NFLA New Nuclear Monitor Policy Briefing

Edition Number 56, 6th March 2019

NFLA submission to the EDF Energy Third Stage Public Consultation on the proposed Sizewell C new nuclear reactor

i. Overview of Policy Briefing

This edition of the NFLA's New Nuclear Monitor provides the NFLA's planned submission to the EDF Energy third round of public consultation for developing a proposed Sizewell C new nuclear reactor at site close to its existing reactors in Suffolk.

EDF are currently developing a proposed new nuclear power station at Hinkley Point in Somerset, and this would be a similar type of European Pressurised Reactor (EPR) development. The two previous rounds of public consultation have seen considerable public disquiet, even from the local Councils in Suffolk. Similar concerns have been raised from a wide range of organisations, which reflect the NFLA's own concerns with this proposed development. It is noteworthy as well that the Councils in Suffolk have also been publicly critical of the information provided in this third stage consultation by EDF.

EDF are inviting submissions until the **29th March 2019**. (1)

To respond to the consultation –

The main ways to respond to EDF's consultation:

- Complete an online questionnaire accessible from the EDF Sizewell C website - https://edfsizewellconsultation.traverse.org.uk/
- Email your comments to info@sizewellc.co.uk

1. Introduction

NFLA has taken an active part in EDF's Sizewell C consultation process.

The NFLA response to the second round of the consultation can be found on our website - http://www.nuclearpolicy.info/wp/wp-content/uploads/2017/01/NFLA_New_Nuclear_Monitor_No46.pdf

The two core conclusions of that response were:

- It is widely regarded as good practice when carrying out an Environmental Impact Assessment to consider the alternatives to a project. If this were done for Sizewell C, NFLA believe it would be seen that there are plenty of opportunities to reduce energy demand and produce cheaper renewable energy alternatives.
- NFLA also note that a major impact of building Sizewell C would be the production of nuclear waste with a radioactive content equivalent to 80% of the UK's existing radioactive waste inventory. This could require anywhere between 20% and 35% of the underground space required by existing waste in a deep geological disposal facility.

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These key concerns still remain. The NFLA response to this third round of consultation reiterates concerns in a number of key areas, whilst bringing in some new information, particularly through a number of recent and relevant studies.

2. National Policy Statements on new nuclear and a changed energy environment

As with earlier consultations on proposed new nuclear stations, such as the first consultation on Wylfa Newydd which declared: "…*the principle of nuclear power generation … is settled*" (2), this consultation says: "*The principle of the need for new nuclear power stations and the choice of Sizewell as a potentially suitable site have already been determined by Parliament … these issues are outside the scope of this consultation*."

The National Policy Statements on Energy (3) and Nuclear (4) were published in July 2011.

The argument is that the Government's National Policy Statement (NPS) on Energy has decreed that "*new nuclear power should be able to contribute as much as possible to the UK's need for new capacity*" and it expects industry to bring forward proposals for around 16GW of new nuclear capacity, so the idea of building a nuclear power station at Sizewell, is not up for discussion unless there are likely to be "adverse impacts" from this particular development which outweigh the benefits.

The NPS's are based on the premise that electricity demand is likely to double by 2050 thus requiring new nuclear power stations. But the situation has changed radically since 2010. The amount of electricity generated in the UK in 2018 fell to its lowest level in a quarter century. At the same time, output from renewable sources rose to another record high, generating an estimated 33% of the UK total in 2018.

The reduction in the UK's per-capita electricity generation has saved 103 terawatt hours (TWh) since 2005, and renewable output over the same period has increased by more than 95TWh. ***The UK trend since 2005 breaks with the economic orthodoxy that a growing economy must be fuelled by rising electricity use.*** Instead, the economy has continued to grow even as electricity generation has levelled off and then started to decline.

The reasons for this decoupling may not be fully understood, but product energy efficiency regulations, energy-efficient lighting, environmentally conscious consumers and economic restructuring, including offshoring of energy-intensive industries have all have played a part. For example, low-energy lightbulbs can cut electricity use by up to 90% while newer "white goods" such as fridges, freezers and washing machines can use up to 75% less electricity each year than the oldest models. There is significant untapped potential to continue cutting electricity use by replacing old appliances at the end of their lives with the latest models. (5)
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While continued reductions in UK electricity demand are likely in the short term, the Committee on Climate Change (CCC) and others expect UK electricity demand to increase in the medium term as a result of increased demand from electric vehicles (EVs) and electric heat pumps. But research suggests the growing energy efficiency of Electric Vehicles (EVs) means that there may be a very limited increase in demand as a result of the electrification of transport. (6)

Generation in 2018 was some 63TWh (16%) lower than in 2005, a reduction equivalent to 2.5 times the output of the new nuclear plant being built at Hinkley Point C. This is despite the UK population increasing by 10% from 60 million to 66 million people.

NFLA note that the National Infrastructure Commission (NIC) says the government "*should not agree support for more than one nuclear power station beyond Hinkley Point C before 2025*", since their cost seem unlikely to fall, while renewables are getting cheaper and could prove a safer investment (7) and the Committee on Climate Change (CCC) says "*If new nuclear projects were not to come forward, it is likely that renewables would be able to be deployed on shorter timescales and at lower cost*." (8)

In short, EN-1 and EN-6 are based on a false premise – there is no "need" for new nuclear power stations. Energy efficiency has already reduced electricity consumption by 30% compared with what it was expected to be in 2017 at the time that Hinkley Point C was first mooted, and the reductions can continue.

The 2011 National Policy Statements contained provision for a review should the Secretary of State decide it would be appropriate. Events over the last 8 years suggest a complete re-evaluation is now required.

In December 2017 the UK Government proposed a process and criteria for designating potentially suitable sites for new nuclear reactors above 1GW capacity for deployment between 2026 and the end of 2035 as part of a new National Policy Statement (NPS). (9)

Paragraph 1.7 of the consultation document on the siting criteria and process for a new national policy statement for nuclear states that:

"*The Government's view is that the assessment of the need for new electricity generation carried out to support EN-1 remains valuable and continues to be relevant. Currently, all but one of the existing fleet of nuclear reactors are due to cease generating before 2030, so the need for new nuclear power remains significant*." (10)

Nuclear generation was 72TWh in 2016 or about 21% of electricity produced in the UK. Total installed nuclear capacity is around 8.9GW. Yet an accelerated programme of LED lighting installation alone, for example, could reduce peak electricity demand by almost 8GW. (11)

Cost-effective investments in domestic energy efficiency alone between now and 2035 could save around 140TWh of energy – roughly equivalent to the output of six power stations the size of Hinkley Point C, according to a report by the UK Energy Research Council. Such a programme could save an average of £270 per household per year at current energy prices. The investments would deliver net benefits worth £7.5bn to the UK, and could reach £47bn, if benefits such as health improvements and additional economic activity are counted. (12)

The Government published its response to the consultation on the revised NPS in July 2018. (13) The response makes no mention of energy efficiency. Para 3.23 states that:

"*A large number of responses, primarily campaign responses, commented on the need for new nuclear power stations and, by extension, the need for a new NPS. Specific reasons put forward included reductions in the cost of renewables combined with developments in technologies to manage intermittency, questions as to whether electricity demand projections have been overestimated and questions as to whether nuclear power remains a low carbon source of energy when the full fuel cycle is taken into account*."

The Government's response to this was:

"*Nuclear power currently provides around 20% of the nation's electricity needs but over the coming decades many of our existing nuclear plants are scheduled to close, alongside the phase out of coal fired stations. This comes at a time when we are likely to need significant additional low carbon capacity as we seek to electrify more of our transport and heating. Government considers that nuclear has an important role to play in our future energy mix, provided that it can be achieved at the right price*."

According to the consultation document for the new NPS, it will be a "stand-alone NPS", sitting outside the 2011 NPS suite and particularly the overarching energy policy set out in NPS-EN1, June 2011. The 'Together Against Sizewell C Campaign' (TASC) has written to the Government to request all information relevant to the decision to make the new NPS a stand-alone document.

The NFLA response to the consultation on the updated National Policy Statement for new nuclear above 1GW post 2025: siting criteria and process is available here:

http://www.nuclearpolicy.info/wp/wp-content/uploads/2018/02/NFLA_New_Nuclear_Monitor_No52-NPS-.pdf

This concluded that the electricity system has changed radically in the years since the project to build new third generation nuclear in Britain was initiated. Clearly EN-1, upon which the original EN-6 depended, needs to be completely re-written. The NFLA called for the consultation to be scrapped and for the Government to re-write the EN-1 National Policy Statement.

Nick Butler explained in the Financial Times on the 4th March 2019 that utilities should be planning for an industrial revolution driven by renewables. By 2035, renewables (solar and wind) will account for more than 50 per of global power generation; electric vehicles will be the low-cost option for car, van and small-truck drivers; oil demand will be declining; and gas demand will have peaked. Total energy demand will be plateauing despite a growing global economy and a still-rising population. This is the considered projection produced by McKinsey, a global management consultancy. The key is the falling cost of renewables, which are set "to become cheaper than existing coal and gas in most regions by 2030". Over the next 20-30 years energy is set for an industrial revolution. Butler concludes that the complacency that smothers hard thinking is outdated. The revolution is happening now. (14).

It seems even clearer in 2019, over a year after the consultation on the revised NPS for nuclear power, that the Government's complacency is smothering hard thinking, as well as creating a democratic deficit. On the one hand, it does not want to revise EN-1 to take account of the growing energy revolution taking place on the ground, giving the public a chance to have their say on the direction of travel. Instead it claims that the proposed new NPS has been disconnected from EN-1, yet continues to justify new nuclear power stations on the out-of-date thinking upon which EN-1 is based. EDF should not be ignoring these fundamental changes in energy policy and completely reconsidering the need for a second new nuclear reactor to be built after Hinkley Point C – which itself still remains vulnerable to cancellation on financial and technical factors.

3. Sizewell C and waste

Sizewell C will produce about 80% of the total radioactivity already created in the UK. If all the proposed new nuclear reactors get built this will at least quadruple the amount of radioactive waste the country will have to deal with. (15) After three years of deliberation, the Committee on Radioactive Waste Management (CoRWM) decided that geological disposal is the best available approach for the long-term management of higher level waste, but lots of caveats and important recommendations were ignored by the Government. CoRWM specifically said it did not want its recommendations seized upon as providing a green light to build new nuclear reactors which raise different political and ethical issues when compared with wastes which already exist. In other words it might be morally defensible to look for the 'least-worst option' to bury dangerous waste already created, but we really shouldn't be creating any more. NFLA remain concerned about the real technical and scientific issues around 'deep geological disposal' for existing waste, but the potential levels of highly radioactive new build waste add a greater level of concern that alone should see a new nuclear programme halted.

4. Sizewell C and nuclear accidents

A severe accident scenario, such as the one suggested by the Radiological Protection Institute of Ireland (now part of the Environmental Protection Agency), (16) would involve a loss of coolant combined with a bypass of the containment. In this scenario core damage would be initially delayed by actions of the plant operators, but eventually take place after 12.75 hours. The release of fission products to the environment starts 12.8 hours after reactor shutdown, and lasts for 35.2 hours eventually stopping 48 hour after reactor shutdown.

Nuclear engineer, the late John Large, expanded on this type of scenario pointing out that the fuel core would completely melt after about 16 hours and the corium mass slumps to the bottom of the Reactor Pressure Bessel (RPV), thereafter burning through the RPV steel shell to fall and slump onto the primary containment floor. At this point in time, the hydrogen gas

in the RPV circuit is released into the primary containment whereupon it reacts with the air in the containment, deflagrating and exploding with sufficient might to breach the containment surety and, with this, the first phase release of radioactivity to the atmosphere for dispersion and deposition further afield commences. He said this scenario is very similar to the events at Fukushima. (17)

According to EDF Energy´s Environmental Statement for Hinkley Point C (Appendix 7E "Assessment of Transboundary impacts"), the likely impacts of an accident do not extend beyond the county of Somerset and the Severn Estuary. In contrast a report for the Austrian Environment Agency says severe accidents at HPC with considerable releases of caesium-137 cannot be ruled out, although their probability may be low. There is no convincing rationale why such accidents should not be addressed in the Environmental Statement (ES); quite to the contrary, it would appear rather evident that they should be included in the assessment since their effects can be widespread and long-lasting. (18)

The RPII Severe Accident Scenario suggests a radioactive release of I-131 and Cs-137 amounting to 610,000TBq which is quite a bit larger than Fukushima. Cs-137 has a half-life of 30 years, whereas I-131 only has a half- life of 8 days. So Cs-137 is much more important in the longer term. With its longer half-life Cs-137 is around for much longer. Having said that I-131 distribution after an accident is important when looking at the incidence of thyroid cancer. Austria had the second highest average I-131 deposition density, outside Belarus, Ukraine and Russia, after Chernobyl. (As ever, whether there was an increase in thyroid cancer in Austria after Chernobyl is controversial – see TORCH 2016).

Table 1 Comparison of Source Terms for Cs-137

Largest release from HPC suggested in UK Article 37 Submission	0.0447TBq (19)
EIA for the planned Dukovany NPP (Czech Republic)	30TBq (20)
EIA for the planned Hanhikivi NPP (Finland)	100TBq (21)
RPII ST4 severe accident scenario	10,000TBq (22)
Austrian analysis severe accident at Hinkley Point C	53,180TBq (23)
Severe accident in the HPC spent fuel pool	1,780,000TBq (24)
Fukushima disaster, 2011	12,000TBq (25)
Chernobyl disaster, 1986	80-85,000TBq (26)

5. Spent Fuel Storage

Unlike spent fuel generated by existing UK nuclear reactors, it is not the intention of future reactor operators to reprocess spent fuel from new nuclear reactors. As a result, spent fuel will almost certainly remain on-site for decades, rather than being transported off-site to Sellafield as it is at the moment at most sites, apart from Sizewell B. Although it is possible that spent fuel might start to be transported off site during the 60 year lifetime of new reactors, prospective operators generally take the view that it is prudent to plan to store all of the lifetime arisings of the planned reactors on-site probably in spent fuel storage ponds. At Hinkley Point C, EDF is planning to be able to extend the life of the storage ponds for up to 100 years after the reactors close. (27)

A recent study in the US detailed how a major fire in a spent fuel pond "could dwarf the horrific consequences of the Fukushima accident." The author Frank von Hippel, a nuclear security expert at Princeton University, who teamed with Princeton's Michael Schoeppner on the modelling exercise said "We're talking about trillion-dollar consequences." (28) This would clearly involve major transboundary radioactive releases much larger than those suggested in the RPII scenario, because the spent fuel store could contain up to 60 years' worth of spent fuel.

According to the Austrian Analysis PSA 2 results (in the Pres-Construction Safety Reports by EDF and Areva) show that a possible severe accident in the spent fuel pool could result in a release of 1,780,000 TBq of Cs-137. (29)

In other words, the greatest risk is one that could remain in place until at least 2130.

6. RPII Severe Accident Scenario (ST4)

According to the UK Government's Article 37 submission to the European Commission on Hinkley Point C, a severe accident would only release 0.0447TBq of radioactivecaesium-137.

The RPII (now EPA) looked at the impact of a severe accident at a new nuclear station at Wylfa on Anglesey. This concluded that up to 10,000TBq could be released. Doses to adult inhabitants of Dublin

Total radiation dose to an adult in Dublin from inhalation, cloudshine and groundshine	**Amount in sieverts**
After the plume passage	18,084 µSv
Cumulative after a week	19,834 µSv
Cumulative after a year	43,794 µSv

Intervention levels have been established for emergencies by the International Atomic Energy Agency. These suggest that sheltering should be recommended if the dose is expected to reach over 10,000 µSv over a two day period.

In the scenario the radiation dose during plume passage is predicted to exceed the intervention level for sheltering, thus people would be advised to remain indoors during the passage of the plume (approximately 24 hours in a particular weather scenario). The intervention levels for iodine prophylaxis (iodine tablets) or evacuation is not exceeded. A radiation dose of just over 9000 µSv (9mSv) from inhalation of iodine-131 was predicted. While this is below the intervention level of 50,000 µSv (50mSv) for administration of iodine tablets (and was based on the assumption that people were outside during the passage of the plume), the RPII notes that staying indoors could reduce this radiation dose significantly. However the 50,000 µSv intervention level is very high. It would certainly be worth taking potassium iodate tablets if a 9,000 µSv was in prospect and these tablets will not do you any harm. (30)

The radiation doses from the table above do not include ingestion doses. The reason given by RPII for this is:

"*These radiation doses were treated separately as in an emergency this pathway is extremely amenable to significant reduction. Indeed, the appropriate use of food controls and agricultural measures can substantially reduce the transfer of radioactivity to the food-chain."*

If no action is taken the ingestion dose resulting from the accident scenario could be as high as 275,000 µSv, bringing the total dose to almost 320,000 µSv. RPII comments:

"*If no protective actions were taken, a dose of this magnitude might be expected to result in an observable increase in cancers in the decades following the accident. For comparison, the annual average radiation dose from all sources of radiation received by members of the Irish public is estimated to be 3950 µSv*."

RPII also notes that:

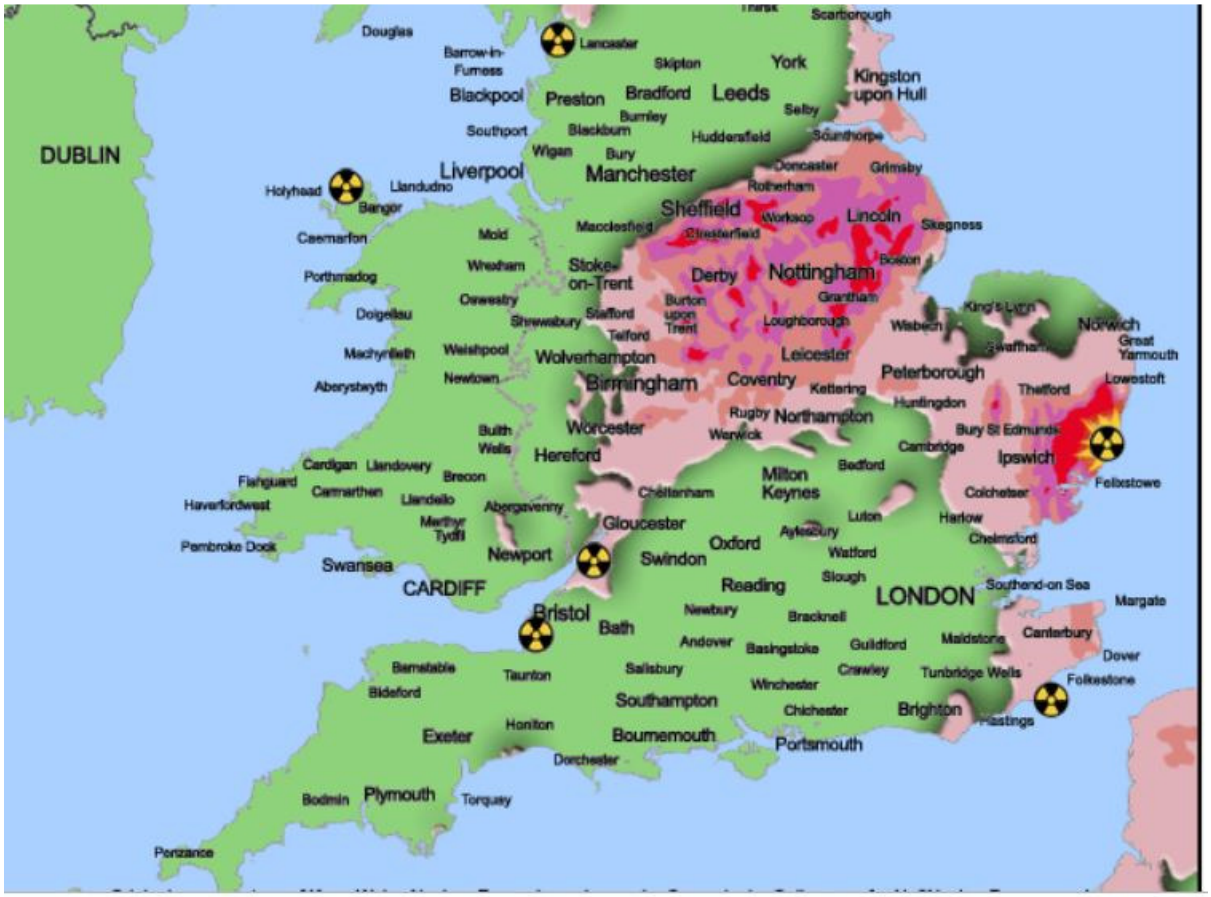
"*In the absence of any protective actions having been taken to reduce or eliminate the contamination of food and animal feed, all of the food types would exceed the Maximum Permitted Levels for a period of at least two months (for meat and root vegetables even after one year, the radioactivity concentrations were predicted to be significantly higher that the permitted levels in the scenario studied)*."

RPII notes in passing that while the protective actions could be highly effective in reducing radiation doses, their implementation may not always be straightforward. Obviously the

disruption to the Irish agricultural industry could be considerable. In addition, experience of food contamination issues elsewhere suggests that, even in cases where the EU Maximum Permitted Levels are not exceeded, the economic consequences from loss of market due to the 'perception' that food is contaminated can be considerable.

Obviously for the people of central England, an accident at Sizewell C would have a much greater impact in comparison to the impact of an accident at Wylfa on Dublin. With Sizewell we do not have the benefit of 100 kilometres of sea between the accident and the nearest centre of population.

By superimposing the fallout map from Chernobyl onto a map of the area around Sizewell it is possible to get an idea of what the impact a severe accident might look like, depending on the wind direction. The red shading represents the area which would have required compulsory resettlement in Belarus and Russia and the pink are where additionally compulsory resettlement would be compulsory in the Ukraine.



7. Conclusions

The NFLA's core conclusions to the EDF Sizewell consultation are as follows:

- Electricity generation in 2018 was some 63TWh (16%) lower than in 2005, a reduction equivalent to 2.5 times the output of the new nuclear plant being built at Hinkley Point C. This is despite the UK population increasing by 10% from 60 million to 66 million people.

- Nuclear generation was 72TWh in 2016 or about 21% of electricity produced in the UK. Total installed nuclear capacity is around 8.9GW. Yet an accelerated programme of LED lighting installation alone, for example, could reduce peak electricity demand by almost 8GW.

- Cost-effective investments in domestic energy efficiency alone between now and 2035 could save around 140TWh of energy – roughly equivalent to the output of six power stations the size of Hinkley Point C.

- In short the National Policy Statements on Energy and Nuclear (EN-1 and EN-6) need to be reviewed. There is no "need" for new nuclear power stations. Energy efficiency has already reduced electricity consumption by 30% compared with what it was expected to be in 2017 at the time that Hinkley Point C was first mooted, and these reductions can continue.

- In December 2017 the UK Government proposed a process and criteria for designating potentially suitable sites for new nuclear reactors above 1GW capacity for deployment between 2026 and the end of 2035 as part of a new National Policy Statement (NPS).

- In its response to the consultation the Government continued to argue that because our existing nuclear plants are scheduled to close, coal fired stations are being phased out and we are likely to need significant additional low carbon capacity to electrify more of our transport and heating, new nuclear stations will still be required. Nevertheless the new

NPS will be a "stand-alone" document, sitting outside the 2011 NPS suite and particularly the overarching energy policy set out in EN1.

- In other words the Government is refusing to revise EN-1 to take account of the growing energy revolution taking place on the ground, giving the public a chance to have their say on the direction of travel. Instead it claims that the proposed new NPS has been disconnected from EN-1, yet it continues to justify new nuclear power stations on the out-of-date thinking upon which EN-1 is based.

- The Government's complacency and obsession with nuclear power is smothering innovative thinking to take account of a revolution in the energy sector as well as creating a democratic deficit.

- Sizewell C will produce nuclear waste with about 80% of the total radioactivity already created. And yet we are still not sure what to do with this waste.

- According to the UK Government's Article 37 submission to the European Commission on Hinkley Point C, a severe accident would only release 0.0447TBq of radioactivecaesium-137. In contrast a modelling exercise by the Radiological Protection Institute of Ireland suggested showed that a 10,000TBq of Cs-137 was possible. An analysis for the Austrian Environment Agency shows that a possible severe accident in the spent fuel pool could result in a release of 1,780,000 TBq of Cs-137.

- Superimposing maps of radioactive fallout from Chernobyl, which released around 85,000TBq of Cs-137 show that a severe accident could require large areas of southern England to be evacuated depending on the wind direction.

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