NFLA New Nuclear Monitor Policy Briefing

Nuclear Free Local Authorities
Councils working for a renewable, safe and peaceful future

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Responding to the Environment Agency's consultation on the Generic Design Assessment for the GNSL HPR1000 reactor proposed for Bradwell

i. Overview of Policy Briefing

This edition of the NFLA New Nuclear Monitor has been developed by the NFLA Secretariat. It provides the NFLA response to the Environment Agency's consultation on its assessment of the GNSL HPR1000 new nuclear reactor design proposed for the Bradwell site in Essex. The consultation closes on the 4th April 2021.

The Environment Agency's consultation document is available at this weblink: https://consult.environment-agency.gov.uk/nuclear/assessing-new-nuclear-power-station-ukhpr1000/supporting_documents/UK%20HPR1000%20consultation%20document.pdf

The Requesting Party (RP) for this Generic Design Assessment (GDA) is General Nuclear System Limited (GNSL). This company is jointly owned by the China General Nuclear Power Corporation (CGN), Électricité de France (EDF S.A.), and the General Nuclear International Limited (GNI).

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1. Overview

The UK Government's Energy White Paper reiterates the plan to bring at least one further largescale nuclear project to the point of Final Investment Decision (FID) by the end of this Parliament (i.e., 2024). But this is subject to clear value for money for both consumers and taxpayers and all relevant approvals. (1)

NFLA though note that in July 2018 the National Infrastructure Commission recommended that the Government should: "Not agree support for more than one nuclear power station beyond Hinkley Point C, before 2025". (2)

The Climate Change Committee (CCC) argues that investment in renewable energy will save consumers money, whilst investment in nuclear power and carbon capture and storage will cost a lot more. (3) Three of the five CCC energy scenarios for 2050 in its 6th Carbon Budget report have only 5GW of nuclear power, including that with highest energy demand (with 90% renewables); that's less than Hinkley Point C and Sizewell C combined. The CCC also assumes nuclear will cost £85/MWh in 2050. (4)

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Conventional wisdom used to be that supplying our electricity with 100% renewables was impossible. This is no longer the case. NFLA have noted in a detailed paper a large number of studies showing that a 100% renewables generation system is possible. (5) By 2019, for the Committee on Climate Change (CCC), the core factor in regard to such issues comes down to the question of cost. Relying on its own estimate of nuclear costs in 2050, which it believed would be 28% lower by then, it said with a high proportion of renewables costs would start to rise. (6)

The unifying thread that runs through the CCC's 6th Carbon Budget Report is ***that the costs of decarbonisation have fallen far faster than even advocates of clean technologies expected.*** Renewables and energy storage costs have plummeted, there are very good reasons to think hydrogen, heat pumps, and electric vehicles can follow suit.

Any new nuclear stations after Hinkley Point C would be extremely unlikely to come on-stream before 2030, so would be in direct conflict with much cheaper renewables. They would crowd out new renewable energy, causing windfarms and solar farms to be turned off to give priority to nuclear power. The National Grid would be ordering the turning off of renewable energy facilities and paying the operators compensation for this whilst also subsidising the construction of new nuclear reactors. (7)

Sizewell C (SZC) cannot be completed until at least 2034. Yet carbon emissions generated during the construction phase - the carbon content of the materials and labour - will take six years to be paid off by the output of SZC. As new renewables come online replacing fossil fuels, the carbon emissions from UK electricity generation reduce. This means that SZC will effectively cease to contribute to emissions reductions well before 2050 and will, in fact, make a net addition. (8)

Clearly any new nuclear power station proposed after SZC would effectively increase carbon emissions by generating emissions during construction and then pushing renewables off the grid after opening. Professor Benjamin Sovacool's meta-analysis of 103 lifecycle studies found that the mean value for emissions from the nuclear lifecycle is 66gCO2e/kWh. This compares to 9gCO2e/kWh for offshore wind and 32gCO2e/kWh for solar PV. (9)

Every pound invested in nuclear power would effectively make climate change worse. Not just because it is the most expensive form of electricity generation today, but also because it takes a long time to build reactors. Money invested in new nuclear cannot be used to invest in efficient climate protection options, and it produces only more emissions during the long construction period. (10)

The Environment Agency says it "put[s] the climate emergency at the heart of everything it does." Clearly, nuclear power cannot contribute to tackling the climate emergency, and, in the view of the NFLA, it should be rejected by the Environment Agency.

A 'sustainable future' means moving towards a consistent resource-efficient circular economy, and by turning away from the predominantly linear economy which produces waste. According to figures from Radioactive Waste Management Ltd, the radioactivity from existing waste (i.e., not including new reactors) is expected to be 4,770,000 Terabecquerels (TBq) in the year 2200. The radioactivity of the spent fuel alone (not including other types of waste) generated by Hinkley Point C in the year 2200 would be 3,800,000TBq – ***or about 80% of the radioactivity in existing waste.*** (11) The Environment Agency's goal of minimising waste must surely demand that it prioritises renewable energy generation over an energy source which is going to seriously exacerbate the UK's nuclear waste problem.

2. The GDA Assessment

It is of real concern to the NFLA that the GNSL submission up to 2018 did not contain the level of information the Environment Agency needs in order to carry out a detailed assessment.

The EA says that, based on the information it was given, it is unlikely that radioactive discharges would exceed those of comparable power stations, but GNSL needs to demonstrate this for discharges and for quantities of solid waste.

The point, surely, from the public and the environment's perspective is that the UK HPR1000, whichever of the 7 sites designated for a potential new nuclear reactor it is proposed for, will not be replacing a comparable reactor or reactors. For instance, the two Bradwell reactors were only 129MW each whereas a single UKHPR1000 reactor (1,180MW) would be more than 4 times the capacity. Thus, if comparing the old with the new it would be producing 4 times the discharges and 4 times the solid waste.

Although the GDA relates to one reactor on a generic site, NFLA note that the GNSL proposal for Bradwell is for two reactors. This means that radioactive discharges and solid waste produced could be in the region of 8 times that produced by the Magnox reactors.

On Higher Activity Waste and Spent Fuel the document says:

"…disposals are unlikely to occur until late this century, this means that the strategy needs to consider on-site storage and management of both ILW and spent fuel for the lifetime of the power station, or an appropriate alternative."

For NFLA, this is potentially misleading. RWM says for planning purposes, it is assuming that a deep underground radioactive waste repository will be available to receive its first waste in the 2040s. Then it will take around 90 years to emplace all existing waste before we can entertain the idea of beginning to emplace any spent fuel from new reactors, taking the issues well into the next century. (12)

It is worth noting, for instance, that in order to ensure the performance of the bentonite buffer material, to be placed around canisters in a deep underground radioactive waste repository (labelled by the nuclear industry as a Geological Disposal Facility or GDF), is not damaged by excessive temperatures, spent fuel from new reactors is likely to require cooling for around 140 years. (This number was revised upwards by 40 years following a correction to a thermal model used to estimate the cooling time required for spent fuel.) Given that new reactors are expected to have a life of 60 years, that means ***it will be 200 years before some of the spent fuel from new reactors can be disposed of in a GDF***. (13)

According to Radioactive Waste Management Ltd, the radioactivity from existing waste (i.e. not including new reactors) is expected to be 4,770,000 Terabecquerels (TBq) in the year 2200. The radioactivity of the spent fuel alone (not including other types of waste) generated by a 16GW programme of new reactors is expected to be around 19,000,000TBq. The amount of radioactivity in the spent fuel from Hinkley Point C in the year 2200 would be 3,800,000TBq – or about 80% of the radioactivity in existing waste. (14) Clearly, the idea promoted by government policy that the UK is moving to solutions with existing waste that has to be dealt with, so there should be no problem generating more, is a nonsense.

3. Best available techniques for minimising production and disposal of radioactive waste

The role of the Environment Agency (EA) is to ensure the impact of radioactive wastes on the environment is minimised. Research from around the globe, for instance the KIKK Study from Germany, has shown that there is unquestionably a strong link between proximity to nuclear power stations and childhood cancer. (15) NFLA note that the independent consultant on radioactivity in the environment, Dr Ian Fairlie, says:

"I can think of no other area of toxicology (e.g. asbestos, lead, smoking) with so many studies, and with such clear associations as those between Nuclear Power Plants and child leukemias."

This means that, ethically, if cleaner ways to generate electricity are available which do not discharge radioactive wastes into our atmosphere and seas these should be used in preference.

The evidence is stacking up that it is perfectly feasible to develop an all-renewable electricity supply which can provide energy security. (16) The best available techniques for minimising production and disposal of radioactive waste is to generate electricity from renewable sources. It is, therefore, unethical for the Environment Agency to continue to authorise discharges of radioactivity from new nuclear power stations into our environment. NFLA note with concern 2 potential GDA issues and 10 Assessment Findings in this section.

EA says “all exposures to ionising radiation of any member of the public and of the population as a whole resulting from the disposal of radioactive waste are kept as low as reasonably achievable (ALARA), taking into account economic and social factors. We do this by requiring designers and operators to use BAT.”

In our view it is entirely reasonable to expect electricity to be generated with zero exposure of the population to cancer-causing ionising radiation, and the Best Available Technique for doing just that is to use renewable energy sources in combination with energy efficiency.

Table 8-1. The proposed annual gaseous discharge limits (becquerel - Bq)

Radionuclide	Proposed annual limit (Bq)
Tritium (H-3)	5.23E+12
Carbon-14 (C-14)	1.69E+12
Noble gases	1.56E+13
Xennon-133 (Xe-133)	1.16E+13
Xennon-135 (Xe-135)	3.45E+12
Halogens	2.21E+08
Other radionuclides	1.12E+07

These figures compare badly with the proposed annual gaseous and liquid discharge limits for the AP1000 and EPR reactors.

	AP1000 (17)	**EPR (18)**
Tritium	3.0E+12	3.0E+12
Carbon-14	1.0E+12	0.7E+12
Noble gases	1.3E+13	2.25E+13

Table 8-2. The proposed annual liquid discharge limits (Bq)

Radionuclide	Proposed annual limit (Bq)
Tritium (H-3)	1.04E+14
Carbon-14 (C-14)	5.90E+10
Other radionuclides	1.04E+09

	AP1000 (19)	**EPR (20)**
Tritium	0.6E+14	0.75E+14
Carbon-14	0.7E+10	9.5E+10

The Committee on Medical Aspects of Radiation in the Environment (COMARE) recommended that as:

"…part of a new generation of plants, it might be expected that discharges would be lower than existing facilities, rather than 'within the range of historic discharges' which seems to be the criterion being applied by EA." (21)

4. Conclusions

Radionuclides or group of radionuclides	AP1000 predicted annual discharge	Range for 1000 MWe station
Tritium GBq	1800	100 - 3600
Carbon-14 GBq	606	40 - 530
Noble gases GBq	8047	100 - 10000
Iodine-131 MBq	210	<1 - 2000
Other radionuclides not specifically limited MBq	13.44	<1 - 1000

Table Two: Comparison of gaseous emissions from AP1000 reactors with those from other stations.

NFLA note that the AP1000 reactor has higher gaseous emissions - far more important than liquid emissions in terms of radiation doses to local people – than other similar reactors, yet it looks as though the UK HPR1000 could be even worse.

In our view, the requirement for 'Best Available Techniques' (and clean technology) for producing electricity should rule out building new electricity generating stations which produce such highly dangerous wastes. Especially as less expensive, quicker and safer alternatives are available which do not produce such wastes. As such, the EA should not be promoting the development of new nuclear reactors like the HPR1000.

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