)

EDF says it has spent more than £200 million on tests, inspections and creating quarter-scale models of the reactor cores that are shaken to mimic a quake to try to prove that the graphite is safe. EDF hopes the new safety cases will be approved in July to allow for six months of operation. That may pave the way for approval for Hinkley Point B with "pretty much the same safety case".

£200 million may seem like a lot of money, but it's only about one reactor's income for one year, so if it helps EDF keep its fourteen AGRs generating for longer it will have been well worth it for the Company.

But, like Hinkley Point B, the two Hunterston reactors are due to shut for good in 2023. EDF chose not to enter the two Hunterston B reactors into the capacity market auction for the period October 2022 to September 2023. Although Hinkley Point B entered into the auction "*it exited above the clearing price and therefore did not get an agreement. The revenues at the clearing price did not provide sufficient reward to take on the risk of penalties arising from non-delivery*" (4) – probably indicating a lack of confidence at EDF that any of the 4 reactors will make it as far as September 2023.

Another signal that minds at EDF are switching from generation to decommissioning is the fact that the generator has announced plans to submit scoping requests to North Ayrshire Council ahead of planning applications for waste facilities to support future decommissioning activities.



As part of the preparations for decommissioning, EDF is planning to build a new intermediate level waste (ILW) store and two waste processing facilities on the B site with applications for planning permission submitted by early 2021, following a period of consultation with a range of stakeholders.

A final decision has still to be taken on the best route for storage of ILW from Hunterston B and EDF is still looking at a range of options including the shared use of the Hunterston A ILW store. But to ensure the site can move into de-fuelling with no unnecessary downtime, applications are being lodged now to speed up the process should EDF decide to build a new store.

Discussions are also reported to be underway between BEIS, EDF Energy and the NDA, to examine the future decommissioning of the AGR fleet when it is time for the reactors to come off line. As yet no decisions have been made, and those discussions continue.

But it's not just Hunterston B and Hinkley Point B which are causing sleepless nights for EDF. As Emily Gosden, writing in *The Times*, points out, all of *"the AGRs are scheduled to close permanently between 2023 and 2030, but all also have graphite cores that bring their lifespans into doubt."*

All the AGRs will eventually exhibit some form of cracking towards the end of life says Richard Bradfield, chief technical officer for generation at EDF Energy: *"There are two irreplaceable components on an advanced gas-cooled reactor: the graphite and the boilers."*

Hartlepool and Heysham 1

Hartlepool and Heysham 1 are both due to shut-down in 2024. Although they were entered into the capacity market auction for October 2023 to September 2024 and EDF says *"we are confident they will operate to their scheduled closure date of 2024, they exited above the clearing price and therefore did not secure agreements. The revenues at the clearing price did not provide sufficient reward to take on the risk of penalties arising from non-delivery."* (5)

Heysham 1 Power Station was recently served with an improvement notice by the Office for Nuclear Regulation after contravening safety regulations regarding the pressure systems of their nuclear reactor. The notice was served on June 4 after shortfalls were discovered in the examination and inspection of the Reactor 1 pressure vessel. Nuclear reactor pressure vessels feature hundreds of sealed penetrations which must be routinely inspected to ensure they are free from defects. Out of the 600 penetrations in one of the reactors ONR found that EDF Energy had failed to examine 11 penetrations within the intervals specified in the written maintenance scheme. EDF must comply with the improvement notice served to them by the ONR and complete the 11 overdue examinations by December 18, 2020. (6)

Dungeness B

On 27 August 2018 Dungeness B shut down Reactor 22 for its planned statutory outage. On 23 September 2018 Reactor 21 was also shut down for the planned double reactor outage. Both reactors have been shut since. The regular inspections on the reactors in Kent in late summer 2018 identified the need for repairs on steam pipes. The inspections showed that seismic restraints, pipework and storage vessels associated with several systems providing a safety



function were found to be “corroded to an unacceptable condition” according to ONR. (7) Measures are being taken to eliminate the corrosion, including the upgrading of more than 300m of pipeline associated with reactor cooling systems and renewal of numerous seismic pipework supports and remediation of carbon dioxide storage vessels. On 26th February 2020 EDF Energy announced further extended outages at the two reactors The Dungeness B21 reactor was due to come back online on April 20 but the outage was extended to July 18. The Dungeness B22 unit was previously due back online on May 2 but that was extended to July 8. The dates given now are 21st September and 11th September. (8)

The boiler design at Dungeness was “very different” to the other AGRs and probably would be the life-limiting factor for the plant. However, EDF says the issues are “manageable” and that the company aimed to present a safety case shortly to seek to restart in September. (9)

Torness and Heysham 2

The Office for Nuclear Regulation (ONR) published its Project Assessment Report which allows Torness and Heysham 2 to continue operating for the period 2020 – 2030. (10) The Ferret website reported that cracks in the graphite core are now expected to start appearing six years sooner than previously thought (11)

ONR said that the cracking could cause debris to inhibit vital cooling of highly radioactive reactor fuel beginning as soon as 2022 rather than 2028. It said Torness and Heysham 2 will be able to keep operating until 2030 – but only if inspections to check for cracks are intensified. ONR promises to “robustly challenge” the plant’s operators, EDF Energy, to ensure that it “remains safe”.

Campaigners fear that Torness will become increasingly unsafe, and warn it may have to close down sooner than expected. EDF, however, insists that the station will keep generating electricity safely until 2030. NFLA has called on ONR to keep Torness under close scrutiny. *“These safety reservations surrounding the Torness periodic safety review need to be cleared up as soon as possible,”* said the group’s Scotland convenor, SNP Glasgow councillor, Feargal Dalton. *“Whilst EDF is having to spend large resources trying to persuade the regulator that it is safe to restart the Hunterston B reactors, this report emphasises that similar issues with ageing are likely to arise at Torness over coming years.”* Councils would press ONR *“to forensically scrutinise what look like significant weaknesses in the EDF safety case,”* Dalton added. *“In the meantime, the Scottish Government should start discussions about a ‘just transition’ for the workers at both Hunterston and Torness so that Scotland can move to a safe, sustainable and non-nuclear economy as quickly as possible.”*

ONR made nine recommendations to remedy major “safety shortfalls” at Torness and Heysham 2 and raised 41 minor matters with EDF. These include “weaknesses” in health reviews, as well as issues with “structural integrity”, “corrosion management” and “cyber security”.

Although no cracks have yet been detected, ONR inspectors pointed out there was a significant difference in the design of Torness and Heysham 2 compared to that of Hunterston. The newer stations have seal rings between the graphite bricks that make up the reactor core. ONR quoted EDF saying that there could be “a systematic failure” of the seal rings after cracking. “This could



lead to debris with the potential to challenge the ability to move or adequately cool fuel,” said ONR. “If keyway root cracking predictions are realised, then the safety case is unlikely to remain robust for the next ten years periodic safety review period,” observed ONR inspectors.

It could, in fact, be cheaper to build new renewable capacity rather than continue to operate these ageing reactors. This could soon be the case with Torness, especially if it has to keep being turned on and off to inspect the graphite core. Scotland clearly needs to be prepared for the possibility that Torness might be forced to close not long after 2022.

Flexible Return Dates

Paul Brown asked EDF “*At what point do you cut your losses and close the stations permanently?*” but failed to get a sensible reply. On Dungeness B it said: “*For the past two years we have undertaken a major investment programme at Dungeness to secure the station’s longer-term future. Since the start of the year we have made great progress in tackling some of the complex problems our works identified. However we still have further engineering works to complete, and a detailed safety case to finalise, before we ask for restart approval from our regulator. Our present position for estimated return to service is 11 September for Reactor 22 and 21 September for Reactor 21.*”

Stephen Thomas, professor of energy policy at the University of Greenwich, commented on the constantly postponed start-up dates for the ageing reactors: “*It is clear, given that shutdowns expected to take two months are now expected to take two years or more, that EDF has found huge unanticipated problems*”, he said. “*It is hard to understand why, when the scale of the problems became clear, EDF did not cut its losses and close the reactors, but continues to pour money into plants to get a couple more years of operation out of plants highly likely to be loss-makers. It is depressing that ONR, which has a duty to keep the public informed on such important issues, chooses to hide behind bland statements such as that it will take as long as it takes, and that it will not comment on EDF’s decisions.*” (12)

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1. Times 9th June 2020 <https://www.thetimes.co.uk/edition/business/cracks-are-starting-to-show-in-nuclear-power-generators-5hhwhvpm7>
 2. EDF 19th May 2020 <https://www.edfenergy.com/media-centre/news-releases/letter-hunterston-site-stakeholder-group-19-may-2020>
 3. The Ferret 17th October 2019 <https://theferret.scot/hunterston-graphite-debris-nuclear/>
 4. EDF 31st Jan 2020 <https://www.edfenergy.com/media-centre/news-releases/edf-statement-capacity-market-auction-t-3-202223>
 5. EDF Press Release 6th March 2020 <https://www.edfenergy.com/media-centre/news-releases/edf-statement-capacity-market-auction-t-4-202324>
 6. Lancashire Live 9th June 2020 <https://www.lancs.live/news/lancashire-news/edf-fails-carry-out-11-18386206>
 7. NEI Magazine 24th January 2019 <https://www.neimagazine.com/news/newsuk-dungeness-corrosion-rated-at-ines-level-2-6952999>



8. Reuters 26th February 2020 <https://www.reuters.com/article/nuclearpower-britain/corrected-edf-energy-extends-outages-at-uks-dungeness-b-nuclear-power-plant-idUSL5N2AQ7BQ>
9. Times 9th June 2020 <https://www.thetimes.co.uk/edition/business/cracks-are-starting-to-show-in-nuclear-power-generators-5hhwhvpm7>
10. Periodic Safety Review: Assessment of the Heysham 2 and Torness third periodic safety review (PSR3) <http://www.onr.org.uk/pars/2020/heysham-2-torness-19-012.pdf>
11. The Ferret 6th May 2020 <https://theferret.scot/torness-nuclear-reactors-cracking-2022/>
12. Climate News Network 11th June 2020 <https://climatenewsnetwork.net/unanswered-questions-dog-uks-new-nuclear-plan/>



2. Doubts about UK's Nuclear Future

Nuclear power's huge costs, the rapidly falling cost of renewables and now a diplomatic row with China may all be pushing the UK to consider Small Modular Reactors (SMRs) even more seriously.

China is threatening to end its investments in new British nuclear plants, according to *The Times* in retaliation for dropping Huawei from the 5G network. China's ambassador to the UK, Liu Xiaoming, has reportedly said that abandoning Huawei could undermine plans for Chinese companies to build nuclear power plants. (1)

Donald Trump's government, and an increasing number of Conservative MPs, see China as a political, technological and security threat. On the other hand, some argue that China is the economic future and we should try to influence the dragon, not slay it. In some ways it is a re-run of the Brexit debate, pitting globalists who believe in messy compromise against nationalists who put values ahead of economic concerns. It is not a coincidence that some of the figures lobbying on behalf of telecoms giant Huawei, including former CBI president Sir Mike Rake and Finsbury PR boss Roland Rudd, were prominent campaigners for remain, while Tory MP Tom Tugendhat's sino-sceptic China Research Group is nominally modelled on the European Research Group.(2)

Tom Tugendhat, chairman of the foreign affairs select committee. Former Conservative leader, Sir Iain Duncan Smith, has warned that Sizewell C is "*the next Huawei ... another major manifestation of the problem we face having set out on the wrong path with China years ago.*" He is calling for energy policy and how the UK interacts with China to be reviewed. (3)

The Chinese State Company, CGN, has a 33.5% stake in Hinkley Point C, and was originally expected to take a 20% stake in Sizewell C. But under the Regulated Asset Base (RAB) model, EDF and its Chinese partner, CGN, would not own the plant (it would be owned by institutional investors), but would supply, build, operate and maintain the reactor under profitable cost-plus terms. All the risk would fall on consumers. CGN also wants to build two Chinese-designed HPR1000 reactors at Bradwell in Essex. CGN will be the two-thirds owner of Bradwell B, and EDF the junior partner. (4)

Dr. Robert Ford, the US State Department's Assistant Secretary for Non-Proliferation and International Security has warned that CGN 'is closely linked to the Communist regime's military' and urged Britain not to hand China control of its electricity (5).

"*China's threat to boycott Britain's insane nuclear plan is wonderful news*", says Ambrose Evans-Pritchard writing in *The Telegraph*. It no longer makes any commercial sense to build large nuclear plants ever again in Britain. They are prohibitively expensive. Reactors are being shut down across the US despite Herculean efforts by the Trump administration to save the industry. New Nuclear, says Evans-Pritchard, cannot compete in the UK with limitless wind on the Dogger Bank and the shallow waters of the North Sea, backed by galloping cost gains in energy storage. Britain's nuclear expansion plan is therefore lunacy, and China's threat to walk away is an



unexpected Godsend. It frees the Government from an irksome commitment made years ago in an entirely different energy landscape.

"It is a get out of gaol card," said Tom Burke, chairman of E3G and a professor at Imperial. [Hinkley has] become a nightmare for EDF itself. Costs have ballooned to £23bn (in the fine print). The project is repeating the disaster script of EPR reactors at Flamanville in France and Olkiluoto in Finland. (6)

Flamanville in Normandy was initially scheduled to open in 2012 at a cost of €3.5 billion. Following numerous difficulties, it is now valued at €12 billion, and will not start before 2023. (7)

The other EPR being built in Europe is Finland's long-delayed Olkiluoto 3 (OL3) which has just been hit by another setback after the nation's safety watchdog reported valve problems in a component involved in the cooling process. The reactor is still hoping to start producing electricity in November this year. It was originally due to be completed in 2009. (8)

"EDF know they can never make money out of [Hinkley Point C]," said Professor Steve Thomas, a nuclear expert at Greenwich University. *"We would be doing them a kindness to pull out so they can concentrate on extending the life of their reactors in France for another twenty years. There would have to be a political sweetener to save face."* If China pulls the plug, it clarifies the issue. We can bin the whole misguided notion of nuclear expansion and look to cheaper, cleaner, safer, and quicker sources of power. Hinkley's strike price is £92.50 per MWh (2012 prices). The latest auctions for offshore wind on the Dogger Bank have come in at £39.65 and £41.61. In 2015 they were £117. (9)

Others argue that China is unlikely to follow through with its threat to pull out of the UK's new nuclear developments. *"If China pulled out that would be embarrassing for Xi, so I really don't think the Chinese government would like to do that,"* says Dr Yu Jie, senior research fellow on China at Chatham House. (10)

Meanwhile, *The Telegraph* reports that America has offered to build Britain's 5G and nuclear power stations so that the "coercive and bullying" relationship with China can end. Mike Pompeo, the US Secretary of State said America stood with its "allies and partners against the Chinese Communist Party's (CCP) coercive bullying tactics", as he cited reports that Beijing had threatened to punish HSBC and "break commitments to build nuclear power plants in the United Kingdom unless London allows Huawei to build its 5G network". HSBC is understood to have claimed that it could face reprisals in China if Huawei was blocked from selling equipment to the next generation of networks being built by Britain's mobile operators. (11)

Scepticism about RAB

EDF says Sizewell C would be a "near identical copy" of Hinkley Point C, helping it to make a 20% saving on construction costs, but the company does not yet know how the project will be funded. EDF has also been reluctant to give a total cost estimate as it continues design work and negotiates with suppliers. Hinkley could cost as much as £22.5bn, which would put the cost of Sizewell at around £18bn. Two-thirds of the cost of Hinkley will be borne by EDF and the



remainder by CGN, and executives at EDF have made clear it cannot afford to shoulder that level of construction risk again. The government last year launched a consultation on a possible new funding model for new nuclear plants. The so-called regulated asset base model is attractive to developers because it would cut the cost of capital for a new nuclear plant, reflecting how consumers would pay upfront for the project through their energy bills. These consumers could be left picking up the tab for cost overruns. But nuclear industry leaders privately admit there are doubts over the regulated asset base model, given reactors are much riskier than other infrastructure that has been financed in this way. If the government wants more large nuclear plants, it might just have to take a significant equity stake. EDF says it is not wedded to one particular funding model, adding “*the most important thing is to get the lowest cost of capital*”. (12)

Small Modular Reactors

According to the FT, as a result of all these problems there is also growing interest among policymakers in small reactors — dubbed “mini nukes” — under development by companies including Britain’s Rolls-Royce.

Alistair Osborne, writing in *The Times* says “*as radioactive projects go, little beats Sizewell C: the nuclear monstrosity planned for the Suffolk coast.*” He says Sizewell adds a fresh complication to the Huawei problem. “*And for what? A nuclear plant that shouldn’t be built anyway ...if we must have nuclear power in the mix, Britain has a solution: small modular reactors, the sort being developed by Rolls-Royce, the aerospace outfit that urgently needs new lines of work. Far more deserving a case than China’s CGN.*” (13)

Cummings’ Nuclear Plan

The *Daily Mail* reports on what seems to be the “Cummings Nuclear Plan”. It says a consortium of British businesses led by Rolls-Royce has submitted proposals to Ministers to accelerate the building of a new fleet of mini nuclear reactors in the North of England. The plans, circulated in Whitehall ‘in the last few weeks’, could see construction of high-tech factories to build the small reactors begin by next year. (Remember ‘Reinvigorate north with nuclear power stations, says Dominic Cummings’ *Times* 19th December 2019 <https://www.thetimes.co.uk/article/reinvigorate-north-with-nuclear-power-stations-says-dominic-cummings-bl3f5hrxx>)

The consortium – which includes UK construction and engineering firms Laing O’Rourke, Atkins and BAM Nuttall – would use British intellectual property to build the reactors. It would work with partners from the US, Canada and France. It has been estimated that exporting small nuclear reactor technology could be worth £250billion to the UK if the programme is successful.

Sources (Dominic Cummings?) told *The Mail on Sunday* that the plan is ‘starting to resonate’ in parts of Government because it could boost the economy as the country recovers from the destruction wrought by the pandemic. Tom Samson, interim chief executive of the consortium, said ‘We could be looking at locations and beginning to build factories as soon as next year with modules [to build the reactors] starting to come out of the factories by 2024 or 2025. We’ve got over 100 people today working on the programme. It could generate hundreds more jobs even



this year. As soon as we get the signal we'll be able to start ramping up our activities on engineering, planning and project management.'

Samson said: *"We want to become a champion of that clean energy space and I think, equally compelling, is the potential to connect the SMR programme to the production of industrial heat applications, synthetic fuels and aviation fuels being deployed in our engines, not just to provide energy into the grid. It's not unrealistic for us to be focusing on bringing on the first unit by 2029. We need the commitment to signal to the supply chain to get ready, invest and maximise the opportunities for the UK supply chain for equipment, vessels and components from a UK source if we can."* (14)

The fact that nuclear power is proving to be undeliverable in anything like the scale, time and cost that had been originally envisaged, says Dave Toke, Reader in Energy Politics at Aberdeen University, is leading to wishful thinking about SMRs: *"The notion that SMRs would ever be cheaper than large reactors flies in the face of engineering logic"*. (15)

Writing on the Unherd website, Peter Franklin said: *"If we're going to use energy investments to boost regional economies then we'd be better off looking at advanced technologies where the North is already excelling — like offshore wind, for instance. It's not greenery that's driving the mass deployment of renewables anymore, but cold hard economics. Investing in the technology required to manage their variable output is where the future lies now."*

He goes on to argue that commercialising SMRs would require a big R&D effort — and there's no guarantee that anywhere in the UK has a competitive edge in this field. *"If we are to develop a UK-based nuclear industry then let it be in the decommissioning of clapped-out power plants and the safe disposal of radioactive waste. Given the vast global mess left behind by this filthy industry, making the most of our own clean-up expertise could be a major export opportunity. So, in bringing a new economic vision for the North, I hope that Cummings will bury nuclear, not praise it."* (16)

The Nuclear Consulting Group's report on SMRs published last July says the nuclear industry has put forward SMRs as a panacea to problems of high cost and the difficulty of financing large reactors, but there are huge obstacles to overcome. Some of these are technical issues, others are around building up an effective supply chain, while the financing of such schemes will only be possible with significant subsidy from the public purse. The authors conclude that it remains likely that no substantive deployment of the technology will be realised, with just a very few reactors built, at most. This will be despite large amounts of public money being invested in these projects and, worse, the neglect of other more viable non-nuclear options. It provides another example of the industry talking a good game but delivering little. (17)

Copeland's Tory MP, Trudy Harrison, is pushing both Rolls-Royce and EDF Energy to take an interest in building new reactors at Moorside. (18)

National Infrastructure Commission chief economist James Richardson warned that the nuclear industry has failed to deliver on technological promises in the past. *"You have to have a degree of caution with new nuclear technology,"* he said. *"We have been promised things time and time again and typically the industry tends to be more expensive and take longer than planned. I would be cautious against SMRs, they are a question for the 2030s."* (19)



1. Times 7th June 2020 <https://www.thetimes.co.uk/edition/news/china-threatens-to-pull-plug-on-new-british-nuclear-plants-727zlvbzg>
2. Times 14th June 2020 <https://www.thetimes.co.uk/edition/business/china-syndrome-is-dividing-the-world-m883m76kc>
3. Telegraph 27th May 2020 <https://www.telegraph.co.uk/politics/2020/05/27/chinese-involvement-sizewell-nuclear-plant-next-huawei-mps-warn/>
4. Times 24th May 2020 <https://www.thetimes.co.uk/edition/business/the-great-china-dilemma-6rdmhw3wl>
See also Steve Thomas's comment here: <http://www.no2nuclearpower.org.uk/news/comment/stop-wasting-money-on-nuclear-professor-steve-thomas/>
5. Daily Mail 16th May 2020 <https://www.dailymail.co.uk/news/article-8326813/White-House-official-tells-Britain-Dont-hand-China-control-electricity.html>
6. Telegraph 10th June 2020 <https://www.telegraph.co.uk/business/2020/06/10/chinas-threat-boycott-britains-insane-nuclear-plan-wonderful/>
7. Le Monde 26th May 2020 https://www.lemonde.fr/economie/article/2020/05/26/nucleaire-nouvelle-procedure-contre-l-epr-de-flamanville_6040764_3234.html
8. Reuters 25th May 2020 <https://uk.reuters.com/article/uk-finland-nuclear-construction/finlands-new-nuclear-reactor-hit-by-valve-leak-idUKKBN2311TF>
9. Telegraph 10th June 2020 <https://www.telegraph.co.uk/business/2020/06/10/chinas-threat-boycott-britains-insane-nuclear-plan-wonderful/>
10. Telegraph 14th June 2020 <https://www.pressreader.com/uk/the-sunday-telegraph-money-business/20200614/281698321989436>
11. Telegraph 10th June 2020 <https://www.telegraph.co.uk/politics/2020/06/10/us-offers-build-uks-5g-nuclear-stations-end-coercive-relationship/>
12. FT 2nd June 2020 <https://www.ft.com/content/4e3221ef-ac1e-43cc-8d68-e1397ca0637f>
13. Times 4th June 2020 <https://www.thetimes.co.uk/edition/business/china-sets-off-alarm-bells-at-sizewell-kgct50r0p>
14. This is Money 13th June 2020 <https://www.thisismoney.co.uk/money/news/article-8417289/Rolls-Royce-triggers-250bn-nuclear-mini-reactor-race.html>
15. Dave Toke's Blog 15th April 2016 <http://realfeed-intariffs.blogspot.com/2016/04/small-modular-reactors-wishful-thinking.html>
16. Unherd 19th Dec 2019 <https://unherd.com/the-post/dont-nuke-the-north-dom/>
17. Prospects for Small Modular Reactors in the UK & Worldwide by Steve Thomas, Paul Dorfman, Sean Morris & M.V. Ramana, Nuclear Consulting Group and NFLA, July 2019
<https://www.nuclearconsult.com/wp/wp-content/uploads/2019/07/Prospects-for-SMRs-report-2.pdf>
18. In Cumbria 10th June 2020 <https://www.in-cumbria.com/news/18507533.copeland-mps-push-new-nuclear-reactors-west-cumbria/>
19. New Civil Engineer 9th June 2019 <https://www.newcivilengineer.com/latest/caution-urged-over-modular-nuclear-reactors-09-06-2019/>



3. A Dystopian Net-Zero Future?

In June the Nuclear Innovation and Research Advisory Board (NIRAB) published its Annual Report to the Department for Business, Energy and Industrial Strategy (BEIS). It says nuclear energy should provide at least half of the low-carbon electricity not supplied by renewables. NIRAB, together with the Nuclear Innovation and Research Office, provides 'expert' advice to the UK government on the research and innovation needed for nuclear energy to play a significant role in future low-carbon and secure energy mix.

The Annual Report calls for the development of both large and small-scale nuclear power plants. It says advanced reactors can contribute to meeting heat and hydrogen requirements as well as electricity. Achieving a net-zero target by 2050 is likely to require "*all the available and capable low-carbon technologies to be deployed at scale and the earliest opportunity.*" This includes nuclear, renewables and gas combined with Carbon Capture and Storage (CCS). However, it noted that nuclear power "*is the only 24/7 low-carbon technology to have been demonstrated at scale and has provided clean, safe and secure electricity to the grid since 1956.*" (1)

This was quickly followed by a new analysis from agency Energy Systems Catapult (ESC) which called a further 10GW of new nuclear beyond Hinkley Point C. The report notes more needs to be done to effectively address the high cost of deployment, but says any efforts to meet net zero without new nuclear power could put the UK Government's 2050 target at risk and would likely make the shift to a low carbon economy significantly more expensive. It goes on to suggest as much as 50GW of nuclear may be needed by 2050 in order to help decarbonise heat and hydrogen production. It suggests that over the next five years, the government must support 'stage-gated development programmes' for UK deployment of small modular reactors (SMRs) and advanced Gen IV reactors. (2)

Wind alone would too risky, says ESC – UK needs nuclear hydrogen to hit its 2050 net-zero goal. Its scenarios include allying advanced 'Gen IV' high-temperature nuclear plants with hydrogen production, which the study's authors said may open new possibilities for cheaper, more efficient production of zero-carbon H₂, either by providing power for electrolysis or through thermo-chemical processes that don't need electricity at all. The nuclear sector reckons its large-scale projects can tackle the baseload and intermittency dilemmas faced by wind and solar, with emerging technologies such as the small modular reactors under development by Rolls-Royce claiming they are on track to get power costs into renewables territory. (3)

NIRAB's Annual Report proposes three streams of nuclear product development and deployment:

- large-scale Light Water Reactors (LWRs), which are currently available and suitable for baseload electricity generation;
- small modular reactors (SMRs), which are based on the same proven technology and can offer additional flexibility to meet local energy needs;
- advanced modular reactors (AMRs), which typically have a higher temperature output, enabling them to contribute to decarbonisation through heat and hydrogen production, as well as generate electricity at competitive costs.



NIRAB believes it is time to move forward towards demonstration of both SMR and AMR systems with appropriate underpinning R&D programmes to support the decarbonisation of the UK economy. Its recommendations include Government working in partnership with industry to deploy an SMR fleet, with the first commercial reactors operating by 2030 and it should invest in advanced reactor systems including high temperature gas reactor (HTGR) systems. The recommended budget for public investment in a continued Nuclear Innovation Programme for the five years starting in April 2021 is £400m for R&D and £600m for advanced reactor demonstration. Government should enable an AMR demonstrator in 2030 to 2035.

“There is an imperative for industry and government to work together on nuclear technology to secure a vibrant nuclear industry that cost effectively deals with the clean-up of legacy nuclear facilities, sustains current nuclear plant operation, and develops a next generation of low-carbon nuclear power;” said NIRAB chair Mike Tynan (former chief executive of Westinghouse UK). (4)

The Annual Report says *“The Nuclear Innovation Research and Advisory Board (NIRAB) is convinced that new cost-competitive nuclear power must make a significant contribution to meeting the increased demand for low-carbon electricity. It would be prudent to plan for nuclear energy to provide at least half of the firm low carbon electricity not provided by renewables.”* (5)

NIRAB is working on the basis that electricity demand will increase from around 328TWh per year in 2018 to 650TWh in 2050 to allow for the increased demand from electric vehicles and heat pumps. Because 80% of UK nuclear capacity will close by 2030 just maintain its current contribution to the UK’s electricity needs, NIRAB says we will need Hinkley Point C and two further power plants of similar scale to be built and commissioned by 2030.

The most recent modelling (from Energy Systems Catapult) shows a role for nuclear to provide 50% of electricity (equivalent to around 35 GW electricity generating capacity) in 2050 for a cost optimised energy system. NIRAB highlights the intermittency of renewables and residual emissions from Carbon Capture and Storage to support its argument.

With appropriate support, according to the report, the nuclear sector can bring forward nuclear technologies (e.g. SMRs and AMRs) from demonstration stage to full commercialisation and offer diverse solutions to deep decarbonisation of multiple sectors. SMRs and AMRs offer a range of energy services that will prove vital for heat and hydrogen production.

ANTs

The Business, Energy and Industrial Strategy Department (BEIS) defines Advanced Nuclear Technologies (ANTs) as smaller than conventional nuclear power station reactors; and designed so that much of the plant can be fabricated in a factory environment and transported to site, reducing construction risk and making them less capital-intensive. Generally advanced nuclear technologies fall into one of 2 groups:

- Generation III water-cooled Small Modular Reactors (SMRs), similar to existing nuclear power station reactors but on a smaller scale;



- Generation IV and beyond Advanced Modular Reactors (AMRs), which use novel cooling systems or fuels to offer new functionality (such as industrial process heat) and potentially a step change reduction in costs.

GDA

The Office for Nuclear Regulation (ONR) has produced new guidance *“for all future GDA [Generic Design Assessment] activities. In addition to incorporating the latest lessons learned, it considers the changes in the nuclear industry in the decade since GDA was devised, in particular the recent nuclear sector deal (Ref. 4) and the potential for more mature Advanced Nuclear Technologies (ANTs) to enter GDA in the short term. While large portions of the text within this guidance remain unchanged, a number of improvements have been made to enhance the efficiency and flexibility of the GDA process, whilst maintaining the high standards of safety and security achieved previously and the robustness of the regulatory decision making. (6)*

Funding for SMRs

An initial £18m investment to help Rolls-Royce to develop the design for an SMR has been announced several times. In August last year *The Times* reported that *“new mini nuclear reactors would be concentrated across the north — and plans are in motion to place them in the Sheffield city region, Cumbria, Lancashire and Cheshire,”* a government source (Cummings again?) said. *“Nuclear is clean and a way of reducing the UK’s carbon footprint on a large scale.”*

Henri Murison, the Northern Powerhouse Partnership director, said: *“Our upcoming Energy industrial strategy for the Northern Powerhouse will focus heavily on SMRs ...” (7)*

According to the *Mail on Sunday*, a number of existing licensed nuclear sites have already been informally discussed within Whitehall including Moorside, Wylfa and Trawsfynydd in Snowdonia. (8)

There is a *“pretty high probability”* that Trawsfynydd could be the site of the UK’s first SMR says Rolls-Royce - the site of the old Gwynedd reactor ticks all the boxes to pioneer the technology. (9)

In November 2019 BEIS confirmed the outcome of previously announced Nuclear Innovation Programme and Industrial Strategy Challenge Fund advanced nuclear initiatives, including an £18 million grant from the Industrial Strategy Challenge Fund to create a £36 million joint investment with a consortium led by Rolls-Royce (and including Assystem, SNC Lavalin/Atkins, Wood, Arup, Laing O’Rourke, BAM Nuttall, Siemens, National Nuclear Laboratory, and Nuclear AMRC) to fund the so-called ‘Low-Cost Nuclear Challenge’, which aims to develop a Small Modular Reactor designed and manufactured in the UK. The investment will enable the consortium to further develop their design. (10) The consortium ultimately aims to generate a joint investment of £500m which will see it through the Generic Design Assessment (GDA) process. The GDA could take four years and construction for the First of a Kind (FOAK) could take three years, which means the best estimate for the first commercial unit operating would be by the early 2030s. (Rolls-Royce told the BBC’s Today programme that it plans to install and operate factory-built power stations by 2029). (11) By 2050, a full programme of 16 power



stations could create 40,000 jobs and add £52bn of value to the UK economy, the government added. Each of the new power stations are expected to generate 440MW of electricity, enough to power 750,000 homes. (12)

The consortium of companies developing the SMR has appointed Tom Samson - former CEO of NuGeneration Ltd - as its interim chief executive. (13)

The Rolls-Royce SMR design is based on GenIII+ technology, using a pressurized water reactor (PWR) and a single steam turbine. It has settled for a 440 MW design to maximize cost efficiencies while retaining modular build advantages and the ability to transport major components by rail and road. 85% of the capital cost activity is completed off-site in a factory-controlled environment, removing one of the primary causes of cost overruns on other power station builds, according to Ben Todd, Rolls-Royce Communications Business Manager. The first five of the compact nuclear power stations are expected to cost £1.8bn (\$2.31bn) each, have a capacity of 440MW and be able to produce power for 60 years. The projected cost of the electricity is £60/MWh by the time the 5th one is built. (14) The consortium is expecting to rely on RAB funding to build the reactors. (15)

Feasibility studies and funds for non-LWR

In June 2018, the UK government's £200 million Nuclear Sector Deal was announced to cut the cost of nuclear power and bolster the UK skills base, at a time when fears were rising over scientists leaving the UK due to Brexit. That deal included £56 million towards the development and licensing of advanced modular reactor designs – and £32 million pounds towards advanced manufacturing research – against stiff competition from Canada in the SMR race. The Nuclear Sector Deal set out a framework, inter alia, “to support development and deployment of small modular reactors (SMRs) and the innovative technologies that support them.” This builds on the government’s commitment of up to £56m to support the design of advanced nuclear technologies and £86m to create a new National Fusion Technology Platform at Culham in Oxfordshire. (16)

The Government says developing and deploying advanced nuclear technologies will: “Bring forward technically and commercially viable propositions that would lead to deployment of new reactors that would be investable and cost competitive in the energy system.”

In December 2017, the Government “announced a package of up to £44m for R&D funding (£4m in phase 1 and, subject to government approval, up to £40m for phase 2) for ‘advanced’ modular reactors, and bids were invited for Phase 1 feasibility studies.” (17)

Advanced Modular Reactors (AMRs) include:

- Liquid metal fast reactors
- Molten salt reactors
- High temperature gas reactors¹



The following companies have made credible propositions from a range of UK and international concepts and will receive grant funding to undertake detailed studies:

- Advanced Reactor Concepts LLC;
- DBD Limited;
- Blykalla Reaktor Stockholm AB (LeadCold);
- Moltex Energy Limited;
- Tokamak Energy Ltd;
- U-Battery Developments Ltd;
- Ultra Safe Nuclear Corporation;
- Westinghouse Electric Company UK Limited.

These eight, non-light water reactor (non-LWR), vendors each received £4 million to perform detailed technical and commercial feasibility studies. (18)

As part of their application, each organisation supplied an abstract summarising their proposal. The claims and opinions expressed in the abstracts are those of the applicant organisation and do not necessarily reflect the official policy or position of BEIS. The abstracts are available here https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/738082/Advanced_Modular_Reactor_Competition_Phase_1_Feasibility_and_Development_Study_Abstracts_from_the_Vendor_s_Proposals.pdf

The reactors include a Lead-cooled fast reactor, and a sodium-cooled fast reactor.

The government is also actively exploring the potential scope for collaboration with international partners in key areas of nuclear research. The government's accession to the Framework Agreement of the Generation IV Forum (GIF) has recently completed the UK Parliamentary process.

ONR

Although there has not been an application for a GDA to be carried out on an SMR or other ANT, ONR has started to develop a plan to ensure that the regulators' processes and guidance are fit for purpose of regulating ANTs. The Generic Design Assessment (GDA) process is being modernised taking account of learning from previous assessments and by introducing greater flexibility into the process which is important for ANTs.

It is undertaking a focused review of our guidance (SAPs, [[Safety Assessment Principles – a revised document](#) was published January 2020] SyAPs [[Security Assessment Principles – a Guide for Smaller Duty Holders](#) was published July 2019] & TAGs [[Technical Assessment Guides](#)]) to ensure that it is fit for purpose to regulate ANTs. The first stage of the ongoing work considers SMRs. A focused review of guidance on licensing nuclear installations will be considered at a later stage. (19)

The Ferret reported in April that the UK government is trying to resurrect plutonium-powered reactors despite abandoning a multi-billion bid to make them work in Scotland. Documents released by the UK Office for Nuclear Regulation (ONR) under freedom of information law



reveal that fast reactors, which can burn and breed plutonium, are among “advanced nuclear technologies” being backed by UK ministers. ONR has been funded by the Department for Business, Energy and Industrial Strategy (BEIS) in London to boost its capacity to regulate new designs of fast reactors, along with other advanced nuclear technologies. Campaigners have condemned the moves to rehabilitate plutonium as a nuclear fuel as “astronomically expensive”, “disastrous” and “mind-boggling”. They point out that it can be made into nuclear bombs and is highly toxic – and the UK has 140 tonnes of it. But the nuclear industry says that plutonium-fuelled fast reactors can produce “safe, low-carbon power”. UK government nuclear scientists support the idea, arguing that plutonium reactors can “minimise waste volumes”. ONR released 23 documents about advanced nuclear technologies in response to a freedom of information request by Dr David Lowry, a London-based research fellow at the US Institute for Resource and Security Studies. They include redacted minutes and notes of meetings from 2019 discussing fast reactors, and are being published by The Ferret. One note of a meeting in November 2019 shows that ONR attempted to access a huge database on fast reactors maintained by the UK government’s National Nuclear Laboratory (NNL) in Warrington, Cheshire. (20)

In an ONR briefing, dated December 2019, it was noted that, as part of the ONR Advanced Nuclear Technologies (ANT) project, the UK department for Business, Energy and Industrial Strategy (BEIS) has awarded ONR additional funding to scope a number of activities in preparation for Phase 2 of the BEIS Regulatory Capability project. This has been titled as ‘Extended Phase 1’ activities.

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1. Nuclear Engineering International 15th June 2020 <https://www.neimagazine.com/news/newsnirab-recommends-the-development-of-smrs-and-amrs-7973319>
 2. Energy Live News 18th June 2020 <https://www.energylivenews.com/2020/06/18/the-uk-must-commit-to-10gw-of-new-nuclear-to-reach-net-zero-by-2050-but-costs-need-to-fall/>
 3. Recharge 18th June 2020 <https://www.rechargenews.com/transition/wind-alone-too-risky-uk-needs-nuclear-hydrogen-to-hit-2050-net-zero-goal-study/2-1-828038>
 4. Nuclear Engineering International 15th June 2020 <https://www.neimagazine.com/news/newsnirab-recommends-the-development-of-smrs-and-amrs-7973319>
 5. NIRAB Annual Report 2020 https://www.nirab.org.uk/application/files/6315/9160/6859/NIRAB_Achieving_Net_Zero_-_The_Role_of_Nuclear_Energy_in_Decarbonisation_-_Screen_View.pdf
 6. New Nuclear Power Plants: Generic Design Assessment, Guidance to Requesting Parties. ONR, October 2019 <http://www.onr.org.uk/new-reactors/onr-gda-gd-006.pdf> A Technical Assessment Guidance was produced earlier in May 2019: New Nuclear Power Plants: Generic Design Assessment Technical Guidance, ONR, May 2019 <http://www.onr.org.uk/new-reactors/reports/onr-gda-007.pdf>
 7. Times 11th Aug 2019 <https://www.thetimes.co.uk/article/mini-nuclear-reactors-to-power-the-north-m5qtbfc7>
 8. Mail on Sunday 19th Jan 2020 <https://www.dailymail.co.uk/news/article-7903495/New-Rolls-Royce-mini-nuclear-power-stations-built-North.html>
 9. BBC 14th February 2020 <https://www.bbc.co.uk/news/uk-wales-51460208>
 10. BEIS 5th Nov 2019 <https://www.gov.uk/government/publications/advanced-nuclear-technologies/advanced-nuclear-technologies>



11. BBC 24th Jan 2020 <https://www.bbc.co.uk/news/business-51233444>
12. Business Green 7th Nov 2020 <https://www.businessgreen.com/bg/news/3083488/mini-nuclear-reactor-vision-backed-by-government-and-industry>
13. Rolls Royce 23rd April 2020 <https://www.rolls-royce.com/media/press-releases/2020/23-04-2020-smr-consortium-appoints-tom-samson-as-interim-chief-executive-officer.aspx>
14. Nuclear Energy Insider 11th Sept 2019 <https://analysis.nuclearenergyinsider.com/rolls-royce-group-wins-funding-uk-smr-race-gathers-pace>
15. Energy Post 20th Nov 2020 <https://energypost.eu/rolls-royce-wants-innovative-financing-for-its-first-of-a-kind-nuclear-smrs/>
16. Nuclear Sector Deal, BEIS, June 2018
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/720405/Final_Version_BEIS_Nuclear_SD.PDF
17. Department for Business Energy & Industrial Strategy – Advanced Nuclear Technologies Policy paper (Feb 2018) <https://www.gov.uk/government/publications/advanced-nuclear-technologies/advanced-nuclear-technologies>
18. Nuclear Energy Insider 11th Sept 2019 <https://analysis.nuclearenergyinsider.com/rolls-royce-group-wins-funding-uk-smr-race-gathers-pace>
19. See <http://www.onr.org.uk/advanced-nuclear-technologies/index.htm>
20. Ferret 26th April 2020 <https://theferret.scot/plutonium-fast-reactors-dounreay-nuclear/>



4. Nuclear Power Stations and Sea Level Rise

Also see our special issue on Nuclear Power and Sea Level Rise here:

<http://www.no2nuclearpower.org.uk/wp/wp-content/uploads/2020/02/NuClearNewsNo122.pdf>

Nick Scarr, a consulting engineer, has examined the plans for Sizewell C on the Suffolk coast from the perspective of coastal erosion and climate change. And, assuming he's right, his paper is alarming says *The Times* — unless you're relaxed about the risk of the plant being encircled by sea. Sizewell C will be bigger and closer to the sea than the site's existing reactors.

Scarr takes issue with EDF claims that it'll be effectively protected by the offshore Sizewell-Dunwich bank and a coralline crag, so creating a "natural wave break". He points to studies showing waves are getting through in storms, while at the Sizewell C site the crag is more gravelly than desired. With decommissioning of the plant not due until 2150, Scarr believes EDF and CGN are paying far too little attention to forecasts from the Met Office and the Intergovernmental Panel on Climate Change.

Not least the notion that once-a-century "extreme sea level events", are "projected to occur much more frequently by 2050". He says the once in 10,000-year flood risk that "EDF trumpets" is "just 0.71m above the historical 1953 flood level". This is only Scarr's opinion, but he says his paper has been "approved" by Professor Andrew Plater of Liverpool University: a leading coastal geomorphologist.

So, what's EDF's response? Well, it reckons Mr Scarr's analysis of the effects of the sandbank and crag is both confused and wrong. It also says it has evaluated the likely effect of climate change. "*The design of the power station, including its sea defence and the raised platform it will be built on, will protect Sizewell C from flooding,*" EDF insists. It says it'll take an "adaptive approach", raising the sea defences "*during the lifetime of Sizewell C if needed*". Scarr says such an approach only works for construction projects such as painting the Forth Bridge every year, not sea defences for a nuclear plant. Indeed, he reckons it's "*clear evidence*" that the location cannot "*offer the criteria necessary for long-term safety of the project*". (1)

Scarr told the Climate News Network: "*Any sailor, or lifeboat crew, knows that east coast banks need respect — they have dynamic patterns, and even the latest charts cannot be accurate for long. I was deeply concerned by EDF's premise that there is micro-stability at the Sizewell site, which makes it suitable for new-build nuclear. It is true if you restrict analysis to recent historical data, but it is false if you look at longer-term data and evidence-based climate science predictions.*" (2)

"*Climate science not only tells us that storm surges have a higher median level to work from, but that they will also render the banks ineffective for mitigating wave power on the Sizewell foreshore (because of reduced friction, as the water depth is greater).*"

The longer-term data Scarr mentions are not altogether reassuring. Less than 10 miles from the site are the remains of Dunwich, once a thriving medieval port that disappeared in 1338 because of coastal erosion and a huge storm.



Nick Scarr added: *“Note that Sizewell security needs to last at least from now to the year 2150. A shorter period than this, 1868-1992, shown in hydrographic charting, tells us clearly how unstable the offshore banks are over a longer time frame, and that is without sea level rise.”*

Sea level rise is expected to be up to a metre on this coast by the end of the century, but that is only part of the problem – the “once in a century” storm surges are expected to occur as often as once a year by 2050.

EDF’s contention that the site is safe is partly based on a report by engineers Mott Macdonald, compiled in 2014 and based on historical data, which says that this undersea ridge is stable and will continue to be a form of natural coastal defence. However, East Suffolk and Suffolk County Councils, in their joint response to EDF’s consultation, make it clear that Sizewell C’s development has not in their view been shown to be able to be protected from erosion or flood risk over the site’s life. The Councils note that the sea defences proposed are inadequate, observing that EDF has given a misleading impression of the seaward extent of the hard-coastal defence feature (HCDF) and that there will be an unknown impact on the coastline and coastal processes caused by the proposed footprint of Sizewell C being further seaward than Sizewell B. Nor is the design, either with an element of failsafe capacity or capability of future adaptation, future-proofed against the ramping effects of climate change.

Scarr’s report goes further, concluding: *“This threat to the Sizewell foreshore is clearly an untenable risk.”*

One contentious issue on nuclear sites, including those at Sizewell, is the need for decades-long storage of large quantities of highly dangerous spent nuclear fuel in cooling ponds once it is removed from the reactors. Currently the UK has no such disposal route. (3)

Bristol Channel

Over on the Bristol Channel, Vice Magazine has been considering the minutes of the ONR Expert Group on Climate Change discussed in nuclear News No. 122.

On 30th January, 1607, a massive storm surge swept up the Bristol channel, swamping large parts of Devon, Somerset, Gloucestershire and South Wales. It is estimated that 2,000 people or more drowned, as houses and villages were swept away and around 200 square miles of farmland inundated. In the Church of All Saints at Kingston Seymour, near Weston-super-Mare, a chiselled mark remains showing that the water reached 7.74 metres above sea level. Some 412 years on from that tragic event, an academic chose to recall it in a talk he was giving to an ONR Expert Group.

Our nuclear power stations must be able to withstand events “worse” than both that devastating flood and the Great Storm of 1703, one speaker said. Another presentation at the meeting looked at the possibility of “black swan” storm surges and waves. A black swan was ominously defined as a *“high-consequence event that has never been previously observed”*. The possibility of a black swan event that causes massive coastal flooding is a big deal to nuclear power stations as they’re all on the coast to use seawater for cooling.



In fact, that warning was just one of several sobering analyses given the same day at a meeting of academics advising ONR, on climate change risks at the ONR head office in Bootle, Merseyside, in May 2019.

They make interesting, if not alarming, reading. For starters, according to the academics – whose names were all redacted – climate change-related heatwaves could lead to a nuclear disaster. Or in their words: “*significant heat waves of persistent high temperatures are likely to occur*” so that “*the ability of Heating Ventilation and Air Conditioning (HVAC) plant to maintain required temperature limits could be challenged, potentially leading to a plant shutdown and the risk of an accident*”. This matters because, as the academics point out, the UK is set for more frequent and intense heatwaves.

Specific words of caution were given on Hinkley Point C. Its 60-year lifespan is significant as our planet may change quite a bit during that time. “*It is possible,*” one academic said, “*that by the time HPC is decommissioned the planet will be 4C warmer with many extreme weather events, and therefore with significant design implications for NNB.*”

" As one of the experts at the meeting put it, it was “grim news”. But exactly how worried should we be? Nick Ely national coastal modelling & forecasting manager for the Environment Agency says: “*It’s increasingly becoming apparent that defences designed over the last 50 years, using the best evidence at time including climate change, are now no longer providing the standard of protection to the original planned level.*” (4)

Nick Scarr’s report is here:

<https://www.nuclearconsult.com/wp/wp-content/uploads/2020/04/Sizewell-C-%E2%80%93-The-environment-coastal-morphology-and-climate-change-a-2020-perspective-5.pdf>

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1. Times 10th June 2020 <https://www.thetimes.co.uk/edition/business/sizewell-c-debate-turns-a-bit-salty-gvvzhp7rf>
 2. Independent 30th April 2020 <https://www.independent.co.uk/independentpremium/nuclear-power-sea-rise-sizewell-c-edf-suffolk-a9492901.html>
 3. Climate News Network 28th April 2020 <https://climatenewsnetwork.net/sea-level-rise-threatens-uk-nuclear-reactor-plans/>
 4. Vice 3rd June 2020 https://www.vice.com/en_uk/article/akwayk/ons-nuclear-power-stations-climate-warning-uk