Response from Stop Hinkley to the Revised National Policy Statements on Energy and Nuclear Power

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www.stophinkley.org

Introduction

Stop Hinkley is the local campaign group committed to shutting down the existing reactors at Hinkley Point and preventing new ones being built. We began campaigning in the mid 1980s when a new Hinkley “C” reactor was previously on the cards. Our group took an active part in the 14 month long Hinkley C inquiry (1988-9), including running an office for objectors at the Cannington College venue.

Since the subsequent decision by the privatised electricity companies not to proceed with constructing the power station on economic grounds we have continued to campaign against the continued operation of Hinkley A and B and Oldbury in nearby South Gloucestershire. Hinkley A closed well ahead of expectations (in 2000) following our vigorous campaigns on safety and health.

One or other of the twin reactors at Oldbury station was shut for a period of five years during an extensive investigation into the severe corrosion of the graphite reactor cores at the plant which we highlighted. We have also highlighted a similar core corrosion problem at Hinkley B, together with significant boiler corrosion after a long period of non-inspection.

We believe that nuclear power in not safe, produces significant health effects in the nearby population and is not necessary to ensure a reliable low carbon electricity supply in the UK.

This submission contains our comments on the draft revised National Policy Statements on Energy, in particular the Overarching NPS (EN-1), the Nuclear Power Generation NPS (EN-6) and their associated Appraisals of Sustainability, as well as the government’s response to the previous NPS consultation.

Please also note that, even though we have not repeated all the points raised then, these comments should be seen as in addition to (and not a replacement for) the response made by our then Coordinator Jim Duffy to the first energy NPS consultation round in February 2010.

1. The Consultation Process

Stop Hinkley supports the analysis made by the Blackwater Against New Nuclear Group (BANNG) in their separate submission to this consultation. This points out that, despite criticism of the process in the first consultation round last winter, no serious attempt has been made to engage more fully with the general public and interested NGOs.

The documentation is bulky, poorly written and extremely difficult to navigate. There are no clear summaries of the key arguments. Many people are likely to have been put off from responding, leaving only those with the resources, time, expertise and motivation to undertake the task. The result is that many prospective respondents who might have important points to make will have been disenfranchised, effectively excluding the ordinary citizen from the process.

Although a summary of changes from the first NPS documents has been produced, it is unreasonable to expect comments to be limited to just the sections of the documents highlighted. The changes made, some substantial and some minor, inevitably open up the whole rationale of the NPS's. Even though this is a process incorporating revisions, the suite of NPS's are being re-presented as a whole; any comments on any part of their contents should therefore be taken into account.

In terms of public engagement, no site meetings or exhibitions have been held by the Department of Energy and Climate Change to draw attention to the proposed changes in the NPS's, let alone an explanation of precisely what is being proposed for each site. The one meeting held in Bridgwater, the nearest town to the Hinkley Point site, was clearly not long enough (at 1 ¼ hours devoted to the Nuclear NPS) to deal with the level of public interest, with many formally submitted questions remaining unanswered at the end.

2. The Need for Nuclear Power

Both the Revised Draft Overarching National Policy Statement (EN-1) and the Revised Draft National Policy Statement for Nuclear Power Generation (EN-6) confirm the government's view that a future energy supply portfolio for the UK should include nuclear power for reasons of security (reducing reliance on imported fossil fuels), carbon saving and a reliable supply on a day-to-day basis.

They refer to the latest Department of Energy and Climate Change (DECC) "2050 Pathways" analysis as lending weight to this view and often describe the need to build a new generation of nuclear power stations as "urgent".

In fact, there is plenty of evidence that the UK's future electricity supply (nuclear only meets electricity demand) can be met satisfactorily without recourse to a nuclear revival, urgent or otherwise.

The then UK government's own 2003 Energy White Paper "Our Energy Future – Creating a Low Carbon Economy" clearly stated that "while nuclear power is currently an important source of carbon free electricity, the current economics of nuclear power make it an unattractive option for new generating capacity and there are also important issues for nuclear waste to be resolved. This white paper does not contain proposals for building new nuclear power stations."[1]

This view was subsequently supported by its advisory body the Sustainable Development Commission, whose 2008 report "Is nuclear the answer?" argued that "there is a range of different ways for the UK to meet its carbon dioxide and energy security objectives without relying on a new generation of nuclear power plants".[2]

The latest analysis from DECC in its "2050 Pathways" publication also projects the potential for the UK to meet future electricity demand without a nuclear input. Its "Pathway Gamma" scenario shows demand being met in 2050 by a large increase in renewable generation as well as fossil fuelled power stations fitted with carbon capture and storage. Nuclear would cease to make a contribution after the closure of Sizewell C power station soon after 2030. The report concludes that Pathway Gamma involves "very substantial" challenges in terms of balancing the electricity grid because of the large proportion of renewable generation, some of its variable. There would therefore need to be "an extremely substantial increase in storage, demand shifting and interconnection".[3] These are all challenges which other countries are proposing to meet in an energy supply system without a new nuclear element (see below).

It is also important to point out that the alleged "energy gap" has been exaggerated in order to justify new nuclear build. Poyry Energy Consulting, for

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[1] http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file10719.pdf
[2] "Is Nuclear the Answer?", Sustainable Development Commission, 2006.
[3] "2050 Pathways Analysis", July 2010, p.22.

example, in a report for Greenpeace in 2008, concluded that if a substantial contribution is made by renewable sources, then "a major need for new generation capacity does not emerge until after 2020…"[4] Any urgency for new generation capacity has been further reduced by the effects of the economic recession, which, according to the National Grid, has substantially dampened demand. Others point to the large number of gas-fired power stations either already under construction or planned.

At the same time, it is perfectly feasible for the UK electricity system to be transformed into a low carbon network without relying on nuclear power. This would require a major commitment to energy saving measures as well as a much stronger effort to increase the range of renewable energy sources available. Not enough emphasis is placed in the revised NPS documents on the potential for energy efficiency to reduce demand.

The UK Association for the Conservation of Energy, for example, has assessed that if one new nuclear reactor is operating by 2020, it could be delivering just over one million tonnes of carbon savings. By comparison, energy efficiency "could save around 25 million tonnes of carbon through cost-effective energy efficiency measures" by the same date.[5]

The UK is already legally obliged under EU Directives to both reduce its energy intensity through efficiency measures and increase its proportion of renewable energy to 15% by 2020. This translates into a requirement for more than 30% of electricity to come from renewables by 2020 and provides the basic foundation on which a non-nuclear, low carbon future can be constructed.

Britain is in an extremely strong position in terms of renewable energy resources compared with other countries. It has a much better wind regime than Germany, for example, which, with a larger population of 82 million, already gets 7.5% of its electricity from the wind and is looking for 25% by 2025.[6] The UK could also exploit much more seriously the abundance of waves and tides around our

[4] "Implications of the UK Meeting its 2020 Renewable Energy Target", Poyry Energy Consulting, 2008.
[5] Andrew Warren, Director of the Association for the Conservation of Energy, Letter to the *Guardian* 13 July, 2006 - http://politics.guardian.co.uk/green/story/0,,1819253,00.html
See also *Memorandum by the Association for the Conservation of Energy to the UK House of Commons Environmental Audit Committee*, Sept 2005.
http://www.ukace.org/publications/ACE%20Evidence%20(2005-09)%20-%20EA%20Committee%20Inquiry%20into%20nuclear,%20renewables%20and%20climate%20change.pdf
[6] German Federal Ministry for the Environment - www.erneuerbare-energien.de/inhalt/42721/

coasts, as well as a range of other options including solar and biomass-based generation.

Germany has already shown that economic incentives can be used to successfully encourage other renewables apart from wind, which is currently one of the cheapest options. These include bio-energy, solar, small-scale hydro and geothermal. The British government should extend the newly introduced "feed-in tariff" to cover all renewable electricity generation, not just schemes up to 5 MW capacity, in order to achieve the same level of success.

Keeping the Lights On Without Nuclear

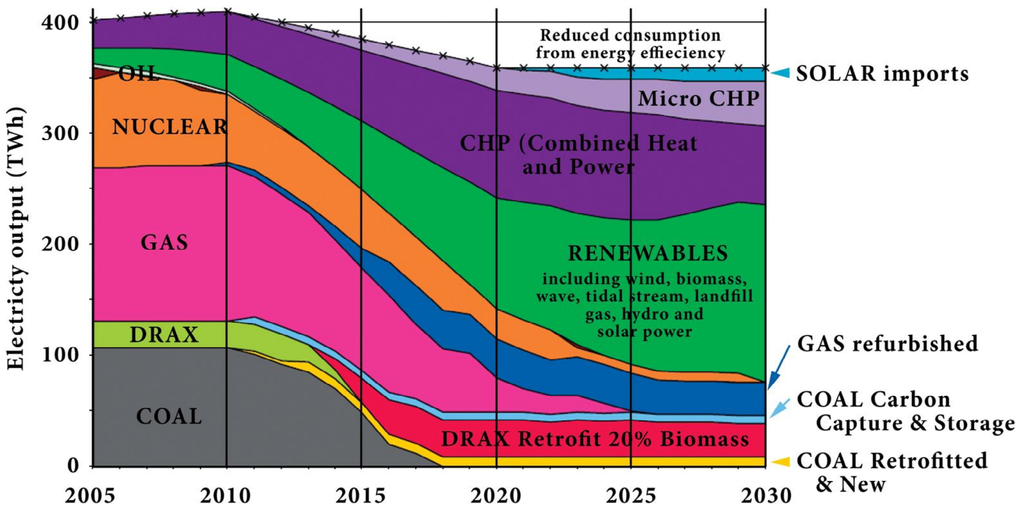
A number of organisations have shown in detail how a non-nuclear, low carbon electricity supply could be achieved in the UK.

Friends of the Earth (FoE), for example, has modelled a series of scenarios to show how demand for electricity in the UK could be met by combining energy efficiency measures with a dramatic growth in renewable power generation. Under these scenarios renewables (including wind, biomass, wave, tidal stream, landfill gas, hydro and solar) would increasingly replace fossil fuels, whilst nuclear would be phased out completely by 2030.[7]

The illustration below shows the middle range option among six different projections in the FoE report, showing overall reduction in demand combined with a substantial contribution from new renewables. The projected reduction in carbon dioxide emissions from UK electricity generation under this scenario is 67% by 2020 and 75% by 2030.

[7] "A bright future: Friends of the Earth's electricity sector model for 2030", Friends of the Earth, March 2006 - www.foe.co.uk/resource/reports/bright_future.pdf

How to phase out nuclear and keep the lights on



Source: "A bright future", Friends of the Earth, 2006

More recently, the Sustainable Energy Partnership has demonstrated, using the government's own demand figures, that it is possible to both "keep the lights on" and reduce carbon emissions with a combination of renewables, coal with CCS, CHP, microgeneration, a continued but reducing use of gas and enhanced efficiency measures. No new nuclear is required. This projection shows that by 2050 the UK's electricity demand could be more than satisfied by a mixture of small and large scale renewables, microgeneration and a diminishing contribution from fossil fuels.[8]

The "Zero Carbon Britain 2030" report[9], produced by the Zero Carbon Project based at the Centre for Alternative Technology in Wales, also projects a future energy supply in which new nuclear power does not feature. Instead, both electricity and heat would be supplied in 2030 by a range of renewable sources, in particular offshore wind.

The Zero Carbon Project has also produced a critique of DECC's "2050 Pathways" analysis, pointing out that it is possible for the UK to "decarbonise faster and quicker than the current UK target using existing renewable energy technologies". This critique points out that there should be far greater use of renewables in DECC's analysis, particularly offshore wind, working towards a

[8] Sustainable Energy Partnership projection to 2050 at www.noneedfornuclear.org.uk
[9] "Zero Carbon Britain 2030: A New Energy Strategy" - www.zcb2030.org

100% renewable energy mix, and that both new nuclear and CCS can be excluded from the equation whilst still achieving net greenhouse gas emissions of zero by 2030.

The Potential for Renewable Energy

The potential for use of renewable energy in the UK is not fully recognised in the revised policy documents. The recent study by the Offshore Valuation Group[10], for example, in which both DECC and the private sector participated, showed that, using five different electricity generating technologies - wind power with fixed and floating foundations, wave power, tidal range and tidal stream power - the available resource around the UK is enough to generate 2,131 Terawatt hours of electricity per year. This would meet the country's current electricity demand six times over.

Three deployment scenarios are examined in the study (see table below). Each scenario envisages a level of deployment greater than that currently planned but exploiting less than the full practical resource. Even the least ambitious scenario would meet 50% of UK electricity demand by 2050.

In the two more ambitious scenarios excess capacity produced by offshore renewable generators would be exported to the rest of Europe. "Integration with neighbouring electricity networks through a 'super-grid' could provide access to a single European electricity market, enabling the UK to sell renewable electricity across the continent," the report points out. Ministers from ten European Union member states bordering the North Sea, including Britain, agreed in December 2010 to work together towards making a transnational offshore grid a reality[11]. This super-grid would be particularly beneficial to the deployment of offshore renewables.

[10] "The Offshore Valuation", Offshore Valuation Group - http://offshorevaluation.org

[11] "EU Countries agree to build common offshore electricity grid" - www.ewea.org

Summary of projections in Offshore Valuation Group report

	Installed capacity	**Resource utilisation**	**Capital expenditure**	**Annual revenue in 2050**	
Scenario 1	**78 GW**	**13%**	**£170bn**	**£28bn**	**50% UK demand**
Scenario 2	**169 GW**	**29%**	**£443bn**	**£62bn**	**Net *electricity* exporter**
Scenario 3	**406 GW**	**76%**	**£993bn**	**£164bn**	**Net *energy* exporter**

The study concludes that the achievability of the scenarios "will ultimately be determined by the level of the UK's ambition; by the level of demand for the UK's renewable electricity in the wider European market; and by evolving technology costs". And it adds: "The UK is now most of the way through its first great offshore energy asset, our stock of hydrocarbon reserves. The central finding of this report is that our second offshore asset, of renewable energy, could be just as valuable. Britain's extensive offshore experience could now unlock an energy flow that will never run out."

Although much attention among the basket of renewable sources has been given to wind power, especially offshore, the potential of other less variable technologies is equally strong. *Energy Business Daily* reported, for example, on 17 Dec 2010:

"High-priced coal is driving the United Kingdom to double its electricity generation from biomass in the next two years. Bloomberg New Energy Finance has estimated it now costs 40.25 Euros to produce one megawatt of electricity from coal in the UK, compared to 39.35 Euros from biomass. Power companies are shifting away from coal-fired power as profits diminish… Analysts expect biomass-based electricity to double to 5,800 megawatts by 2014. This is enough energy to power six million homes.

"Melanie Wedgebury, spokeswoman for Drax Group Plc — the owner of Western Europe's largest coal-fired power plant — says making the switch from coal to biomass is a win for everyone: 'It would be a double-win. It will remove coal from the energy mix and replace it with significant, reliable, cost-effective and dispatachable renewable power'."[12]

At a European level the European Renewable Energy Council, which represents industry organisations in the photovoltaics, small hydropower, solar thermal, bioenergy, geothermal, ocean, concentrated solar power and wind energy sectors, has produced a scenario which envisages Europe being supplied almost 100% by renewable energy in 2050. This is achievable "even without an aggressive energy efficiency policy", the "RE-thinking 2050" report concludes[13].

The EU-27 member states are already well on their way to achieving the official target for 21% of electricity to come from renewables by 2010, reaching an estimated 19.9% by the end of 2009[14]. This seemed an unlikely outcome at the beginning of the decade. The EU is now working towards a legally binding target of about 33% renewable electricity by 2020.

Other European countries are already showing how progress towards this goal is possible. Germany, for example, from a relatively low baseline, has reached a level of 17% renewable electricity[15] - a threefold increase since 1995. It is now looking to source 35% of its electricity from renewables by 2020 and 80% by 2050[16]. At the same time it is committed to a long-established policy of phasing out nuclear power.

CHP and Microgeneration

Not enough emphasis is placed in the revised policy documents on the use of Combined Heat and Power (CHP). This not only has the advantage of making more efficient use of fuel, it avoids the government's tendency in its analysis to see the future energy supply as increasingly electricity-based, and therefore by implication requiring a greater nuclear input. This is a point elaborated on in their analysis of the National Policy Statements by the Nuclear Free Local Authorities organisation.[17]

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[12] http://energybusinessdaily.com/renewables/coals-high-prices-turn-britain-to-biomass-based-electricity/

[13] www.rethinking2050.eu/
[14] www.erec.org/statistics/res-e-share.html
[15] www.ifandp.com/article/008670.html
[16] http://rhein.blogactiv.eu/2010/09/13/germany-defines-sustainable-energy-policy-up-to-2050/
[17] www.nuclearpolicy.info/docs/nuclearmonitor/NFLA_New_Nuclear_Monitor_No23.pdf

The NFLA also points to the advantages of CHP both in terms of reducing gas consumption, therefore reducing carbon emissions, and providing a balance to variable renewable energy. A study by Pöyry Energy Consulting, for example, has shown that either installing (or extending the existing) UK industrial CHP plants could generate as much electricity as ten nuclear power stations and halve gas imports.[18] Implementing a decentralised energy strategy which links CHP to District Heating schemes would also not necessarily lock the UK into using more fossil fuel gas. In fact, as the Poyry study shows, it could lead to dramatic reductions in gas consumption much sooner than would otherwise be the case. Secondly, once the district heating networks are established they can be converted to run on other (renewable) fuel sources such as biomethane, biomass, geothermal and solar.

At the same time, as the NFLA points out, the successful combination of CHP and renewables is attracting increasing attention.[19] In Denmark, for example, when the wind speed drops by 1 metre per second the country needs to find an additional 350 MW of electric power capacity. Gas CHP has the capacity to respond quickly to such a fluctuation, but to maintain high efficiency the system must also find a use for the heat produced when generating electricity. Danish district heating companies are increasingly providing the grid with balancing services, and the Danish model shows how a combination of a high wind generating capacity and CHP can run together smoothly.[20]

In Germany, micro combined heat and power (CHP) has been identified as the solution to balancing wind in the network. LichtBlick is the largest independent energy supplier in Germany and has announced its goal to place 100,000 micro-CHP systems with an electric output of 20 kW each into homes and buildings in Germany. The property owner will be provided with the cogeneration unit and a heat storage unit and be guaranteed that the home will be supplied with heat as required.[21]

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[18] Poyry, Securing Power Summary, Greenpeace, June 2008
http://www.greenpeace.org.uk/files/pdfs/climate/industrialCHP_summary.pdf

[19] Fiona Riddoch, "Cogeneration can enhance smart grid operation by balancing the intermittent availability of renewable fuels", Power Services, 14 June 2010
http://powerservices.lakho.com/2010/06/14/cogeneration-can-enhance-smart-gridoperation-by-balancing-the-intermittent-availability-of-renewable-fuels/

[20] Heinrik Lund, "The Danish Experience: Successfully Managing Renewables and Cogeneration in a smarter grid structure", Teaming up for energy renewal conference, 2 June 2010
www.conference2010.eu/presentations/HenrikLund%20-%20The%20Danish%20experience%20in%20successfully%20managing%20renewables%20and%20cogeneration%20in%20a%20smarter%20grid%20structure.pdf

[21] Frits Bliek, "How smart grids and micro-CHP work together in the 21st Century", Teaming up for energy renewal conference", 2 June 2010. http://www.conference2010.eu/presentations/Frits%20Bliek%20-

If CHP is not promoted as a way of balancing renewables, non-CHP gas-fired electricity generating stations will most likely be used, so, as shown by Poyry in the case of industrial CHP, gas consumption could end up being higher in the all-electric scenario. A study by PB Power for the Mayor of London and Greenpeace UK concludes that a Decentralised Energy (DE) strategy could reduce CO_2 emissions from London by 27.6% by 2025. Despite the increased use of gas for CHP, gas consumption could be 15% lower under a high DE scenario compared with a high nuclear scenario.[22]

The NFLA also underlines the lack of commitment in the revised policy documents to microgeneration, including domestic scale CHP. The government's own Microgeneration Strategy[23] quotes from a study commissioned by the DTI from the Energy Saving Trust (EST) which suggested that by 2050, microgeneration could provide 30-40% of the UK's electricity needs and help to reduce household carbon emissions. “If the UK is aiming to produce 40% by 2050, a target of 10% for 2020 should be set,” it concludes. “This would obviate the need for new nuclear reactors.”[24]

Renewable strengths, nuclear weaknesses

The revised policy documents are often critical of renewable energy sources as potentially expensive and unreliable, whilst nuclear is assumed to be reliable and economic. EN-1, for example, refers (Para 3.3.4, p. 17) to nuclear power as “able to provide continuous low carbon generation” and being “capable of responding to peaks and troughs in demand or supply”, while “renewable technologies provide intermittent generation”.

This gives a false impression of their relative merits and disbenefits. Renewable energy sources such as wind power are better described as “variable” than intermittent. They do not suddenly switch on and off but operate in a supply curve which is increasingly predictable as weather forecasting and monitoring become more sophisticated. Other European countries have successfully integrated increasingly large quantities of variable wind power and maintained a reliable

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%20How%20Smart%20Grids%20and%20microCHP%20work%20together%20in%20the%2021st%20century.pdf

[22] “Powering London into the 21st Century”, PB Power, Mayor of London and Greenpeace UK, March 2006 http://www.greenpeace.org.uk/MultimediaFiles/Live/FullReport/7474.pdf

[23] “Our Energy Challenge: Power from the People”, Microgeneration Strategy, DTI, March 2006 http://webarchive.nationalarchives.gov.uk/tna/+/http://www.dti.gov.uk/files/file27575.pdf/

[24] See http://www.microchap.info/?iframe=true&width=100%&height=100%

electricity supply. These include Denmark, with about 20% of wind generated electricity, and Spain, with an average of about 13% and peaks of more than 50%.

Variable renewable sources will also be increasingly managed by use of storage, for example pumped storage systems, or by charging electric vehicles when a large supply is available, as well as through development of a European grid which will enable improved transnational power exchange, both on land and by sea. These and other measures would help avoid the pessimistic projection in the AoS of the Nuclear NPS (para 3.3.6) that if one third of electricity were supplied by renewables in 2050, then “generation capacity would need to triple because more capacity would be needed to account for the intermittency of renewables”.

The detailed report “Wind Power: Managing Variability” by independent consultant David Milborrow[25] concludes that:

- There is no technical barrier to accommodating large amounts of wind power in our energy mix. We can keep the lights on.
- Even at relatively high levels of wind in the energy mix, the need for backup capacity is modest, with most backup needs being met by the existing pool which supports all forms of power generation.
- The costs associated with managing the variable nature of wind power are modest and can be expected to decline as new technologies, including a supergrid, smart grid and improved energy storage are developed.
- As other variable technologies are developed, it is expected that these too would be suited to displace conventional power stations.
- Other European countries are already using large proportions of wind power in their energy mix and see no technical barriers to increasing to higher levels.

By contrast, nuclear power is not generally used to “respond to peaks and troughs in demand or supply”, since this is not an economic proposition. Other available inputs, such as gas-fired generation, are much more flexible. It is also suggested (EN-1, Para 3.5.3, p.27) that new nuclear power stations “will reduce exposure to the risks of supply interruptions”. In fact, the most modern nuclear plant in the UK, the Sizewell B Pressurised Water Reactor in Suffolk, was out of

[25] www.greenpeace.org.uk/media/reports/wind-power-managing-variability

action for about six months this year (March-September 2010) because of a breakdown, and in 2008 was responsible for electricity blackouts across the country when an unexpected fault shut down the reactor.[26]

If a programme of new nuclear power stations is strongly encouraged by the government then there is also a risk that less support will be given to renewable energy solutions. This is not just a matter of direct government support but of perceptions in the investment community.

Nuclear economics

On cost, EN-1 asserts (Para 3.5.8, p. 28) that “new nuclear will become the least expensive form of low carbon electricity generation”. In fact, while many recently installed renewable generation plants in the UK, such as wind farms, are up and running and their costs transparent, there is no such transparency about nuclear. No new nuclear power station has been opened in Britain since Sizewell C in 1996. The costs of operating a new plant in the UK regulatory environment and electricity market are therefore speculative. What is certain is that the expected capital cost of the first proposed new nuclear power station, at Hinkley Point, has already risen to £9 billion (for two reactors) and could even reach the €5.7 billion per reactor level of the similar plant still under construction at Olkiluoto in Finland.

The Citibank investment bank concluded in a November 2009 briefing, “New Nuclear – The Economics Say No”, that “three of the risks faced by developers – Construction, Power Price and Operational - are so large and variable that individually they could bring even the largest utility company to its knees financially”.[27] More recently, Citibank’s investment advisor Peter Atherton has repeated his assertion (in evidence to the House of Commons Energy and Climate Change Committee, 14 Dec 2010)[28] that new nuclear construction projects would present potential investors with extremely high financial risks.

Finally, it is assumed in the revised policy documents that new nuclear power stations can start to be deployed from 2018 onwards, and that the experience of France gives confidence that they can be built fast enough to meet the government’s target for substantial deployment by 2025. The recent track record does not support this confidence. The French-designed European Pressurised

[26] http://news.bbc.co.uk/1/hi/7422817.stm
[27] “New Nuclear – The Economics Say No”, Citibank/Citigroup Global Markets, 9 Nov 2009.
[28] www.publications.parliament.uk/pa/cm201011/cmselect/cmenergy/uc648-ii/uc64801.htm

Reactor being built at Olkiluoto in Finland, for example, is four years behind schedule and almost twice its original budget, while the EPR being built at Flamanville in France is two years behind schedule and an estimated 50% over budget.[29]

It is also worth bearing in mind that the last time a UK government committed itself to a large programme of nuclear power stations (after the election of Margaret Thatcher in 1979) only one station was built, Sizewell C, and then only after 15 years.

3. Nuclear as Low Carbon Electricity

In support of nuclear power as a low carbon source of electricity, the revised EN-1 continues to assert that carbon dioxide "emissions from a new nuclear power station are likely to be within the range of 7-22g/kWh" (Para 3.5.5, p.28). This is based on the findings of a 2009 British Energy study which showed that carbon emissions from the Torness nuclear plant in Scotland were 7gCO_2/kWh, compared with 400g for gas and 900g for coal. In addition, the government says in its response to the original NPS consultation (The Government Response to the Consultation on the draft NPSs for Energy Infrastructure, para 7.62) that it continues to monitor the results of published lifecycle analyses from around the world.

Any scientific analysis of carbon emissions must take into account the lifecycle operations of a particular power generation technology, including the mining and production of its fuel and the emissions involved in the construction and eventual decommissioning of its plant. For nuclear power this would include, for example, the mining of uranium, its preparation and enrichment, the concrete and steel involved in building the power station, the decommissioning process and the long term management of radioactive waste.

No reference is made, however, to the analysis of 103 lifecycle studies by Benjamin Sovacool from the National University of Singapore published in the Energy Policy Journal.[30] This concluded that, even when only the most methodologically rigorous of these studies were selected, the average lifecycle emissions from nuclear plants amounted to 66 grams CO_2equivalent/kWh of

[29] http://www.parliamentarybrief.com/2010/09/really-mr-huhne-you-should-brush-up-on-your-french
[30] Energy Policy 36 (2008) pp2940-2953 (see Renew Online No.77 http://eeru.open.ac.uk/documents/rol77.doc)

electricity generation. Although this is less than the estimate of 112–166g CO_2e/kWh reported by Storm van Leeuwen and Smith[31], it is much higher than the nuclear industry's estimate, and far worse in terms of carbon emissions than all the renewable alternatives, including solar PV.

4. Radioactive Waste Storage and Disposal

The Revised Draft National Policy Statement for Nuclear Power Generation (EN-6) says that, in terms of the management and disposal of radioactive waste from new nuclear power stations, the government is satisfied that:

- "geological disposal of higher activity radioactive waste, including waste from new nuclear power stations, is technically achievable;
- a suitable site can be identified for the geological disposal of higher activity radioactive waste; and
- safe, secure and environmentally acceptable interim storage arrangements will be available until a geological disposal facility can accept the waste."

(Para 2.11.3)

It therefore concludes that "the question of whether effective arrangements will exist to manage and dispose of the waste that will be produced from new nuclear power stations has therefore been addressed by the Government and the IPC (Infrastructure Planning Commission) should not consider this further." (Para 2.11.4)

There are a number of issues which arise from these statements. Firstly, it remains inaccurate to describe the storage of highly radioactive waste at sites such as Hinkley Point as "interim". Interim implies a short term measure while some other solution is adopted. In this case, however, interim means a period of more than 100 years and possibly 160 years, a timescale stretching many lifetimes into the future.

The intention to store radioactive waste at Hinkley Point over this timescale has effectively transformed the proposal from being just for an electricity generating power station into a long term waste disposal site as well. This is especially the

[31] www.stormsmith.nl

case given that there is no certainty about an eventual disposal route away from Hinkley (see below).

Secondly, there are major uncertainties as to whether the storage will be “safe, secure and environmentally acceptable”. The reason why the spent fuel (now accepted by the government to be radioactive waste) has to be stored for such a long period at the power station in an above ground store is because the proposed European Pressurised Reactor uses a high burn-up fuel which remains heat-generating for much longer than previous types.

The hazards associated with the storage of this new type of fuel at power station sites were summed up by consultant Hugh Richards in his report “Spent Nuclear Fuel – the Poisoned Chalice” for the Nuclear Consultation Group. These are his conclusions:

“Significant additional hazards are to be imposed on nuclear sites, without proper consultation based on sufficiently detailed information from the nuclear industry. The use of high burn-up (60,000MWd/tU) fuel is in its infancy and there is no experience of its long-term management after discharge. This will lead to a series of grave consequences:

- High burn-up spent fuel is twice as hot and twice as radioactive as ‘legacy’ spent fuel.
- It emits ten times as many neutrons per second as legacy spent fuel.
- Dense-packing of high burn-up spent fuel in the pools increases the likelihood of a fuel fire and meltdown should the pool water be lost in an accident or terrorist attack.
- Insufficient information has been supplied for the management or the safety of high burn-up spent fuel to be assessed.
- No details of wet or dry ‘interim spent fuel stores’ have been provided, so it is impossible to judge their ability to withstand aircraft attacks.
- Existing dry casks cannot safely accommodate high burn-up spent fuel.
- The accumulation of high burn-up spent fuel at the sites of new reactors will increase the radiological hazard beyond the existing vulnerability on nuclear sites, and cannot be justified.”[32]

[32] Hugh Richards, “Spent Nuclear Fuel – the Poisoned Chalice”, Nuclear Consultation Group, March 2009.

It is therefore certainly not true, as asserted in the AoS of the Nuclear NPS (para 6.9.1) that the potential negative effects of the "interim" storage of spent fuel are "of minor strategic significance and similar in nature to the effects produced by other aspects of new power station development".

It is clear that the long term storage of highly radioactive waste is a major issue of concern to people living in the vicinity of the eight sites which now form the government's shortlist for "new nuclear build", including Hinkley Point. Even those generally well disposed towards nuclear power are concerned about the issue of long term waste storage at the site. The Committee on Radioactive Waste Management (CoRWM) recommended that the concept of voluntarism, which is being applied to the location of a final disposal site for radioactive waste, should also "be applied to new central or major regional stores at new locations if they are to inspire public confidence". Given that two nuclear reactors are proposed at Hinkley Point with a combined capacity of 3,200 MW - and with a resulting inventory of 3,600 tonnes of spent fuel/waste - this must qualify as a "major regional store". As it stands there will be no opportunity for the communities round Hinkley Point to volunteer to accept or reject a long term waste store.

National opinion polls confirm the public's misgivings about radioactive waste management. The UK nuclear industry itself, for example, represented by the Nuclear Industry Association, has commissioned regular surveys from Ipsos MORI about attitudes to nuclear power. In one of the most recent in the series, from November 2009[33], the issue of radioactive waste was raised. Of the representative sample questioned, only 20% agreed that there was "a clear way forward on nuclear waste" while 38% disagreed. When asked about the "disadvantages of nuclear energy as a source of electricity", the "long term disposal of nuclear waste" came top of the list.

The government's response to the original consultation on EN-6 says (p.112-113) that it may be possible to reduce the period of cooling of spent fuel after the power station has stopped generation electricity to 50 rather than 100 years. This could be achieved by more judicious management of the storage space and by "mitigating actions which could reduce the heat load on each disposal canister".

[33] "Public Attitudes to the Nuclear Industry", Ipsos MORI for the Nuclear Industry Association, Nov 2009

Nonetheless, even if this shortening of the timescale were achievable, there would still be 110 years of waste storage from the point the reactors started operating. The response on EN-6 also says (p.113) that it is envisaged that a Geological Disposal Facility as proposed by the government will be ready to accept new build waste in 2130. Assuming that a new power station is operating within ten years, this would coincide with the 110 years storage period. The history of the search in the UK for a suitable site for a GDF and an acceptable technology, however, does not bode well for this timetable being achieved (see below).

The third issue is about the certainty of a final disposal route for highly radioactive waste being effectively operational by any given time in the future.

Discussions have been taking place in the UK since the 1980s about how and where to site an underground repository, now described as a GDF. The search has been fraught with technical issues as well as the difficulty of finding a willing host community. In the 1990s an application by Nirex to construct a test “rock laboratory” for a repository in Cumbria was turned down on technical grounds at a public inquiry.

The government now suggests that a GDF could be operational by 2040, but only initially for existing waste from the UK’s Magnox (such as Hinkley A) and AGR (such as Hinkley B) reactors. The model of repository proposed is the one currently under discussion in Sweden, which it is assumed will be operating by 2020. However, this has yet to receive approval from the Swedish national regulatory authorities, let alone be constructed. No other country in the world has yet started operating an underground repository for civilian high radioactivity waste of the type that would be produced at Hinkley Point.

Search for a geological disposal site

Although local authorities in Cumbria (the only ones in the country) have expressed an interest in further investigation as to whether their locality is suitable for a GDF, it is by no means clear whether they, or any other community, will eventually step forward under the “voluntarism” scheme through which communities nominate themselves. In any case this approach is fundamentally flawed, as the geology should come first in any such decision.

This was the conclusion of the evidence by Professor David Smythe of Glasgow University to the Department for Food and Rural Affairs (DEFRA) consultation on voluntarism in 2007[34]. Professor Smythe was also a key witness at the 1990s (Nirex) inquiry referred to above and has worked as a Nirex contractor. He concluded that:

1. There are no suitable disposal sites in West Cumbria.
2. The British Geological Survey (BGS) geological criteria, which would allow inclusion of West Cumbria sites, are flawed.
3. The government's "voluntarism" process is flawed, as it does not prioritise scientific safety considerations.

The overall conclusions to be drawn from Professor Smythe's study are:

1. The appropriate order for site selection should be firstly, geology and hydrogeology (and hence long term safety) and *then* the involvement of local communities.
2. Notwithstanding the order of site selection, West Cumbria has been proven to be geologically unsuitable.
3. Site selection has to be based on scientific principles, before applying any socio-political considerations.
4. The current consultation exercise should be considered to be fundamentally flawed, unless and until volunteer communities, *excluding any in West Cumbria*, come forward from districts which are known to have geological potential for hosting a waste repository.

There have also been a number of detailed criticisms of the government's assertion that "geological disposal of higher activity radioactive waste, including waste from new nuclear power stations, is technically achievable". Submissions to the NPS consultation by Nuclear Waste Advisory Associates, for instance, have drawn attention to major gaps in the technical knowledge currently available to enable a GDF to proceed. Hugh Richards, responsible for the analysis of on site waste storage already cited, concludes that the spent fuel from the new generation of reactors will take up much more underground space than envisaged - up to 5.7 square kilometres - and should sensibly be separately from "legacy" (Magnox and AGR) wastes. It is already accepted by the government

[34] http://docs.google.com/viewer?a=v&q=cache:P8GDNS_yk5cJ:davidsmythe.org/personal/research-career/pdf/Defra%2520statement%2520oct2007.pdf+British+Geological+Survey+report+nuclear+disposal&hl=en&gl=uk&pid=bl&srcid=ADGEESg2BYIesA-5DfkN-fDi6Y0ofvJc_vQXRBjgmdVTo1WfclTzhfN1qiIvQrP_far5ekjThHsuAa-_nPpDSl5dIwctjQLIvgP7mO18lTG5oryI1kgL-JsEmgqaNtgpS4emy2wOwfOa&sig=AHIEtbQAROSeA8CQ2_dJ6MVx9108SFJcZA

that new build spent fuel from 10 GW of reactor capacity would increase the size of a GDF by more than 50%. This calculation would increase it further, making it even more difficult to find a suitable location.[35]

Further doubt has been cast on the technical capability of the sort of GDF currently being considered to contain radioactive waste over very long periods of time, potentially thousands of years, by the recent literature review carried out by Helen Wallace of GeneWatch for Greenpeace UK. Her report, “Rock Solid? A scientific review of geological disposal of high-level radioactive waste”[36], concludes that the “following phenomena could compromise containment in a deep repository”:

- “Copper or steel canisters and overpacks containing spent nuclear fuel or high-level radioactive wastes could corrode more quickly than expected.
- The effects of intense heat generated by radioactive decay, and of chemical and physical disturbance due to corrosion, gas generation and biomineralisation, could impair the ability of backfill material to trap some radionuclides.
- Build-up of gas pressure in the repository, as a result of the corrosion of metals and/or the degradation of organic material, could damage the barriers and force fast routes for radionuclide escape through crystalline rock fractures or clay rock pores.
- Poorly understood chemical effects, such as the formation of colloids, could speed up the transport of some of the more radiotoxic elements such as plutonium.
- Unidentified fractures and faults, or poor understanding of how water and gas will flow through fractures and faults, could lead to the release of radionuclides in groundwater much faster than expected.
- Excavation of the repository will damage adjacent zones of rock and could thereby create fast routes for radionuclide escape.
- Future generations, seeking underground resources or storage facilities, might accidentally dig a shaft into the rock around the repository or a well into contaminated groundwater above it.

[35] Hugh Richards, “Deep Repositories for Spent Fuel – Burying the Truth”, March 2009
[36] Helen Wallace, “Rock Solid? A scientific review of geological disposal of high-level radioactive waste”, GeneWatch UK, Sept 2010, www.greenpeace.org/raw/content/sweden/rapporter-och-dokument/rock-solid.pdf

- Future glaciations could cause faulting of the rock, rupture of containers and penetration of surface waters or permafrost to the repository depth, leading to failure of the barriers and faster dissolution of the waste.
- Earthquakes could damage containers, backfill and the rock."

Given these uncertainties about whether a suitable location to receive highly radioactive waste from Hinkley Point and other proposed new build sites will be available at any given time in the future, it must make sense for the government to adhere to the precautionary policy that no new nuclear power station should be allowed to proceed in the UK until a GDF is finally operational.

5. Health Impacts

The Appraisal of Sustainability of the draft revised Nuclear NPS states (para 3.7.27) "that the health detriments associated with the operation of new nuclear power stations will be very low". This is not the view of Stop Hinkley, nor of many people who live in the vicinity of Hinkley Point, especially downwind from the plant, and for whom health issues are a vital concern. The local Health Authority first pointed to Hinkley as a likely link to a 24% excess of leukaemia among young people in West Somerset in a study covering seventeen years of records in 1988. This paper has never been challenged. Since then our group has commissioned several epidemiological studies showing excess breast cancer and infant deaths in the area. The history of epidemiological studies round Hinkley Point includes:

In 1983, 1985 and 1988 Dr Cameron Bowie of Somerset Health Authority found that the incidence of leukaemia among young people in West Somerset was a quarter higher than the national average. He suggested the increases were linked in some way to Hinkley Point's routine discharges and considered accidental releases may have played a part.[37]

In 2000 Stop Hinkley commissioned a study by Dr Chris Busby (now Professor) of Green Audit to examine the health risk of living near Hinkley. He studied the Office of National Statistics figures on breast and other cancers, finding a doubling of breast cancer mortality in Burnham-on-Sea over a five year period. The suspicion was that the large mud-flats off Burnham had become a depository for radioactive particles which at low tide were exposed and blown downwind to

[37] http://www.stophinkley.org/Health/Leukaemia%20Incidence%20In%20Somerset1988.pdf

the town. Studies in Cumbria had already shown that sheep droppings as far as twenty miles from Sellafield contained radioactive particles.[38]

In 2002 the group Parents Concerned About Hinkley conducted a doorstep survey by volunteers, subsequently analysed by Dr Chris Busby. A 100% response from 30% of the Burnham North population between 1996 and 2001 showed: leukaemia incidence 2.7 times the England and Wales average, breast cancer 98% above average, kidney cancer four times the average and cervical cancer 5.5 times the average. The government committee on radiation and health, COMARE, dismissed the study, saying inaccurately that it was a 30% response from the whole population and therefore unrepresentative.[39]

In 2007 the earlier breast cancer mortality findings in Burnham were corroborated by a further study by Dr. Busby extending to an eleven year period (1994-2004), where cancers were found to be 50% above the national average.[40]

In 2008 a study commissioned by Stop Hinkley found infant deaths were three times higher and perinatal deaths six times higher than normal in coastal communities from Hinkley to Burnham.[41]

In October 2010 support was given to the findings on breast cancer incidence in Burnham by an independent expert, Professor Derek Pheby, former Director of the South-Western Regional Cancer Registry and member of the Medical Research Council.

Over the eleven year period, 113 women would have been expected to contract breast cancer. In fact Dr. Busby found 167 women were diagnosed: a rate 50% higher than normal. According to Professor Pheby, the random chance of this occurrence in the two electoral wards, Burnham South and North, was one in two million. Dr. Pheby criticised the South West Cancer Intelligence Service for not allowing basic data on cancer incidence in the area to be released until forced to do so by a Freedom of Information request and a House of Lords ruling.[42]

These findings should also be seen in the context of Stop Hinkley and others' long-standing criticism of the ICRP (International Commission on Radiological

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[38] http://www.stophinkley.org/Health/CancerMortPart%201.pdf
[39] www.llrc.org/health/subtopic/burnham.pdf
[40] www.stophinkley.org/NewsPages/news070426.htm
[41] www.stophinkley.org/NewsPages/news080301.htm
[42] www.stophinkley.org/PressReleases/pr101021.htm

Protection) model for assessing the relationship between radiation dose and health effects. The ICRP bases its risk model on the epidemiology following the Hiroshima nuclear explosion in Japan. Many argue that a single blast of radiation is not equivalent to chronic ingestion over perhaps years of low level radiation from, for example, a nuclear power station.

This case against the ICRP model, upon which the nuclear industry and the Environment Agency base their supposed safe doses, is backed up by the United Nations Scientific Committee on the Effects of Atomic Radiation in its most recent publication, which says:

"Risk estimates for the induction of human disease are obtained primarily from epidemiological studies. These studies can clearly distinguish radiation effects only at relatively high doses and dose rates. To gain information at low doses and dose rates, which are more relevant to typical human radiation exposures, it is necessary to extrapolate the results of these studies. To be valid, this extrapolation requires a detailed understanding of the mechanisms by which radiation induces cancer and genetic disorders."[43]

The European Committee on Radiation Risk has also been particularly critical of underestimations in the ICRP model, revising its estimates by hundreds of times the effect predicted.[44]

These criticisms of the ICRP model are also pertinent to analysis of the 2009 German government report which found excess cancers near all of the country's nuclear power stations.[45] This study, known as the KiKK report, showed a more than doubling of leukaemia in children living within five kilometres of nuclear power stations, but has not been accepted as establishing any relationship between the health effects and exposure to radiation from the plants.

In response to the KiKK report, COMARE has re-assessed the findings on childhood cancer around nuclear installations in the UK and concluded, as noted in the AoS of the Nuclear NPS (para 3.7.18) that "there is no evidence… that living within 25km of a nuclear generating site in Britain is associated with an increased risk of childhood cancer."

[43] "UNSCEAR 2000: Sources and Effects of Ionizing Radiation, Vol II, Effects", para 1 p2 Introduction
[44] www.llrc.org/health/subtopic/icrpabdicates.htm
[45] "Leukaemia in young children living in the vicinity of German nuclear plants", Kaatsch 2008, International Journal of Cancer (KiKK report)

An alternative view of these findings is contained in a recent letter published in Radiation Protection Dosimetry, by Dr Ian Fairlie and Dr Alfred Körblein (a German radiation scientist), which raises many objections to the conclusions.[46]

However, as noted in the AoS of the Nuclear NPS (para 3.7.24), COMARE is still "undertaking a further review of the incidence of childhood cancer around nuclear power stations, with particular reference to the KiKK study…" Any definitive statement on this issue should therefore await the result of that review.

6. Hinkley Point specific impacts

In the Revised Draft Nuclear NPS (EN-6) Volume II a number of potential local impacts from a new nuclear power station at Hinkley Point are flagged up. These include:

1. Climate change and radioactive waste storage: It is assumed that the consequences of accelerating climate change, including sea level rise in the Bristol Channel and the threat of flooding, will be anticipated "well in advance, giving time for appropriate action to be taken to address those impacts" (para C.5.21). This is a big assumption. No detailed sea level rise assessments have been made stretching well over 100 years ahead, nor is it clear what impact climate change might have on societal organisation, for example, enabling these actions to be carried out.

What *is* certain is that sea level rise is likely to be significant, threatening such activities as a radioactive waste store at Hinkley Point. A recent study published in the Proceedings of the National Academy of Sciences, for example[47], (31) has predicted that global average sea levels are likely to rise by between 75 cm and 190 cm by 2100 – three times faster than predictions by the Intergovernmental Panel on Climate Change, which estimates a maximum rise of 59 cm by 2100[48]

[46] Alfred Körblein and Ian Fairlie, Letters to the Editor, Radiation Protection Dosimetry Advance Access published on October 19, 2009 Radiat Prot Dosimetry 2010 138: 87-88; doi:10.1093/rpd/ncp206.
[47] Vermeer, M & Rahmstorf, S, "Global sea level linked to global temperature", PNAS, 7 Dec 2009 www.pnas.org/content/early/2009/12/04/0907765106.full.pdf+html
[48] Connor, S, "Sea levels may rise three times more than first thought", Independent, 8 Dec 2009 www.independent.co.uk/environment/climate-change/sea-levels-may-rise-three-times-more-than-first-thought-1836036.html

(32) (and compared with around 40-50cm in the UK's high emissions scenario climate projections).

2. Effects on sites of European conservation significance: The Hinkley Point site is surrounded by both nationally and internationally designated conservation areas. The coastline bordering the proposed Hinkley C site is part of the Bridgwater Bay Site of Special Scientific Interest (SSSI). Bridgwater Bay's shallow waters and mudflats are a sanctuary for thousands of waders, ducks and other sea birds, especially in winter. The site is also bordered by Special Protection Areas, Special Areas of Conservation and a National Nature Reserve. Bridgwater Bay is designated as a wetland of international importance under the Ramsar Convention.

The NPS accepts, in relation to these designated areas, that "significant strategic effects on biodiversity cannot be ruled out at this stage of appraisal" (para C.5.47). However, the government has concluded that there is an Imperative Reason of Overriding Public Interest (IROPI) which favours inclusion of the Hinkley site despite these adverse effects. We have already addressed the issue of overall need for new nuclear power which is used to justify IROPI.

3. Effects on marine life: The Revised Draft NPS for Nuclear (EN-6) says (para 3.8.6) that "there should also be specific measures to minimise impact to fish and aquatic biota by entrainment or by excessive heat or biocidal chemicals from discharges to receiving waters".

In fact, according to assessments by Electricite de France (EdF) for its proposed Hinkley Point reactors, once the power station is operating, large numbers of fish and other marine species will be killed as millions of litres of water are sucked into the cooling water intake. This will happen either by what is described as "impingement" – getting caught in the mesh filters at the entrance to the cooling system – or by "entrainment" – passing through the filters and then dying from a range of stress factors, including "mechanical, hydraulic, pressure, temperature and chemical related stressors".

According to EdF's Environmental Appraisal, Volume 2 (Table 19.25), the annual predicted losses of "juvenile fish" as a result of entrainment will amount to almost 7.5 million individuals. This includes shrimps, sprats, whiting, prawns, sole, bass, herring, cod and other species. Other large numbers of fish will be killed by impingement.

The company accepts that the effect could be “significant” on the particular species European eel, river lamprey and sea lamprey.

It is hard to see how any mitigation measures can easily stop these species from being caught in the filters which defend against their entering and fouling the power station’s turbine generators, or subsequently dying as they pass further into the pipe network.

7. Sustainability

Sustainable development is defined in the AoS of the Nuclear NPS (para S.4.3), and elsewhere in the NPS’s, as enabling “people throughout the world to satisfy their basic needs and enjoy a better quality of life, *without compromising the quality of life of future generations*” (our emphasis). It is hard to understand how this principle can be reconciled with the long aftermath of radioactive wastes which will be left by new nuclear power stations for future generations to deal with, especially given the uncertainties which still surround their management and disposal.

8. Conclusions

1. This revised consultation process on the suite of energy-related National Policy Statements has failed to provide either adequately clear documentation or opportunities for local engagement to ensure that it is a legitimate exercise in public consultation.

2. The revised Over-arching Energy and Nuclear NPS’s have not taken adequate account of other projections (alongside the government’s own “2050 Pathways” assessment) which show how the UK’s energy supply could be met without relying on new nuclear power stations.

3. In assessing nuclear power’s carbon output, no consideration has been given to other full lifecycle assessments, for example the review by Benjamin Sovacool of the University of Singapore of 103 such studies.

4. There is no justification for the NPS’s assertion that nuclear power is likely to become the least cost low carbon electricity generation option.

5. Stop Hinkley does not accept the government’s assertion that “the health detriments associated with the operation of new nuclear power stations will be very low”. Many studies have shown a greater than expected incidence of cancers in the area round Hinkley Point. We also challenge the ICRP model which concludes that these excesses could not be explained by the current level of the power stations’ emissions.

6. There are serious issues about the storage of highly radioactive waste at new nuclear power station sites, especially the new “high burn-up” fuel from the proposed European Pressurised Reactor, which have not been addressed.

7. It is unjustified to conclude that effective arrangements will (or are likely to) exist to manage and dispose of the radioactive waste that will be produced by new nuclear power stations. The search for a suitable location for the government’s proposed Geological Disposal Facility is still a long way from conclusion and there are numerous technical issues to be overcome. No other country has successfully started operation of a similar facility.

8. The revised Nuclear NPS fails adequately to take into account the specific impacts at the Hinkley Point site of a) climate change and the long term storage of radioactive waste, b) effects on the adjacent internationally designated protection areas, and c) effects on marine life of water intake impingement and entrainment.

9. Overall, the NPS documents appear designed to avoid challenging conclusions which the government has already reached, in particular that nuclear power should play a part in the UK’s response to climate change and the need for new power station capacity.

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