The Royal Academy of Engineering

The Role of Nuclear Power in a Low Carbon UK Economy

Response from The Royal Academy of Engineering to The Department for Business, Enterprise and Regulatory Reform

October 2007

Introduction

The Royal Academy of Engineering is pleased to respond to the Government's consultation on the future of nuclear power: 'The Role of Nuclear Power in a Low Carbon UK Economy'. As Britain's national academy for engineering, bringing together the country's most eminent engineers from all disciplines and with a strategic priority to lead debate, the Academy is particularly well placed to comment on what is a crucial question for UK energy policy.

A first draft of the response was prepared by Fellows of the Academy with direct experience and expertise in the nuclear industry. This was subsequently circulated to all Fellows of the Academy for their consideration. The final response is collated from the original draft along with all the comments received from over 50 Fellows who made their views known.

In planning the future of the UK's energy policy, the issues of security of supply and climate change represent a significant challenge and no single technology will provide a solution.

With the UK's indigenous supplies of fossil fuels dwindling and competition for global resources increasing, diversity of primary fuel supplies is the best way to ensure the security of the UK's electricity supply. Global reserves of uranium are sufficient to meet any potential UK demand and are generally sourced from politically stable regions. Therefore, a proportion of nuclear power in the generating mix would increase diversity and help ensure a secure and reliable supply of energy.

The need to mitigate emissions of greenhouse gases so as to avoid the worst effects of climate change adds an additional level of complexity. While the UK's contribution is relatively small on the global scale, it is important to show leadership in this area. This will strengthen its position in international negotiations and maintain its position at the forefront of modern technological developments. While there are many technologies which are potentially capable of providing low-carbon electricity, nuclear power has a proven history of providing reliable, low-carbon baseload electricity on a large scale. With the UK's current nuclear power stations reaching retirement it is essential to continue to utilise this low-carbon source of electricity, otherwise there is a danger that the UK's emissions of carbon will increase significantly in the short term.

For these reasons, the Academy believes that nuclear power has a crucial role to play in the UK's electricity generating capacity and that a programme of new nuclear power stations is needed if the UK is to maintain a secure and affordable electricity supply, while simultaneously reducing emissions of carbon dioxide in line with the Government's aspirations. This view was supported by all the Fellows of the Academy who responded to the consultation.

We therefore urge the Government to support the implementation of a programme of new nuclear power stations. We also urge the Government to address the issues which might impede progress, most notably the issues of radioactive waste disposal and public acceptability.

Question 1
To what extent do you believe that tackling climate change and ensuring the security of energy supplies are critical challenges for the UK that require significant action in the near term and a sustained strategy between now and 2050?

Climate change is a key issue with global and intergenerational consequences. We have to show leadership and commitment in moving to a low-carbon economy, otherwise our endeavours to bring about major changes on the international stage will fall on deaf ears.

The mitigation of climate change is a long-term issue and will require sustained international effort over the next 50 years just to avoid the problem getting worse. Arguably, climate change measures taken short-term will not affect this generation as the damage was done over the preceding 100 years.

In both the near-term and the period to 2050 and beyond, security of supply is also a key issue. This is particularly true since the UK is now a net importer of oil and gas - fuels which are often sourced from unstable regions of the world and which, in the longer term, will become increasingly scarce. Security of supply will have a fundamental impact on this generation, the UK's competitiveness and security, and also on the Government of the day in the event of failure.

Government must ensure that in determining the framework to deliver the aspirational policies and targets set out in this consultation, the Energy White Paper and the Planning White Paper (all of which are linked) that sufficient attention and emphasis is given to the engineering practicalities of delivering the required assets and infrastructure.

Question 2
Do you agree or disagree with the Government's views on carbon emissions from new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Yes, we agree with the Government's conclusions on carbon emissions from new nuclear power plants. These conclusions are backed by extensive studies already carried out by credible international bodies, e.g. the ExternE study commissioned and published by the EC and similar publications emanating from the NEA, OECD and the IAEA.

Basically, if our nuclear power plants are replaced with fossil fuel sources, as they retire, we will not even stand still in terms of carbon emissions. In spite of all other efforts in enhancing contributions from renewables and in energy efficiency measures, emissions will rise and the UK will fail to meet its own targets as set in the Draft Climate Change Bill. It will also fail to meet EC targets and will lose international credibility.

Question 3
Do you agree or disagree with the Government's views on the security of supply impact of new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Although we agree with the conclusions the Government has arrived at in terms of the best way to ensure secure energy supplies (i.e. encouraging a diverse mix of

generating technologies) and within that, allowing nuclear power, there are some gaps in the rationale which, if addressed further, strengthen the case for including nuclear power in the generating mix.

No mention is made of the ease of procuring and retaining stocks of fuel. Modern nuclear power plants use around 25t of fuel/year. If a strategic vision for possible long-term deployment of nuclear power in the form of fast breeder reactors (FBRs) existed in the UK (as it does in, for example France and Japan), it would be recognised that the stocks of uranium and plutonium already in the UK provide a source of fuel well into the next century. Even for light water reactor (LWR) systems, these stocks would provide fuel for the lifetime of 1-2 reactors without the need for further imports.

Question 4
Do you agree or disagree with the Government's views on the economics of new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

The Academy thinks that the Government is probably right to be prudent when it comes to assessing the economics of new nuclear power stations but believes the arguments in the consultation are overly conservative. We have participated in many discussions on this issue over the period between the Performance and Innovation Unit's report and the 2006 Energy Review and commissioned a report by PB Power, 'The Cost of Generating Electricity', in 2004.

The economic case for nuclear power is dominated by the cost of capital which is heavily influenced by the perceived risk. We believe the stance adopted by investors will be much more favourable in the face of positive policy statements and clarity on waste disposal costs and the regulatory, planning and approvals process.

The net present value case used in the consultation question is also understated in that it assumes a station life of 40 years whereas the norm for modern stations is 60 years.

The economics of nuclear power will also potentially benefit from any future price of carbon arising from trading schemes such as the European Emissions Trading Scheme or a successor to the Kyoto Protocol.

Question 5
Do you agree or disagree with the Government's views on the value of having nuclear power as an option? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We certainly agree with the Government's views on having nuclear power as an option and will elaborate further in our response. However, we have significant concerns about the Government's overall approach to modelling the generating mix and have articulated these concerns in our responses to the draft Climate Change Bill, in our evidence to the Joint Select Committee and our response to the Planning and Sustainability White Paper. The modelling has failed to take account of the practical engineering challenges of delivering the required assets and infrastructure. The engineering and construction of nuclear power plants is well understood and demonstrated whereas the engineering required to deliver other forms of low-carbon electricity, such as offshore wind or carbon capture and storage (CCS), is still being developed.

Question 6
Do you agree or disagree with the Government's views on the safety, security, health and non-proliferation issues? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We agree with the Government's assessment of the safety, security, health and non-proliferation issues and do not believe they provide a reason to prevent energy companies from investing in new nuclear power plants. There is ample evidence internationally and referenced in the Government's consultation to give confidence on these matters, e.g. refs 24, 25, 26. The USNRC has drawn similar conclusions in licensing, for example, the Westinghouse AP1000 reactor for deployment in the USA.

The design of modern systems has taken full account of lessons learned over the lifetimes of existing plant and the safety standards arising from developments such as passive technology yield benefits of 1-2 orders of magnitude. The radiation dose arising from new nuclear power plants is miniscule compared with natural background. This is particularly so if a once through, rather than reprocessing, fuel cycle is adopted. Even if the latter is utilised, with modern facilities and technologies, the doses are again orders of magnitude lower than historic levels and well within internationally accepted limits.

With respect to non-proliferation, the regulatory framework and the type of designs likely to be deployed mean UK operations present minimal risk. It must be remembered that the UK will be a procurer of the technology, most likely from the US, France or Canada, all of whom are subject to rigid regulations. They would not allow transfer of nuclear technology unless the UK was able to meet the stringent requirements set internationally.

All the energy companies potentially interested in deploying nuclear power plants as part of their future portfolio (EdF, E.ON, Innogy, BE) have significant international experience of deploying and operating such systems and have a thorough understanding of the regulatory regimes and operations needed to safeguard safety, security, health and non-proliferation.

In the Academy's view, security of supply is the most important factor and the certainty for baseload electricity provided by having a significant proportion of nuclear energy in the generating mix is paramount. We are concerned that the Government is sleepwalking its way to a major security of supply situation over the coming two decades. We would urge the Government to prepare a definitive roadmap for at least the next 50 years covering practical options for the deployment of various technologies, including nuclear, and not just theoretical models which have no regard for the engineering challenge in delivering the required assets and infrastructure.

Question 7
Do you agree or disagree with the Government's views on the transport of nuclear materials? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

The Academy agrees and would seek to further reinforce the Government's views on the transport of nuclear materials. The Government is right to set into context the difference between the raw materials, the initial un-irradiated fuel (both not very radioactive) and the spent irradiated fuel. We believe it would have been appropriate to include the fact that fuel movements to a power plant of fresh fuel amount to just one every 12-18 months. This gives a low-carbon footprint and transport risk

compared with other forms of base load such as coal or gas which require constant refuelling.

We note in paragraph 84 and chapter 12 the intent to assume spent fuel will not be reprocessed. We have further comments to make on this assumption but from the point of view of minimising transport risk and movement we believe a detailed assessment needs to be carried out to properly determine the relative benefits and risks of either storing spent fuel on site for the lifetime of the reactor or storing on site for a limited period and then shipping to a centralised interim store pending the availability of a repository.

Question 8
Do you agree or disagree with the Government's views on waste and decommissioning ? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

The Academy has on many occasions over the past 5-6 years urged Government to make progress on the disposition of radioactive waste. We have submitted input to relevant consultations and given evidence to both Lords and Commons Select Committees exploring issues around long-term radioactive waste management. With the Royal Society we have published definitive reports on the issues. Separately, distinguished Fellows have contributed to more recent Royal Society publications. Our immediate Past President chaired the House of Lords Science and Technology Committee which significantly criticised progress to date. Latterly we have run seminars to explore both legacy waste issues and the implications of wastes arising from new build.

Whilst we agree in principle with the conclusions the Government has drawn and set out in the consultation document, we believe it is important that the following be emphasised.

- Radioactivity is a function of fuel burn-up, not reactor lifetime, so it will depend upon the fuel management regime employed by the operating utility. Also, legacy fuel from the fast breeder programme has burn-up which will exceed any additional material from a new build programme.

  In any event, we do not believe this should be an issue as the volume of existing waste, which includes legacy fuel from the fast breeder programme, will bound any additional material anticipated from a new build programme.

- It is important that the difference between waste arising from lifetime operations and spent fuel is properly acknowledged and appropriate interim arrangements are put in place to manage both. Although we note the assumption of not reprocessing spent fuel, the Academy believes it would be wrong to foreclose this option for the future by permanently disposing of this valuable energy resource early in a new build lifecycle. We agree that it will be possible to dispose of spent fuel, if that was the policy decision at the time, in the same repository as the UK's historic legacy. It is important that a definitive study, taking full account of international experience and practice, is carried out as soon as possible to enable the siting and engineering of a repository to be determined.

Given that the utilities will be required to set aside an appropriate "levy" to fully fund long-term waste management and disposal from a new nuclear build programme, whilst responsibility for the actual disposal of the waste will fall to Government, it is

vital that Government develops a roadmap now which includes wastes and spent fuel from new build and takes account of volume and form as well as a chemical and radioactivity inventory.

Question 9
What are the implications for the management of existing nuclear waste of taking a decision to allow energy companies to build new nuclear power stations?

As stated in earlier submissions, the important point is that the bulk of the issues are associated with the management of existing wastes. The marginal increase associated with a series of new nuclear power plants should not have a significant effect on either the repository site or the engineering challenges to deliver the relevant infrastructure. It is vital that any residual issues associated with reaching a solution for the management of radioactive waste do not prejudice either policy or investment decisions for new nuclear power plants.

The Academy also supports COWRM's recommendation that the siting of any long-term radioactive waste repository must have the positive support of the local community, coupled with a suitable community package which would enhance its well-being.

We note the reference to existing facilities already operational internationally and suggest the Government also takes account of the successful construction and operation of the Waste Isolation Pilot Plant in the United States.

We note in paragraph 8.22 the scenarios documented to examine the impact of new nuclear power plants on the percentage of electricity generated and the comparison with legacy systems.

We believe the benefits from new stations are significantly underestimated given that they would be expected to deliver 90% availability compared with 70-80%, at best, from the existing Magnox and advanced gas-cooled reactor (AGR) plants.

We believe the Government should do more to publicise the major differences between legacy systems and modern units in terms of ease of decommissioning and of international experience in both the practice and the financing of waste management, decommissioning and disposal costs associated with LWRs. Once defuelled, the engineering challenge associated with decommissioning an LWR is very much easier than is the case with the Magnox or AGR legacy fleet to be found in the UK. It is important to understand that international benchmarks are available now and it is not just a question of relying on future improved designs which will yield further benefits.

The consultation (paragraph 8.49) did not seek specific input on proposals for ensuring that the costs of waste management and decommissioning are covered by the owners or operators of new nuclear power plants but indicated that comments would be welcome. The Academy is supportive of the intent to ensure funds are adequate to cover the full costs. Any one of the proposed models would work and all are in use internationally, for example, in Sweden, Finland, Switzerland, Germany and the USA.

On balance, funds being held by a separate independent body such as a Trust may give more confidence to the public that they will be properly managed and sustained for the use for which they were intended. There are examples where owner/operator

or Government managed funds have been raided for other purposes or pooled into general Treasury accounts.

Question 10
What do you think are the ethical considerations related to a decision to allow new nuclear power stations to be built? And how should these be balanced against the need to address climate change?

The Academy understands the requirement for ethical issues to be understood and considered as part of the deliberations on the way forward for the UK's energy system.

We believe the consultation sets out the issues in terms of intergenerational issues for both the creation of additional waste (disadvantage) versus reductions in carbon emissions and security of baseload electricity provided (benefit).

However, we also strongly believe that this consultation, together with other linked consultations and White Papers, fails to take into account the risks and disadvantages of alternative forms of energy in terms of the engineering challenge and practicality of deployment.

Much is made of the fact that the waste is radioactive (true) but the burden placed on future generations is marginal when set into context with the UK's legacy.

The importance of security of supply is understated in the section dealing with ethical issues. There are ethical considerations of access to affordable electricity and quality of life which are assured with an appropriate proportion of nuclear electricity in the generating mix.

There are ethical considerations with other forms of generation so the issue should not be seen as a nuclear issue. Similar challenges will flow as proposals for CCS mature.

Overall the concepts appreciated and understood by the engineering profession of proportionality, risk and probability seem to have been lost in the scenarios and arguments laid out in the consultation.

These lead the Academy to conclude:

- that wastes from new nuclear build will be small in proportion to the existing legacy. The technology exists to ensure they can be safely contained and any associated risks are far outweighed by the benefits of secure, low-carbon baseload electricity;

- that a final solution for the management of radioactive waste needs to be implemented as soon as possible and that plans to accommodate wastes and spent fuel from new nuclear power plants needs to be factored in to the responsible body's strategy (currently the NDA).

Question 11
Do you agree or disagree with the Government’s views on environmental issues? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We agree with the conclusions reached that environmental considerations do not provide a reason to prevent energy companies investing in new nuclear power plants but have some comments to further strengthen the arguments.

We also hold the view that since the European Union's Strategic Environmental Assessment Directive requires a high level assessment of plans or programmes likely to have significant environmental impact and that the Government intends to do this as part of a Strategic Siting Assessment, this work should begin now as a contingent action.

In terms of the landscape and construction section (9.12-9.17), the comparison of land area required compared with that for onshore wind in the opening sentence of paragraph 9.15 is misleading when related to the evidence later cited and grossly understates the land area required for equivalent generation.

For uranium mining and milling there is a significant amount of information which, whilst interesting, does not have much relevance to the consultation questions. The UK's potential draw on the international inventory is likely to be small and sourcing from developed economies such as Australia and Canada should assure globally accepted norms for environmental protection. There is an existing conversion and enrichment industry in the UK at Springfield, near Preston, and Capenhurst, near Chester, which successfully competes in the global market place, notwithstanding any decision the UK may take on deployment of new nuclear power plants.

Springfield supplies intermediate products such as uranium oxide powder and pellets and has the capacity to supply finished fuel, having done so successfully in the past. Information on diffusion plant for enrichment is spurious as the global norm is centrifuge and has been for over two decades.

Enrichment is the most energy intensive part of the fuel cycle. Improvements made here (several orders of magnitude compared with diffusion) far outweigh issues associated with extraction of uranium ore which is often erroneously cited as very energy intensive. It should also be noted that:

- transport of finished fuel from fabrication plant to reactor occurs once per year compared with the continuous refuelling required for fossil fuel power plants;

- when comparing the environmental impact of nuclear power and other forms of electricity generation the Government fails to fully account for all the relevant factors. For example, greenhouse gases in the case of gas and secondary discharges of NOx and SOx as well as CO_2 in the case of coal.

Question 12
Do you agree or disagree with the Government's views on the supply of nuclear fuel? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We agree with the conclusions reached that reserves will be sufficient to meet global and hence UK demand, there are some significant considerations missing as follows:

- Whilst costs of extraction will rise as reserves are exhausted their relative impact will be small. Also costs will rise for extraction of fossil fuels as reserves of oil, gas and coal deplete. This will have a much bigger impact on levelised costs in the future.

- Alternative sources of fuel mentioned are limited to uranium, plutonium and mixed oxides (MOX). There is no consideration of thorium which is a proven nuclear fuel. The reserves arguably outstrip those of uranium and those countries with ready access to such reserves, (e.g. India), are pursuing the thorium fuel cycle vigorously.

- The consultation points out the current restrictions on the Sellafield MOX Plant (SMP) capacity. It takes no account of the fact that the actual fuel for a new build programme would not be needed for at least a decade. By then, should the NDA study have concluded there is value in the UK's strategic stock of plutonium, if converted into MOX fuel, it is not inconceivable that a case could be made for enhanced or new fabrication capacity incorporating all the lessons learned from SMP and other overseas MOX plants.

- In the long-term, use of plutonium, uranium or MOX within a fast reactor fuel cycle is being pursued as a national priority by France and Japan, is being revisited by the USA and is, at least, the subject of research by Korea. FBRs are being implemented by India, Russia and China.

As a matter of fact, should the UK choose to deploy fast breeder technology in the future then it has sufficient reserves of uranium and plutonium from its historic civil programme to implement a fast reactor cycle and be self-sufficient in fuel for the foreseeable future, without the need for further imports of fresh uranium.

The Academy is not recommending this at this time but merely using the point to emphasise the fact that nuclear technology, as with energy technology in general, should be viewed in the context of a long-term (more than 50 years) strategic road map. Government needs to do more to stay abreast of what is happening globally to keep options open as this impacts on skills and know-how essential to serve the short and medium term.

Question 13
Do you agree or disagree with the Government's views on the supply chain and skills capacity? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Energy companies will make their own decisions with respect to supply chain and skills capacity. The Academy believes that Government has significantly underestimated the risks of both supply chain capacity and skills availability to achieving any desired energy mix.

Taking skills first, the Academy and the Energy Research Partnership have commented in recent months on the availability of skills in engineering generally and the energy sector in particular.

The initiatives listed in the consultation documents seem at first sight to reflect adequate foresight and planning but this is misplaced. Almost all the initiatives in the skills arena to date are associated with waste management and decommissioning. These skills are different from those required to service new nuclear build. Furthermore, the data in paragraph 11.7 points to the fact that UK requirements represent only 1% of global demand. This completely misses the point that many of those being trained in UK universities in topics relevant to the energy sector are from China and India which, as a matter of national policy, are ensuring that top flight students are appropriately trained and repatriated. Global demand for these skills is increasing but the pipeline of domestic students is not.

The specialist nuclear skills invested in to date have been almost exclusively targeted towards decommissioning and clean up. Similarly, the EPSRC funds allocated are again mainly focused on waste management and decommissioning issues. Very little is allocated to next generation systems R&D which would be the means to fuel the research and academic pipeline for teaching reactor related topics. It was a matter of great regret that the then DTI reneged on an intent to fund the UK's modest participation in the international GenIV R&D initiative. This action caused important university initiatives to stall and the dispersal of the UK's remaining knowledgeable teams in BNFL's Nexia R&D and AmecNNC. It seemed a perverse decision in the light of an apparent intent to create a National Nuclear Lab which would "ensure unique skills were safeguarded…"(Paragraph 11.38)

Exclusion of nuclear technology from the remits of both the Energy Technologies Institute and the Technology Strategy Board, both of which are pursuing technology development and deployment in the energy sector, further compounds the issue.

The Academy would question the assertion that the Government is facilitating work to support skills development in the area of new build. Certainly there are excellent initiatives underway in the academic sector with some industry support but Government could and should do more if it is to stay abreast of international developments and plan nuclear power's potential role in the energy mix on a 50+ year time trajectory.

One area where the Government should have done more to ensure that adequate skills were available is the nuclear regulator (the NII within HSE). The NII does not have adequate Suitably Qualified and Experienced Personnel to service the demand for assessment of vendor designs. This will cause further delay to a timeline on which they have always been on the critical path. We understand there are still issues associated with the NII's ability to recruit and reward the resources it needs. This issue should be dealt with immediately.

On the supply chain, the Academy is aware of the study sponsored by the NIA in 2006 which concluded that up to 80% of new systems could be UK sourced. However, like the Government's analysis in the consultation, this takes no account of the existing demands in the market place where capacity to supply is already stretched.

While this will in time respond to the market, it is conceivable that delays of some years in the availability of key components will push any UK deployment into a third decade.

The point is made in the consultation that strategic ordering could circumvent some of these issues but any assumptions that this would be the case in the UK are naive. When there is still considerable risk of delays in regulation, Government policy intent, planning and approvals, and waste disposal solutions it is unlikely that potential vendors, owners or investors will commit significant resources to secure long lead time items.

Question 14
Do you agree or disagree with the Government's views on reprocessing? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We understand the sensitivities behind the Government's assumption that any nuclear power plant which might be built should proceed on the basis that spent fuel will not be reprocessed and that accordingly waste management plans and financing should proceed on this basis. We fundamentally disagree with the assumption in paragraph 12.16 that spent fuel should be treated as waste. Although there may be a policy decision to not reprocess, it is essential that the difference between waste and spent fuel is understood in any future dispositioning strategy.

We are able to support the planning assumption of not reprocessing on the grounds that it paves the way for utilities or financial backers to include the option to invest in new nuclear power plants in their forward investment plans. The financial provisioning required to cover back-end costs associated with a once-through cycle would be expected to be sufficient to encompass any scenario going forward, so a future re-visit of recycling policy would not be expected to falter on financial grounds. Also, the design of a repository to include the spent fuel from a future fleet of nuclear power plants would ensure that all options were covered inasmuch as the marginal additions to inventory, if a future reprocessing scenario were pursued, would be expected to be readily accommodated within the infrastructure to accommodate the existing legacy.

We do not, however, agree that reprocessing should be permanently ruled out as an option for the following reasons:

- To rule out recycling seems a perverse decision in a 21st century society where sustainability is seen as a core requirement in a developed industrialised society. In a world where energy resources will be seen as increasingly precious, putting beyond use the vast uranium and plutonium energy sources contained within spent fuel would be irresponsible. As a minimum, steps should be taken not to preclude future recycling. Poor experience in the UK together with views coloured by historical plant operations and discharges should not deny future generations the opportunity to take advantage of evolving international experience and best practice.

- Recycling reduces the long-term radioactive toxicity which would otherwise arise from permanent disposal of spent fuel.

- New nuclear power plants will operate for 60 years. It is entirely feasible to envisage lifetime storage of spent fuel at reactor site, a strategy adopted by many utilities worldwide. Equally, consignment to a centralised interim store is also possible.

- Whilst the Government indicates it has received no proposals for reprocessing, this is not surprising. Policy uncertainties in the UK have hitherto precluded proposals to invest in nuclear generating capacity, never mind associated fuel cycles.

- It would be wrong to assume that a Thorp-like plant, or any of the current Sellafield assets, would be utilised. Technology is moving on and in 50 years time, which is when any future decision on recycling may be taken, many factors will be different from those influencing today's decision makers, whether they be owners, investors or Government. Factors such as cost and availability of uranium will determine the economics of recycling given the large capital investment in infrastructure needed to deliver it. Factors such as international experience and developments in the intervening years, where alternative recycling strategies with waste minimisation and proliferation

resistance inherent at the design stage, will be developed and deployed internationally. Here the Academy would urge the Government to ensure the UK stays abreast of international developments and participates in the R&D at an appropriate level since utilities and owners will be responsible for financial provisioning whereas Government will be responsible for what happens to spent fuel. It would seem sensible to allocate the responsibility to the yet to be created National Nuclear Lab and fund accordingly.

Question 15
Are there any other issues or information that you believe need to be considered before taking a decision on giving energy companies the option of investing in nuclear power stations? And why?

We do not believe that more information needs to be considered before giving energy companies the option of investing in new nuclear power plants. However, Government needs to develop a better understanding of the engineering practicalities of delivering the aspirational targets for CO_2 mitigation enshrined in the Draft Climate Change Bill and the Energy White Paper (We have articulated our concerns here in previous submissions to Government and the Joint Select Committee). Having done so, the Academy is of the view that Government will finally realise the challenge ahead and will further accelerate steps to encourage new nuclear power plants as part of the UK's electricity generating mix, especially by avoiding further procrastination on the issue of managing radioactive waste.

Question 16
In the context of tackling climate change and ensuring energy security, do you agree or disagree that it would be in the public interest to give energy companies the
option of investing in new nuclear power stations?

The Academy strongly supports the view that it is in the public interest for the UK to have a significant proportion of nuclear capacity within the UK's electricity generating mix and that energy companies should indeed have the option to invest. Our rationale is as follows:

- Whilst the UK is only a small contributor to the climate change issue, its bargaining position in international negotiations will be greatly strengthened by demonstrating leadership in taking mitigation measures;

- Nuclear energy is the only reliable large scale source of baseload low-carbon electricity;

- Security of supply is paramount in a 21st century industrialised economy and readily provided by nuclear energy;

- To ensure energy security and tackle climate change there will be a shift from the utilisation of fossil fuels in the transport sector and the use of gas as a heat source within the domestic sector. This will increase the demands in the electricity sector as fuel cells and battery alternatives are deployed and hydrogen begins to make inroads as an energy vector.

Question 17
Are there other conditions that you believe should be put in place before giving energy companies the option of investing in new nuclear power stations? (for

example, restricting build to the vicinity of existing sites, or restricting build to approximately replacing the existing capacity)

The Academy does not believe the Government has given sufficient weight to the facts articulated in our response to Q16 and the impact they will have on a 50-year energy roadmap for the UK. If the proportion of nuclear energy in the mix was sustained, the actual capacity would need to significantly increase.

The Academy would remind the Government that at peak, 30% of the UK's electricity was provided by nuclear generation. Our view is that to ensure diversity and security of supply over the coming five decades 30% would be an appropriate amount. This could be subject to further review when there were indications that such a limit would be reached.

While there may be good reasons to restrict build to existing sites (e.g. on public acceptability grounds) not all may be suitable to take new plant because of factors such as available grid infrastructure. The Academy is of the view that this is probably the most pragmatic way forward initially but that the option for siting elsewhere in the future should not be ruled out.

There are issues on siting where the Academy believes that confining to existing sites may be overly restrictive. This is especially so since paragraph 126 of the consultation confirms that the power to consent to the construction of new nuclear power plants in Scotland is devolved to Scottish Ministers. Torness and Hunterston between them provide nearly 3GW of the UK's remaining 8GW and Hunterston certainly would be one of the preferred existing sites.

Question 18
Do you think these are the right facilitative actions to reduce the regulatory and planning risks associated with such investments? Are there any other measures that you think the Government should consider?

The Academy strongly supports the facilitative actions taken to reduce the regulatory and planning risks and that these should be taken forward and progressed urgently on a contingent basis. We believe that the Strategic Siting Assessment work should be progressed urgently and that a definitive Statement of National Need be prepared, ready to articulate in line with the requirements set out in the Planning and Sustainability White Paper.

We remain concerned that yet another White Paper is implied in paragraph 129.

Submitted by:
Mr P Greenish CBE
Chief Executive
The Royal Academy of Engineering
3 Charlton House Terrace
London SW1Y 5DG

Prepared by:
Dr Alan Walker
Policy Advisor