Nuclear Free Local Authorities

new nuclear monitor

Number 15, February 2009

The Government's Consultation on the Justification for Building New Nuclear Power Stations†

1. Introduction

On 17th December 2008 the Department of Energy and Climate Change launched a consultation on the Nuclear Industry Association's Application to Justify New Nuclear Power Stations.

The Consultation Documents are in three volumes available here:
http://www.berr.gov.uk/whatwedo/energy/sources/nuclear/whitepaper/actions/justification/page45386.html

The consultation is open until 25th March 2009. Responses should be sent to:-

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Local authorities are encouraged to respond to this consultation on the grounds that nuclear investment will damage the nascent local energy revolution which local authorities should be at the centre of, thus damaging efforts to tackle climate change; nuclear power capital costs are out of control and recent studies have cast "significant doubt" over the official risk attached to radiation doses received by people living near nuclear reactors.

2. Background

The "justification principal" was established by the International Commission on Radiological Protection (ICRP). It states that no practice involving exposures to radiation should be adopted unless it produces sufficient benefit to the exposed individuals or to society to offset the radiation detriment it causes.

A Justification exercise is required under EU law to ensure that nuclear power developments have an overall benefit which outweighs any health detriment caused by the use of ionising radiation.

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In the words of the Department of Energy and Climate Change (DECC), applicants seeking to Justify a new nuclear facility:

"*…need to demonstrate to the satisfaction of the Justifying Authority that any health detriment from ionising radiation is outweighed by the benefits associated with the proposed class or type of practice*". (1)

The Justifying Authority, in this instance is, controversially, the Secretary of State for Energy and Climate Change. (2)

The justification process is carried out for each class or type of practice, rather than for each new nuclear facility. So the first task in the case of new nuclear reactors is to decide whether they represent a "new practice".

Secondly, because the Nuclear Industry Association has applied for a justification decision on four types of new reactor: AECL's ACR-1000; Westinghouse's AP1000, Areva's EPR and GE-Hitachi's ESBWR, the Government will have to decide whether the designs are sufficiently similar to make a single decision, or whether there are technical differences which result in major disparities between the scale and balance of benefits and detriments, so requiring four separate justification decisions. (3)

The Government's preliminary view is that it should treat the NIA's application as an application for four different classes or types of practice, (4) and that these should not be considered as "existing practices". (5) If the four reactor-types were "existing practices" there would be no need for a justification process.

By requiring each reactor-type to go through a separate justification process, DECC can maximise the openness and transparency of the process. Each of the four reactor-types should, therefore, be treated as separate, new, classes or types of practice, and not as existing practices.

3. What is the Government consulting on?

As well as seeking views on the Government's proposed approach to defining the Class or type of Practice, the consultation also asks for views on the Nuclear Industry Association's application document. Responses will help to inform the Justification decision itself. During 2009, the Government intends to consult further on the Secretary of State's draft decision on the NIA's application.

However, Atomic Energy of Canada Ltd announced in April 2008 it was pulling its ACR-1000 design out of the Generic Design Assessment process[1] to focus its energy on capturing business at home in Canada. (6) Then in September 2008, General Electric and Hitachi asked for a temporary halt to the assessment of their Economic Simplified Boiling Water Reactor (ESBWR) design, in order to focus efforts on getting U.S. approval. (7) These reactor types should, therefore, be dropped from the process to allow more detailed discussion with regard to the remaining two reactor designs – the AP1000 and the EPR.

4. DECC – Judge and Jury

Following a decision in 1994 by the High Court in a case regarding the Thermal Oxide Reprocessing Plant at Sellafield brought against the Government by Greenpeace and Lancashire County Council, justification decisions were taken on a site-by-site basis by the Environment Agency or the Scottish Environment Protection Agency (SEPA). However, the Government decided in October 2000 that future justification decisions would be for generic classes or types of practice and would be taken by the Secretary of State, although in Scotland they are still taken by SEPA. (8)

On 10th January 2008 the Government confirmed it wanted new reactors to go-ahead, and said it would carry out a number of 'facilitative actions' to speed up their construction. (9) This puts the Government in the position of

[1] For information on these other processes see New Nuclear Monitor No.14 "The Government's Facilitative Actions to Speed Up Nuclear Developments". http://www.nuclearpolicy.info/docs/nuclearmonitor/NNM14.pdf

being the promoter of new reactors and the Judge and Jury in decisions about whether new reactors are justified. The Government has already decided that "*new nuclear power should play a role in providing the UK with clean, secure and affordable energy* [which] *is in our country's vital long term interest*".

On the other hand, the chair of the Environment Agency, Lord Smith has said the long-term storage and disposal of high-level nuclear waste is the "*great unsolved issue*" of nuclear fission. "*It is an absolute necessity if a new nuclear programme goes ahead that the issue of high-level waste is properly resolved.*" (10)

In 2006 the Environment Agency cast doubt on the wisdom of investing billions of pounds in a new generation of reactors saying it could siphon away resources from alternatives, and expressed the fear the last energy review was biased towards the nuclear option. (11) On nuclear waste it said "…*it cannot be assumed that the approach found for the existing stockpile of radioactive waste would be acceptable for waste arising from a new programme.*"

The Environment Agency would appear to be better placed to provide an unbiased justification decision, perhaps in co-operation with SEPA, whereas DECC has clearly already made its mind up.

5. The Nuclear Industry Association (NIA) Application

In addition to anticipated detriments (e.g. routine controlled radioactive discharges and routine worker radiation exposure), applicants were asked to provide information on potential detriments such as accidents. NIA suggests the Government's interpretation of the justification test goes beyond what is in the European Directive and means that potential detriments other than radiological health detriments need to be weighed up against the benefits. It claims its application has therefore provided a wide-ranging review of other potential detriments. (12)

The application includes chapters on radiological health detriment; radioactive waste and decommissioning, and other potential detriments, as well as chapters on economic impacts and security of supply and climate change impacts. There is a small section on "cost-effectiveness in reducing carbon emissions", but in view of the concerns expressed by the Environment Agency (see above) and others such as the Sustainable Development Commission, a much more wide-ranging analysis of opportunity costs is necessary.

6. Opportunity Costs

The opportunity cost of any investment is the cost of forgoing the alternative outcomes that could have been purchased with the same money. So, of course all investments will forego other opportunities, but here we are concerned with those potential investments, which will be foregone, if we invest in nuclear power.

The NIA section on cost effectiveness merely compares new reactors with gas-fired generation. (13) **NIA has failed to examine the opportunity cost of building new reactors.** However, resources are scarce, and climate change is a serious and urgent problem so we need to sure that any spending decision we make involve spending 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.

Amory Lovins, Chairman and Chief Scientist of the Rocky Mountain Institute, says although nuclear power can save carbon, it saves 2 to 11 times less per pound spent and 20 – 40 times more slowly than if you spent the money on energy efficiency or micropower (under which heading Lovins includes renewables apart from big hydro and combined heat and power). (14)

As a consequence, this failure of nuclear power to meet the cost effectiveness test means that 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. (15)

To tackle climate change the speed with which carbon abatement measures can be introduced is also important. New nuclear power stations are not expected to come online until 2018 at the very earliest – more likely 2020. The UK Association for the Conservation of Energy, for example, 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. (16)

7. Negative Impacts of Nuclear Spending

As well as spending our scarce resources as effectively as possible, we also need to ensure that our spending decisions do not impact negatively on other carbon abatement solutions.

Nuclear power provides around 20% of UK electricity, but only about 8% of total energy. Allowing for losses at the power station, nuclear power's current contribution to the UK's final energy consumption is only 3.6 % (80 TWh/y out of a final consumption of about 2,250 TWh/y). (17) So the UK Government will need to consider the impact of any decision to replace existing nuclear power stations on the other 96.4% of energy consumption.

The UK Government's Sustainable Development Commission (SDC) points out that, even with a doubling of nuclear capacity from current levels, cuts of at least 50% would still be needed from other measures if the UK is to meet its climate targets for 2050. (18) So it is important that our capacity to implement other carbon abatement measures is not damaged by any decision to go ahead with the construction of new reactors.

Warwick Business School (UK) (WBS) argues that, far from complementing the necessary shift to a low carbon economy, the scale of the financial and institutional arrangements needed for new nuclear stations means they would fatally undermine the implementation of low carbon technologies and measures such as demand management, and therefore will ultimately undermine the shift to a true low carbon economy. (19)

The SDC says a new nuclear programme would give out the wrong signal to consumers and businesses, implying that a major technological fix is all that's required, weakening the urgent action needed on energy efficiency. The Commission says a decision to proceed with a new reactor programme will require "*a substantial slice of political leadership … political attention would shift, and in all likelihood undermine efforts to pursue a strategy based on energy efficiency, renewables and more CHP*." (20) Sir Jonathon Porritt, chair of the Commission, says nuclear power is seriously diverting attention from the hard decisions required to solve the UK's energy challenges. (21)

Spending on new reactors is likely to have a negative impact on more cost effective carbon abatement solutions.

8. Local energy revolution delayed

In February 2003, when the Government published its first Energy White Paper, (22) Patricia Hewitt, the Department of Trade and Industry (DTI) Minister at the time, said:

"*It would have been foolish to announce …a new generation of nuclear power stations, because that would have guaranteed we would not make the necessary investments in energy efficiency and renewables."*

The White Paper promised a "step change" in policies and programmes to deliver energy efficiency. (23) The 2003 plans included encouraging local authorities to take the lead, acting as catalysts for change. Some local authorities have indeed been carrying out some innovative climate change strategies, but without the central government support these schemes will never be ambitious enough or at the scale required to meet carbon abatement targets. We are still waiting for the step change in energy efficiency which was promised six years ago.

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 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. (24)

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 has virtually no policies to encourage installations on the scale required. The best hope in the near future is the Carbon Emission Reduction Target (CERT), which, from April 2008, requires utilities to spend £1 billion a year over the UK for three years. As well as insulating 3 million cavity walls, CERT will allow utilities to partially fund around 121,000 low and zero carbon installations, in existing homes - nowhere near the 625,000 required every year until 2050.

9. Examples of Best Practice

Europe's largest low carbon zone is planned for Wales' Heads of the Valleys (HoV) region. The HoV Low Carbon programme would see 40,000 microgeneration units or their equivalent installed in the area over the course of 15 years. At the same time 65,000 homes would have their energy efficiency measured with 39,000 energy reduction measures implemented. (25) The Welsh Assembly Government is making £12m available but additional funding is anticipated from a variety of sources including the Carbon Energy Reduction Target (CERT) scheme. (26)

Another scheme in Kirklees, Yorkshire allows homeowners to have solar panels or windmills to generate energy attached to their homes for a share in the capital value of the house. The Kirklees scheme has resulted in more homes producing renewable energy than anywhere else in the UK and more insulation provided in one year than the total number of London homes which benefited from the UK government's scheme. (27) The Kirklees Warm Zone is one of the biggest and most comprehensive programmes to tackle domestic energy efficiency and climate change in the UK. Every home in Kirklees which is suitable for loft and cavity wall insulation will receive this work for free. It will be introduced on a house by house basis. (28)

Meanwhile, the Scottish Parliament (MSPs) has been discussing a call for £100 million to be allocated each year to make insulation and microgeneration available to every Scottish dwelling in next year's Scottish budget. (29) John Swinney, the finance secretary, appeared to suggest he organize pilot schemes before a nationwide roll-out. (30)

In London, London Assembly Member, Darren Johnson has been calling on the Mayor and Government to invest immediately in schemes which will both tackle climate change and create jobs. A London wide programme to improve the energy efficiency of all homes could create up to 17,000 new jobs for builders, joiners, plumbers, electricians, roofers, heating and structural engineers and builders' supply merchants. (31)

10. Nuclear Diversion

The Government will no doubt argue that there is absolutely no reason why, despite statements to the contrary by Patricia Hewitt, promoting new nuclear stations needs to detract from implementing an energy efficiency programme. However the fact that we are still waiting for the step change promised in 2003 argues differently.

The contrast between the amount of Government effort, energy and funding which goes into promoting new nuclear reactors compared with renewable energy is staggering. In June 2008, for example, the Government created the Office of Nuclear Development (OND), to build more effective cross-Government working on nuclear energy, and facilitate new nuclear investment in the UK. The OND has staff drawn from both the civil service and from industry, bringing together the relevant Government teams and resources to achieve its objectives. (32)

Meanwhile, the Government is to close the grant scheme – the Low Carbon Building Programme – which offers grants to public sector bodies for microgeneration equipment, almost a year before it launches the new feed-in tariff regime, creating a funding black hole undermining this embryonic industry and possibly leading to thousands of green job losses. (33)

11. Centralised vs Decentralised Energy

Warwick Business School asks whether support for nuclear power, which will bolster the centralised model of electricity distribution, will also damage efforts to shift to a more sustainable, low carbon, model which maximizes use of renewables and energy efficiency. It concludes that support for new reactors is more likely to strengthen the momentum of the conventional energy system than enable a decentralised energy system to develop. Thus it is likely to damage efforts to tackle climate change. (34)

Investing in new nuclear power stations will, therefore, have a huge opportunity cost. We will lose the opportunity to kick-start the local energy revolution, in which every building and community contributes to generating the power they need. The closure of nuclear, as well as fossil fuel plant over the next twenty years provides an exciting opportunity to develop a decentralised low-carbon energy system more compatible with the needs of the post Kyoto world. (35)

12. The Cost of Nuclear Power

Using the central cost assumptions, but depending on the discount rate the Government estimated the cost of new nuclear electricity at between £31/MWh and £42/MWh. (36)

It now appears that nuclear capital costs are "out of control," with costs on track to reach 15 – 20 cents per kWh or $150 to $200/MWh, which at current rates of conversion is around £100 to £130/MWh. (37) Another new US study makes even these costs look too low. The Severance report puts the costs of electricity from new nuclear plants at 25 to 30 cents/kWh — triple current U.S. electricity rates! (38) The study is by a leading expert in power plant costs, Craig A. Severance. (39) These estimates put new reactors among the costliest private projects ever undertaken. Most renewable and efficiency projects will be well below these costs, so on an economic basis alone should be implemented first. (40)

In response to the UK Government's cost estimates for nuclear electricity, and its conclusion that "*..nuclear power stations would yield economic benefits to the UK…"* (41) nuclear economist Gordon MacKerron, and his colleague at Sussex University Energy Group, complained this is not robust conclusion: "…*it does not properly acknowledge the uncertainty that inevitably attaches to the introduction into the UK of technology that is both novel and politically contentious*". The simple answer to the question 'what are the economics of nuclear power', the group concludes, is: we don't know. (42)

The cost of building new reactors has more than doubled since 2000, according to Cambridge Energy Research Associates (Massachusetts) with a majority of the increase occurring since 2005. (43) The estimate for two 1,100MW reactors in Florida has tripled to $17billion. (44) Construction costs for new reactors in the US will soar, according to Standard & Poor's Ratings Services. Construction risk issues are "more acute" for new nuclear units than for other types of power projects. (45)

The figure of US$1000/kW (so that a 1000MW plant would cost $1bn) was toted by the nuclear industry in the late 1990s as an achievable construction cost for the new types of reactors then being designed. This was seen as optimistic, so when the first order for an EPR-type reactor was placed for Olkiluoto in 2004, the US$3000/kW cost was not a surprise. It is now clear that construction at the site is going very badly and the project is 50% over budget and 3 years late. Further cost increases are expected. However, prices continue to escalate rapidly. In 2008, the estimated construction cost from a range of sources seemed to be settling at around US$4000-6000/kW, double the Olkiluoto price and often double the estimates made by the same utilities a year or two previously. (46)

The Government's cost estimates for new reactors, upon which the whole basis of the NIA's Justification Application rests, could well be wildly out. An urgent investigation into 'out of control' nuclear costs needs to be made before any conclusions are reached about whether new reactors are justified.

13. Radiation

The NIA's application claims that the nuclear stations of the types proposed would result in maximum doses to members of the public well within the dose constraint. The dose constraint is defined as a restriction on the annual dose to an individual from a single source applied at the design and planning stage of any activity. The level is currently set at 300 microsieverts per year (0.3mSv/yr). It also claims that doses to workers would be less than 10,000 microsieverts per year (10mSv/yr).

The NIA includes "Supplementary Notes on Radiation" at Annex 3 of it application. (47) This Annex states that "there remain areas of debate, continuing research and residual uncertainty" with regard to the risks associated with radiation. However, it goes on to say that "the scale of this remaining uncertainty is too small to cast any significant doubt over the conclusions on radiation health detriment presented in this application."

This conclusion does not appear to accord with recent research results.

A major conclusion of the recent German KiKK study (48), for example is that the leukemia risk near German Nuclear Power Stations casts "significant doubt" over the official doses received by people living nearby. In other words, the official methodology used for estimating radiation doses near Nuclear Power Stations is unreliable. The KiKK study found a 2.2-fold increase in leukaemias and a 1.6-fold increase in solid cancers among children under 5 years old living within 5 km of all German nuclear power stations. The large size of the study and the fact that it was commissioned by the German Government add weight to its conclusions. It is now officially accepted in Germany that children living near nuclear power plants develop cancer and leukaemia more frequently than those living further away (49).

A recent spate of other scientific studies spotlighted the issue of the health effects of discharges of radioactivity from nuclear facilities. Researchers at the Medical University of South Carolina carried out an analysis of 17 research papers covering 136 nuclear sites around the world. The incidence of leukaemia in children under 9 living close to the sites showed an increase of 14 to 21%. Another German study which found 14 cases of leukaemia compared to an expected four cases between 1990 and 2005 in children living within 5 kilometres of the Krümmel nuclear plant near Hamburg, making it the largest leukaemia cluster near a nuclear power plant anywhere in the world. (50)

The report published in 2004 by the Committee Examining Radiation Risks of Internal Emitters (CERRIE) – a UK Government sponsored committee – concluded that uncertainties about risks mean that in some cases we might be exposed to 10 times the risk previously thought. These uncertainties, said the Committee, require policy makers and regulators to adopt a precautionary approach when dealing with exposures to internal radiation. (51)

CERRIE looked at newly discovered effects of radiation such as genomic instability (ongoing, long-term increases in mutations within cells and their offspring), bystander effects (cells next to those irradiated are damaged) and minisatellite mutations (repeat DNA sequence mutations). Since CERRIE reported in October 2004 these recently discovered radiation effects – so called 'untargeted' effects - have been described in more and more detail. This work has clearly resulted in a "paradigm shift" amongst scientists. Although the precise significance for human risk is still unclear, these effects are likely to have an important role in future assessments of radiation risks for a number of reasons, not least of which is that they occur at very low doses. It is not even clear whether these effects have deleterious effects on humans, but the latest evidence seems to indicate both beneficial and adverse effects depending on genetic make-up.

This new evidence leads to the conclusion that a way of protecting those who are more radiosensitive than the average will have to be devised. A recent report from the US Institute for Energy and Environmental Research emphasized this point by highlighting a growing concern that women face a risk about 50 percent higher than an average man from the same amount of radioactive material, while the risk for children is several-fold higher. (52)

The question of whether we should now reassess currently accepted risks of radiation clearly arises. When faced with the uncertainties posed by untargeted effects, it would be wise to apply the precautionary principle – in other words err on the side of more caution rather than more risk.

14. New reactors; new radioactive discharges

The UK Governments has, so far, not responded in a precautionary way. This can only result in diminished public confidence in radiation protection authorities. Nor is this a good time for the Government to be promoting the construction of new nuclear reactors.

It is particularly unfortunate that the justification process is running in parallel with the Generic Design Assessment being carried out by a group of nuclear regulators.

There needs to be an urgent Government examination of recent epidemiological studies – particularly the German KiKK study, as well as recent biological work carried out on 'untargeted effects' with a view to devising a new method of protecting those who are more radiosensitive, particularly women and children, before any decisions on justification are made. More detailed information on the expected discharges from the new designs of reactors should also be made available.

15. Nuclear Accidents

The fact that there has not been a major nuclear accident since Chernobyl in 1986 may be lulling us into a false sense of security. Should there be an accident in future, even one that does not result in major radiation exposure, it could have a major global effect on the nuclear industry.

Harvard physicist John Holdren, recently appointed by Barack Obama as director of the White House Office of Science and Technology Policy, (53) says in order to increase nuclear's contribution to worldwide electricity to a significant level we would probably need 2–3,000 new reactors spread around the globe, not just in existing nuclear countries. Then if there is an accident, or successful terrorist attack or proliferation disaster anywhere in the world, the pressure to shut down reactors would be immense, and we could suddenly find ourselves without the 2–3,000 reactors we thought we were going to have. (54) Relying on nuclear to help solve climate change, therefore, is an incredibly risky strategy.

A major study of reactor hazards by two leading scientists and an international energy specialist, published by Greenpeace in April 2005, concluded that risks from reactors in the
West have been significantly increasing over the last few years and the likelihood of accidents occurring is now higher than ever. The authors argue that all operational nuclear reactors have very serious inherent safety flaws, which cannot be eliminated by safety upgrading. (55)

But, it is not just ageing reactors that are vulnerable to accidents. The Union of Concerned Scientists (UCS) describes the profile of risk over the lifetime of a reactor as a 'bathtub' curve. New reactors start out as a high-risk as they are 'broken-in'. In the middle of their life, reactors should be in peak health where the risks are at their lowest. Then as reactors get older they enter a 'wear-out' phase with a high risk that components will wear out and fail. There are several examples of disasters, which happened during the 'break-in' phase. (56)

The two designs most likely to be constructed in the UK – the AP1000 and EPR – are both so-called 'evolutionary designs' – developed from existing Pressurised Water Reactor (PWR) designs. But concerns have been expressed that safety margins will be lower to reduce costs, and there will be fewer back-up safety systems. At present there is no operating experience for either reactors type, so it is difficult to come to any conclusions.

Relying on a risky technology; using new reactor designs for which we have no operating experience is too dangerous a strategy for tackling climate emissions. An accident anywhere in the world could leave the UK with a huge whole in its carbon reduction strategy.

16. Nuclear Waste

The NIA Application states that spent fuel could be stored at the reactor site until around 2090, but describes this as 'no significant detriment'. It also states that if the spent fuel were transported away this would result in around 100 transports over the 60 year life of the reactor, and that the additional waste from a 10GW(e) new nuclear programme could lead to an increase in the size of the repository of between 50 and 90% depending on assumptions made. (57)

There are far too few details and far too many questions left unanswered by the NIA about the detrimental impact waste stores are likely to have on communities with new nuclear reactors over their 100 year life; about the impact of using new higher burn-up fuel with a higher levels of enrichment than has been used in the past; and the impact on the size, footprint, cost etc of the proposed geological disposal facility. (58)

The problem with deciding now that proceeding with new nuclear reactors is "Justified in principle" is that once the actual details emerge, however troublesome, there will be a tendency for the Government to remain committed, and to ignore new problems as they emerge. The claims made by NIA need to be thoroughly examined.

The Committee on Radioactive Waste Management (CoRWM) which made its recommendations to the Government in July 2006 (59) specifically said it did not want its recommendations seized upon as providing a green light for new build – yet that is exactly what the Government has been doing. New build waste will extend the time-scales for implementation of any solution to the waste problem, possibly for very long but essentially unforeseeable future periods. Creating new nuclear waste raises completely new political and ethical issues which are quite different from the issues raised by the waste we have already created. It, therefore, requires a completely separate consultation exercise. (60) The open and transparent way to examine the NIA's claims about waste would be to organize such a consultation exercise.

The Government needs to organize a separate consultation exercise on waste from any new nuclear reactors, before agreeing to the NIA's Justification Application. This must cover every aspect from the hazards of spent fuel storage on reactor sites to the impact of waste from a new reactor programme on the proposed geological disposal facility, and covering the ethics of creating yet more dangerous nuclear waste when we are still not certain what to do with waste from existing reactors.

17. Conclusions

1. By requiring each reactor-type to go through a separate justification process, DECC can maximise the openness and transparency of the process., so each of the four reactor-types should be treated as separate, new, classes or types of practice, and not as existing practices. However, the ACR-1000 and ESBWR should be dropped from the process at this stage.

2. DECC is not the right body to be acting as the Justification Authority. The Government cannot provide an unbiased decision. It has already decided that "*new nuclear power should play a role in providing the UK with clean, secure and affordable energy* [which] *is in our country's vital long term interest*". **The Environment Agency would appear to be better placed to provide an unbiased justification decision, perhaps in co-operation with SEPA, whereas DECC has clearly already made its mind up.**

3. NIA has failed to examine the opportunity cost of building new reactors. Resources are scarce, and climate change is a serious and urgent problem so we need to sure that any spending decision we make involve spending 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.

4. Spending on new reactors is likely to have a negative impact on more cost effective carbon abatement solutions. Investing in new nuclear power stations will have a huge opportunity cost. We will lose the opportunity to kick-start a local energy revolution, in which every building and community contributes to generating the power they need.

5. The Government's cost estimates for new reactors, upon which the whole basis of the NIA's Justification Application rests, could well be wildly out. An urgent investigation into 'out of control' nuclear costs needs to be made before any conclusions are reached about whether new reactors are justified.

6. There needs to be an urgent Government examination of recent epidemiological studies – particularly the German KiKK study, as well as recent biological work carried out on 'untargeted effects' with a view to devising a new method of protecting those who are more radiosensitive, particularly women and children, before any decisions on justification are made. More detailed information on the expected discharges from the new designs of reactors should also be made available.

7. Relying on a risky technology; using new reactor designs for which we have no operating experience is too dangerous a strategy for tackling climate emissions. An accident anywhere in the world could leave the UK with a huge whole in its carbon reduction strategy.

8. The Government needs to organize a separate consultation exercise on waste from any new nuclear reactors, before agreeing to the NIA's Justification Application. This must cover every aspect from the hazards of spent fuel storage on reactor sites to the impact of waste from a new reactor programme on the proposed geological disposal facility, and covering the ethics of creating yet more dangerous nuclear waste when we are still not certain what to do with waste from existing reactors.

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