Nuclear Free Local Authorities

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Consultation on the Nuclear Industry Association's Application to Justify the UK Advanced Boiling Water Reactor (UK-ABWR)

1. Background to Briefing

This edition of the NFLA's 'New Nuclear Monitor' has been developed for the NFLA Secretariat by the NFLA Scotland Policy Advisor. It provides and overview and model response to the UK Government's public consultation on an application submitted by the Nuclear Industry Association (NIA) for a regulatory justification decision on the Advanced Boiling Water Reactor (ABWR). The consultation runs until 13th May 2014. (1)

Responses should be submitted, preferably by e-mail to:
UK-ABWR Regulatory Justification Application
Department of Energy and Climate Change
Room 108
55 Whitehall
London
SW1A 2EY
Email: abwrjustification@decc.gsi.gov.uk

2. Introduction

Under European Union regulations, companies hoping to build a new class or type of nuclear facility must show the benefits outweigh the potential health risks – this is known as the Justification Process.

In March 2008 the Government issued Guidance for applications for a justification decision for new nuclear reactor designs. (2) Nuclear companies were invited to put forward new reactor designs by June 2008 for a justification decision. An application was made by NIA on behalf of utilities interested in developing four new reactor designs: the EPR, AP1000, the Advanced CANDU Reactor (ACR) and the Economic Simplified Boiling Water Reactor (ESBWR).

In December 2008 DECC published a consultation document (3) and the NIA application. (4) The NFLA published a briefing in response to this consultation in February 2009. (5) The consultation closed on 25th March 2009.

Almost a year later, between November 2009 and February 2010 the Government held another consultation on the Secretary of State's proposed decision, but this time it was restricted to the AP1000 and EPR. (6) The Justification draft decision documents pointed out that the Government's Committee on the Medical Aspects of Radiation in the Environment (COMARE) was undertaking a further review of the incidence of childhood cancer around nuclear power stations, with particular reference to the KiKK study in Germany, but this wasn't expected to be published until after the consultation had closed.

The Nuclear Free Local Authorities (NFLA) published a briefing on responding to the Justification consultation in December 2009. (7) NFLA joined other groups in calling for a public inquiry to examine in particular plans for safely managing radioactive waste from new reactors; the

disposability of the high burn-up spent fuel and the possibility that spent fuel would be stored for up to 160 years at reactor sites. NuClear News No.16 looked at some of the highlights from submissions to the consultation. (8)

Despite a strong push for a public inquiry the Secretary of State, Chris Huhne, published his decisions as Justifying Authority on 18 October 2010, (9) which agreed that two nuclear reactor designs, Westinghouse's AP1000 and Areva's EPR, would be Justified - that is, that their benefits outweigh any radiological health detriment they may cause.

The ABWR is the reactor type which Hitachi and Horizon proposes to build and operate at Wylfa on Anglesey and Oldbury in Gloucestershire. With the ABWR Justification Process the Government is again proposing a two stage process. There will be a second consultation on a draft regulatory justification decision by the Secretary of State as Justifying Authority. This is expected to take place, along with public engagement events, between July and October this year. If the benefits of operating ABWRs reactors is found to outweigh the health detriments i.e. be Justified, then the Secretary of State (the Justifying Authority) will make a regulatory justification decision in the form of secondary legislation (a Statutory Instrument) between January and March 2015. Clearly any slippage in the timetable could mean a decision being delayed until after the General Election.

3. Health Detriment

At an NFLA seminar held in Glasgow in October 2009, delegates heard from radiation consultant, Dr Ian Fairlie, about the findings of a report by the German government on cancer rates around nuclear sites in Germany. (10) The German KiKK study reported a **1.6-fold increase in solid cancer risks and a 2.2-fold increase in leukaemia risks, among infants under 5 years old living within 5 km of all German nuclear power stations. These increased cancer rates were unequivocally linked to proximity to nuclear reactors.** The study's findings support over 60 other studies worldwide on increased childhood cancer near nuclear power stations.

The Secretary of State's Justification Decision was published in October 2010, before COMARE reported on its study on childhood cancer with particular reference to the KiKK study. The decision document highlighted requests from several respondents for a delay in taking the final decision until COMARE's review had been published and subject to public examination. (11)

Unfortunately the Government's response did not accept a need for delay. It said:

"*The Government's view is that new nuclear power stations would pose a very small risk to health …The Secretary of State is satisfied that the best evidence suggests that no appreciable linkage between nuclear power stations and a higher incidence of cancer has been demonstrated*. "

When COMARE's report was finally published in May 2011 (12) it was widely reported as providing evidence that nuclear power plants did not cause childhood cancers. The Committee said we should now be looking for other reasons, perhaps infections or even viruses, to explain leukaemia clusters. However these conclusions were scientifically incorrect.

An earlier 2008 study commissioned by the Department of Health had found a 36% increase in acute childhood leukaemias between 1969 and 2004 within 5 km of 13 of the 14 UK nuclear power stations but this increase was not considered statistically significant. COMARE's 14th Report actually uses the same 1969 to 2004 time period as the 2008 study despite being requested to extend the time period. It does however add non-Hodgkins lymphomas (NHL), chronic myeloprolific diseases, and unspecified leukaemias to the acute leukaemias examined in 2008. These are strange inclusions as there are no actual cases of these extra diseases in the 5 km circles near British NPPs in the study period, and these disease categories were not used in the KiKK study which was supposed to be replicated.

COMARE still found a 22% increase in childhood acute leukaemia, non-Hodgkins lymphoma (NHL), chronic myeloprolific disease and unspecified leukaemia. This was called a negative finding because it lacked statistical significance. This also was scientifically incorrect. What COMARE should have stated was that a leukaemia increase was found which was not statistically significant, but that this could simply be due to small numbers.

Dr Ian Fairlie branded COMARE's findings "*poor science*". Speaking during a visit to Oldbury, Fairlie said: "*The report has in a sense cherry-picked data.*" Sellafield was excluded but data that was irrelevant was included. (13)

In a critique by Dr Fairlie (14) he points out that by adding new disease categories the net result is to reduce the apparent increase in leukaemias/lymphomas near NPPs from 36% in the 2008 study to 22%. COMARE rejects the 22% increase by incorrectly implying that, as its findings did not meet a significance test, the findings were negative. COMARE's Report is regrettable as it may mislead members of the public into thinking there are no increases in leukaemias when in fact this may not be the case.

"*You won't hear the UK government admit it*" argues Dr Paul Dorfman of the Nuclear Consultation Group, "*but after decades of research there is now evidence of real excesses of childhood cancer and leukaemia near some nuclear facilities*." He said let's be clear about this, the German Childhood Cancer Registry has found that there is a significantly increased risk for children under five years of age to contract leukaemia the nearer they live to a nuclear power plant. (15)

Since COMARE's 14th Report there has been a new French study of childhood leukaemia near nuclear power plants, published in 2012, which found a statistically significant increase in leukaemia in children under 15 years old in 2002-2007 within 5 km of 19 French nuclear power stations. (16)

Since the KiKK report there have now been four European reports showing an increase in childhood leukaemias in the vicinity of nuclear power stations – the French report, another one in Germany and one in Switzerland, plus the COMARE report. (17) Dr Ian Fairlie and Dr Alfred Körblein carried out a meta-analysis which merged the data from all four studies and found a **37% increase in childhood leukaemias near nuclear power stations which is statistically significant**. (18)

4. The application

The NIA application considers the potential radiological health detriment to the public and workers under the following headings:

- Uranium mining and extraction;
- Uranium conversion, enrichment and nuclear fuel element manufacture;
- Normal nuclear power station operation – radiological impact for the public;
- Normal nuclear power station operation – radiological impact for workers;
- Transport of radioactive materials – radiological impact on public and workers;
- Potential transport accidents – impact on public and workers;
- Potential reactor accidents – radiological impact for public and workers;
- Decommissioning – routine doses to workers; and
- Decommissioning impact of discharges and accidents on workers and the public.

The Application says spent fuel would be stored on site until transported to another nuclear site for further interim storage, disposal or, possibly, reprocessing. The Government considers that it would be technically possible and desirable to dispose of both new and legacy waste in the same geological disposal facilities and that this should be explored through the Managing Radioactive Waste Safely programme.

An "*NDA Disposability Assessment of UK ABWR waste and spent fuel*", is expected to be published during the time in which the Justifying Authority is considering this application. This will assess whether it would be feasible to dispose of ABWR spent fuel in the theoretical Geological Disposal Facility (GDF) being planned for the UK's legacy nuclear waste. But there is no promise that this will be available for examination by consultees before the closing date of the consultation.

The application does not appear to have considered waste management or spent fuel accidents, during the storage period, which could be up to 160 years (100 years after the closure of the plant). Nor is there any consideration of encapsulation, which could be carried on the reactor site or at the GDF site.

5. Other disbenefits of new nuclear reactors

Despite the evidence to the contrary, if it remains the Government's view "*that new nuclear power stations would pose a very small risk to health",* then the Justification Regulations requires that the benefits of the practice must outweigh these radiological health detriments, even if they are small.

The available evidence suggests that, compared with other options, building nuclear power stations may not, in fact, produce a net benefit.

In 2009, NFLA argued that the opportunity cost of any investment is the cost of forgoing the alternative outcomes that could have been purchased with the same money. Resources are scarce, and climate change is a serious and urgent problem so we need to ensure that any spending decisions we make involve using our limited resources as effectively and quickly as possible. For each pound we spend we need to buy the maximum amount of "solution" possible (the "least cost" solution). On both criteria, cost *and* speed, nuclear power is probably the least effective climate-stabilizing option on offer. Investment in nuclear power will, in effect, worsen climate change because each pound we spend is buying less solution than it would do if we were to spend it on energy efficiency for example.

To tackle climate change the speed with which carbon abatement measures can be introduced is also important. New nuclear power stations are not now expected to come online until 2023 at the very earliest. The UK Association for the Conservation of Energy estimates that if one new nuclear power plant starts operating in the UK by 2020, it might start delivering perhaps just over one million tonnes of carbon saving. In contrast energy efficiency "*could save around 25 million tonnes of carbon through cost-effective energy efficiency measures*" by that date. (19)

The UK Government's target is to reduce carbon emissions by 80% by 2050. To do this we need to implement a set of policies which can, amongst other things, cut emissions from the domestic sector by 80% by 2050. (These policies can also help the Government meet its legal obligations on fuel poverty). Every house will have to have excellent insulation and some form of Low and Zero Carbon Technology – microgeneration and community heating schemes. This means carrying out installations in all of the UK's 25 million dwellings over the next 40 years or 625,000 dwellings every year between now and 2050. Local authorities will have to play a major role in implementing these policies, but beyond a few trailblazing authorities, an insufficient amount of effort is going into this area. The Government's policies on energy efficiency – the Green Deal and Energy Company Obligation (ECO) – will not encourage installations on anything like the scale required. (20)

6. Expensive nuclear will crowd out cheaper options

Writing in *The Spectator*, Peter Atherton of investment analyst Liberum Capital, asks "*Why has Britain signed up for the world's most expensive power station?*" (21) It is already obvious that Hinkley is not a good deal for Britain. The NIA report does not claim that ABWRs will be any cheaper than EPRs.

The government has guaranteed that EDF would be able to sell the power from Hinkley Point at a price of £89.50 per MWh (assuming that Sizewell C is also built), which compares to a current

wholesale power price of around £50 per MWh. The £89.50 is in 2012 money: and will be inflated by the Consumer Price Index (CPI). Assuming CPI inflation averages 2.5 per cent over the next decade, the price ABWRs might expect at opening for their output would be around £121 - £130 per MWh. the indexing continues throughout the 35 years of the contract. So by 2030 the guaranteed price would be about £150 per MWh.

Amory Lovins, Chief Scientist at the Colorado-based Rocky Mountain Institute says "*Britain's plan for a fleet of new nuclear power stations is … economically daft*." The guaranteed price is over seven times the unsubsidised price of new wind in the US, four or five times the unsubsidised price of new solar power in the US. Nuclear prices only go up. Renewable energy prices come down. There is absolutely no business case for nuclear. (22)

The trouble is that the UK Government's Levy Control Framework sets annual limits on the overall costs of levy funded policies. Levy funded policies include the Renewables Obligation (RO), small scale Feed-in Tariffs (ss-FIT), Investment Contracts for Final Investment Decisions Enabling for Renewables (FIDeR) and Contracts for Difference (CfDs). This means that the total pot of money available to fund subsidies to low carbon energy is limited. Forecast expenditure in 2018/19, for example is £6.45bn but only £2.9bn will be available for new entrants. (23) It is not yet known how much money will be available for levies in the years that ABWRs open, but it is clear that the allocated funds could very easily be used up by new reactors thus pushing out renewables, even if they are cheaper.

Alternatives to ABWRs	**Relative to the nuclear strike price etc.**	**Cost**	**Capacity/generation (for comparison Hinkley C = 3.2GW and up to 25TWh/yr)**	**Reference**
Interconnector with Iceland	Cheaper	£4bn	1.2GW	Sunday Times 16th Feb 2014 **http://tinyurl.com/oty5gju**
Large-scale PV	EMR Delivery Plan suggests only 2.4 - 4GW by 2020	Cheaper than nuclear	30TWh for commercial roofs; 190TWh for solar farms	Solar Portal 20th Dec 2013 **http://tinyurl.com/m88l8dc**
Domestic PV	Roll-out faster and less risky than nuclear	Cheaper than nuclear	22 – 140TWh/yr	Solar Portal 20th Dec 2013 **http://tinyurl.com/m88l8dc**
Offshore Wind	Strike Price for 15 years rather than 35 years for nuclear	Down to perhaps £85/MWh by 2020 or soon after	195TWh/yr by 2030	A Plan for Clean British Energy FoE Sept 2012 **http://tinyurl.com/mcdsb9t**
Domestic Energy Efficiency	Helps keep domestic fuel costs low, unlike nuclear		~40TWh/yr by 2030	See Energy Price Freeze, NuClear News No.58 Jan 2014 **http://tinyurl.com/p8krake**
Overall Energy Efficiency	Helps keep business competitive with cheaper energy costs, unlike	140TWh/y at negative cost	155TWh/yr	McKinsey Report July 2012 **http://tinyurl.com/ofx5gu2**

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7. Alternatives to ABWR reactors which don't produce a radioactive health detriment.

By the time the Secretary of State is ready to publish his draft Justification decision in spring 2015 the UK solar PV industry could have installed a cumulative PV capacity of more than 7GW. This would correspond to 35% of the 20GW by 2020 aspiration of Energy Minister, Greg Barker. 2.5GW is expected to be installed in 2014, a further five years at that rate will get the industry to the 20GW mark, something that was unthinkable a few years ago but is quickly becoming a figure that may need to be upgraded to reflect the changing status of solar PV within the overall energy mix of the UK. (24)

8. Security of Supply – the concept of baseload is obsolete

The NIA argues that new ABWRs will help to ensure a diverse mix of technology and fuel sources, which will increase the resilience of the UK's energy system. They will reduce exposure to the risks of supply interruptions and of sudden and large spikes in electricity prices that can arise when a single technology or fuel dominates electricity generation.

But Wylfa and Oldbury will not be able to start operating for at least ten years. They won't be able to contribute to energy security and reducing dependence on fossil fuels until after 2024.

Solar power, on the other hand, could provide energy security quickly, reduce electricity bills and protect the environment at the same time. Mark Turner, a director at a leading UK solar power company, Lightsource Renewable Energy, says Britain's solar industry has the capability to deliver the same amount of electricity every year as is expected to be produced Hinkley Point C within 24 months and at a comparable cost. Turner says that while solar power will not be the entire solution:

"…*if we supported its deployment then within a couple of years we could have 10% of the UK's energy mix completely free from the vagaries of the global fossil fuel markets*". (25)

Both solar PV and offshore wind could provide the same amount of electricity as Hinkley Point C more cheaply. However, the Nuclear Industry Association (NIA) argues that even if solar and wind end up requiring lower strike prices, without an energy storage breakthrough they cannot provide the same level of base load power as nuclear. (26)

The argument that renewable energy isn't up to the task because "*the Sun doesn't shine at night and the wind doesn't blow all the time*" is overly simplistic. There are a number of renewable energy technologies which can supply baseload power. The intermittency of other sources such as wind and solar photovoltaic can be addressed by interconnecting power plants which are widely geographically distributed, and by coupling them with peak-load plants such as gas turbines fuelled by biofuels or natural gas which can quickly be switched on to fill in gaps of low wind or solar production. Numerous regional and global case studies – some incorporating modelling to demonstrate their feasibility – have provided plausible plans to meet 100% of energy demand with renewable sources. (27) These include:

(1) Energy consulting firm Ecofys produced a report detailing how we can meet nearly 100% of global energy needs with renewable sources by 2050. Approximately half of the goal is met through increased energy efficiency to first reduce energy demands, and the other half is achieved by switching to renewable energy sources for electricity production. (28)

(2) The European Renewable Energy Council (EREC) prepared a plan for the European Union (EU) to meet 100% of its energy needs with renewable sources by 2050, entitled *Re-Thinking 2050*. (29)

(3) Zero Carbon Britain 2030: a plan produced by the Centre for Alternative Technology. (30)

Ben Cosh of TGC Renewables argues that concerns that the intermittency of solar is somehow more challenging to deal with than the intermittency of wind are unfounded. Solar power is measurably more predictable and easier to handle. National Grid says that to attach 22GW of solar capacity to today's grid there would be some technical challenges. But Germany and Italy have shown what solution oriented engineers can achieve with a smart grid.

- On load tap changers which control the voltages according to demand and generation
- Providing national grid with remote control of PV systems to constrain generation when required
- Greater use of interconnectors to trade with neighbouring countries in different time zones, and different usage habits
- Requiring inverters which play a more active role in frequency, voltage and power factor management
- Use of storage to turn solar into base load. The economics of this would work without subsidy with an installed cost of $1/W for the solar plant and installed costs of storage of $125/kWh, aligned to pump storage
- Use of battery or compressed air storage to capture peak midday solar generation and release it into the evening peak demand
- Industrial, Commercial and Domestic Demand side response which rewards consumers of electricity for moving their variable demand to times of day where electricity is cheapest. (31)

Clearly a key part of a 100% renewable energy strategy would be a major energy efficiency programme. A study for the UK Government by consultants McKinsey showed a massive 155TWh/yr of electricity available for saving – 140TWh of which could be saved at negative cost. This compares to a UK electricity demand in 2010 of 370TWh. There are around 100TWh of electricity savings detailed in the McKinsey report which the UK Government currently has no plans to capture. (32) If the UK aimed to capture much more of the potential electricity savings available from building envelope improvements and lighting in the services sector, and more efficient motors and pumps in the industrial sector between 50 and 100TWh could be saved, much of it at negative cost, removing the need for any new nuclear reactors.

9. ABWR Reliability

There are four ABWRs currently in operation – all in Japan. Although these are said to have been built to time and budget, none have a capacity factor above 73% and two have capacity factors of less than 45%.(33) A capacity factor is the amount a plant generates compared to the amount that would be generated if it was operating at full power all of the time. Nuclear power plants are costed on the basis that they will achieve capacity factors of 80-90 per cent. With a capacity factor of 45 per cent any nuclear power project comes out needing twice the power price to be an economic proposition. (34)

Although the NIA Application admits that for the period 2006-10 the four ABWRs had an average load factor of about 45%, the report doesn't attempt to explain why.

10. Conclusion

NFLA notes a meta-analysis which merged data from UK, France, Germany and Switzerland found a **statistically significant 37% increase in childhood leukaemias near nuclear power stations.**

NFLA argue that nuclear power is one of the slowest and most expensive methods of reducing carbon emissions. Investment in nuclear power will, in effect, worsen climate change because each pound we spend is buying less solution than it would do if we were to spend it on energy efficiency for example.

NFLA believe that the operation of the UK Government's Levy Control Framework means that allocated funds could very easily be used up by new reactors thus crowding out renewables and energy efficiency, even if they are cheaper.

NFLA assert that the idea that the UK needs nuclear power to provide baseload electricity is obsolete.

NFLA concludes that the experience of ABWRs built so far shows that this is not a reliable technology.

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