

March 2009

This response is made to the Department of Energy and Climate Change's (DECC) *Consultation on the Nuclear Industry Association's application to Justify new nuclear power stations* and the linked application by the Nuclear Industry Association (NIA).<sup>1</sup>

In summary, Greenpeace is of the view that new nuclear build, including all aspects of the new practices from uranium mining, reactor operations through to new waste creation and disposal, cannot be justified.

This response focuses on the serious lack of information on the potential health detriments to the public from the proposed new practices.

In particular it:

- asks whether the NIA is the appropriate legal entity to have made the application,
- challenges the content of the application which does not cover the full 'scope of practice' being applied for, that it is fragmented and does not serve to adequately inform the reader,
- questions the application's lack of relevant information on health detriments from routine operations associated with the new practices - including all aspects of them,
- asks why essential information on the possible radiation exposures from accidents or terrorist attacks is omitted from the application,
- queries why economic information on insurance cover and liability in the event of an accident/terrorist attack is not fully discussed;
- raises questions on how this process links to other processes and decision making on the new practices,
- considers the failure of the applicant in not properly addressing spent fuel management (including on-site spent fuel storage and encapsulation) within the framework being discussed in other Government processes.

Greenpeace is of the view that this application should have been rejected by the Government. Any application for justification which is to be considered should, at least, have covered separately:

- new reactors with on-site storage of spent fuel and encapsulation (current 'framework'),
- new reactors with central spent fuel storage and encapsulation,
- new reactors with central spent fuel storage and reprocessing (and encapsulation),

The call for revised applications is made because the three 'options' outlined above are raised (albeit somewhat obliquely in the latter two cases) within the application and other documents the vendors and utilities which support the application have submitted in response to other Government consultations.

If different options are linked to specific designs - and the intentions of the vendors and utilities - and if this would entail separate applications for each different reactor design/new practice, then they will have to be submitted for consideration.

Greenpeace does not believe application meets the requirements as set out in the guidance issued on Justification by BERR in 2008 as it does not adequately discuss the

possible detriments of new practices, e.g. the impact of a major accident and release of radioactivity involving a spent fuel store.<sup>ii</sup>

This response shows why the Justification application is both inadequate and premature. It should not have been made until at least after the Generic Design Assessment (GDA) process is finished. For that reason alone the application should be rejected and the applicants required to wait until after the GDA process is completed.

Greenpeace also has a fundamental objection to the decision making process that is envisaged. That the Secretary of State, the Justifying Authority (JA), and DECC have both come out so definitively in favour of new build means it is wrong for the SoS to be the JA - judge and jury. Justification is a regulatory function, and as such must be carried out by an unbiased decision maker. In this case the JA has already said and publicised his opinion. In these circumstances, the process is neither fair nor does it appear fair. When a decision is of such great public importance, and is so far reaching in its consequences, it must be conducted fairly and impartially. For that reason, this process must be opened up to an unbiased and independent public examination. It is essential that the many key issues not properly explored through the application are examined through an inquiry, as allowed for under the regulations governing Justification.

### **Question 1**

*Do you agree with the Government's preliminary view that, following the application submitted by the NIA, the decisions by the Secretary of State and the Justifying Authority should be by reference to four classes or types of practice, based on: (a) The generation of electricity from nuclear energy using oxide fuel of low enrichment in fissile content in a light water cooled, water moderated thermal reactor known as ACR1000 designed by Atomic Energy of Canada Ltd. (b) The generation of electricity from nuclear energy using oxide fuel of low enrichment in fissile content in a light water cooled, water moderated thermal reactor known as AP1000 designed by Westinghouse Electric Company LLC of the USA. (c) The generation of electricity from nuclear energy using oxide fuel of low enrichment in fissile content in a light water cooled, water moderated thermal reactor known as EPR designed by AREVA NP of France and Germany. (d) The generation of electricity from nuclear energy using oxide fuel of low enrichment in fissile content in a light water cooled, water moderated thermal reactor known as ESBWR designed by GE-Hitachi of the USA, and that these qualify as new classes or types of practice. If not, why not?*

### **The application**

Greenpeace questions why the NIA - and not the reactor vendors or those utilities which 'support' the Justification application - submitted this document.<sup>iii</sup> In the case of the Generic Design Assessment (GDA) process, the reactor vendors made the applications. Under the Strategic Siting Assessment (SSA) process it is mainly the potential vendors and/or operating utilities which are putting forward nominations. The SSA process makes it clear the Government prefers 'credible nuclear power operators' to make nominations, yet for such a major process as Justification a trade association appears acceptable? Why is this the case?

With regard to this, no explanation has been provided as to why the NIA is making the application, nor why the Government has accepted it. It is not clear what processes were used between the companies listed in the application to sign off on it (NIA 2).<sup>iv</sup> This leaves a question mark over who has responsibility for the information provided in the application as well as whether the NIA is the correct entity to be making this application.

The NIA has not sought to explain why four reactor designs are being put forward for Justification when only two are still being considered under the GDA process? This discrepancy should be explained (two of the designs in the application are presumably no longer 'available for UK regulator assessment' (NIA 2, page 6 of 11, addendum 1). As only 2 reactor designs are currently going through the GDA process (Areva's EPR and Westinghouse's AP1000) this response is limited to commenting, where applicable, to the claims made regarding those two designs.

This response is made then with the caveat that there are questions over the probity of the application and the Government's acceptance of it.

### **Practices**

Greenpeace believes the new practices described in the application must be considered as separate *and* new. That the industry has sought justification is in itself indicative that it believes these to be new practices which require justifying. None of the new practices, in relation to this Justification application, can be seen as practices which are existing and which require 'only' a review.

The practices should be considered as new because the reactor designs are untried and untested anywhere in the world. There is no operating experience for these plants.<sup>v</sup> The complexity of the reactor designs, and the examination being undertaken through the GDA process (plus the fact that other agencies apparently consider these to be new practices), indicates that these are new practices. Further, the associated facilities, in particular the proposed interim spent fuel stores on-site and encapsulation plants, are not (as planned) existing practices and must be treated as new.

The application notes (NIA 2, table 1.3) that a number of the activities - in relation to existing practices - represent a 'material scale of change required'. It notes this for a number of parts of the new practices e.g. spent fuel management and disposal. Material scale of change is not quantified or defined. The table omits key elements of the new practices e.g. 100 years on-site storage of spent fuel and encapsulation of spent fuel on site.

However, it is most important to note that at several points in the application the NIA appears to accept - judging by the wording it has provided - that the practices are new e.g. addendum (NIA 2 chapter 4, page 1 of 6) that:

*It is also stated that evolutionary reactors (which are those that fall within the proposed new class of practice) have been designed so that levels of safety and environmental protection are at least as good, if not better than, those of existing UK stations.*<sup>vi</sup>

### **Question 2**

*Does the NIA application contain sufficient information to enable the Justifying Authority to make an assessment of a) these classes or types of practice and b) the preferred class or type of practice in the NIA application? In either case, if not, what further information is needed?*

*and*

### **Question 3**

*Do you have any comments on the arguments or evidence in the NIA's application? Are there any additional arguments or evidence which the Justifying Authority should consider?*

For the purposes of this response, questions 2 and 3 are answered together - because the lack of sufficient information and lack of clarity in the application demonstrates it is not a suitable document on which to base consideration of the Justification of new classes or types of practice (CTP).

As noted earlier, it is not clear exactly who is responsible for the information in the application. What is clear is the NIA application does not contain sufficient information to enable the Justifying Authority (JA) to make an assessment of the *new* CTP. More information is needed on numerous issues, only a few of which are explored in this response.

An example of where information is lacking is how the applicants (NIA, vendors, utilities?) will act to ensure not only that legal limits and constraints in radiation doses are met, but also how Basic Safety Objectives (BSO) will be achieved. It is on issues such as how dose limits and constraints can be achieved either through design processes (vendors responsibility?) or operations (utility responsibility?) that the application becomes even more questionable. Although the Justification process is at a strategic level, having a trade body applying means any questions or issues raised cannot be directed at those who design and operate the plants. Thus it is not clear where the responsibility lies (if at all) in substantiating the claims made in the application.

Also, as will be discussed later in this response, the distancing of those designing and operating reactors from the Justification process - allied with the separation of the Justification and Optimisation principles (of radiological protection) - serves to make the process increasingly fragmented and raises more questions than it answers.

The application should have made clear which of the applicants - vendor or utility (or both) - will act to ensure legal limits, constraints and BSOs on doses are to be met or achieved - as per the Nuclear Installations Inspectorate's (NII) Safety Assessment Principles (SAPS).<sup>vii</sup>

That this Justification application has not been put forward by the organisations which will ultimately have direct responsibility for minimising the health detriments of the proposed new practices makes it much less credible as a document on which to base a far-reaching and long lasting decision. It is the vendors and utilities which should be providing the 'evidence' they will minimise health detriment, not a trade body (which seems to be claiming minimisation of health detriments will be sorted out in later processes).

### **Practice as a whole**

The application does not properly address all parts of the new practices. Although the application (NIA 2, footnote table 1.3) acknowledges:

*ICRP emphasises that waste management and disposal operations should be treated as an integral part of the practice generating the waste.*

Integral parts of the new practices are not fully detailed. Nowhere does the application fully detail what 'interim' storage of spent fuel means, nor does it explain encapsulation and how this process will be undertaken. The application should have provided a table (at the very least for reactor sites) of all essential on-site facilities, with the expected discharge levels; the doses they might give rise to and the total radioactive inventory they might contain. That it fails to do this is clearly wrong. It would therefore be impossible for the JA to decide whether or not the new practices can be justified based on the information

contained in this application.

### **Radiation Protection Principles**

The application does not explain how those undertaking the proposed new practices plan to utilise, *together*, the three principles of radiation protection (Justification, Optimisation and application of Limitation) as laid out by the International Commission on Radiological Protection (ICRP).<sup>viii</sup> Instead the application separates these as subjects for different processes.

The application (NIA 2, 4.4-4.5) notes:

*4.4 Optimisation refers to the requirement, within the hierarchy of radiological protection principles, for radiation doses from a practice that is justified to be reduced to a level as low as is reasonably achievable. Optimisation involves striking a balance between the efforts (time, trouble, cost etc.) required to reduce doses, against the dose reduction these efforts can deliver. In the UK optimisation is implemented as a requirement within the legal processes through which a design is licensed and authorised, and it is these stages that have the greatest impact in determining what level of radiological health detriment is ultimately permitted. These essential regulatory stages will follow justification if new nuclear power stations are to be licensed and built in the UK. The application of optimisation means that in practice radiological doses from the nuclear industry are very significantly below legal limits. (emphasis added)*

*4.5 It is important to understand that this application does not address or prejudge the results of optimisation. Instead it presents sufficient evidence to demonstrate that the first hurdle, justification, is met. To be justified it is sufficient to show that there are net benefits of the practice that outweigh any potential radiological health detriment; it is not necessary to demonstrate that the practice has been optimised. If the net benefits of a practice are very significant (as this application shows), the first radiological protection principle, justification, can be met quite simply by demonstrating that the radiological detriments are by comparison small – for example, by demonstrating that the practice can be carried out within all the relevant dose limits or constraints (since these have been set at levels of health risk that are relatively small). This means it is not necessary to rely on precise estimates of what radiological effects will derive from applying the regulatory processes relevant to optimisation that have yet to be undertaken. (emphasis added)*

From the first paragraph it can be seen that optimisation is how a given level of health detriment is permitted - but the NIA then claims: '*To be justified it is sufficient to show that there are net benefits of the practice that outweigh any potential radiological health detriment; it is not necessary to demonstrate that the practice has been optimised.*' Without actually knowing what level of radiological health detriment may be 'ultimately permitted' how can any new practices be Justified? On this issue, the NIA virtually ignores the notion that there are any remaining concerns around the impact of low level radiation exposures, yet debate on this matter is very much far from settled. For example, the application is dismissive of the Kikk report on leukaemia rates around nuclear plants in Germany, and then refers to (unreferenced) reports from France and the UK to 'justify' its claims that there will be no real health impacts from the new practices. We recommend those reading this submission to consider in detail other discussions on the impact of low level radiation.<sup>ix</sup> That the NIA's discussion of radiation so perfunctory (NIA 3, pages 14-19) is to be expected of a trade body, but also adds further to why the application should have

been submitted by vendors and operators who would have to be more accountable, over the long term, for the claims made in the application,

NIA, 2, (4.5) also states:

*It is important to understand that this application does not address or prejudge the results of optimisation. Instead it presents sufficient evidence to demonstrate that the first hurdle, justification, is met.*

However, in taking Justification and Optimisation separately the application cannot show the first hurdle is met - and most definitely cannot demonstrate it is overcome.

The application (NIA 2) states:

4.9 The approach in this chapter is to explain the relevant UK regulatory requirements for each potential source, and to show that any relevant UK radiation dose limit (or where appropriate dose constraint) can be met (see first Box for an explanation of the relevant dose limits). As explained above, we consider that this step should be sufficient to enable the justification principle to be addressed. However, in addition and so as not to mislead those reading this application, evidence is also presented of the scale of reduction to any radiological impact that is likely to occur as a result of applying the optimisation principle. This is done by drawing on the results of the application of UK and international regulation to similar practices of which there is already actual experience – e.g. reactor operation, transport of fuel etc.

What the above actually shows is that Justification, in terms of trying to assess health detriments, *is* premature if undertaken separately, before optimisation. The application does prejudice optimisation. It does not give a full account of the health detriments - it cannot because optimisation has not been fully assessed. It serves to underline the two principles should not be considered separately. This is particularly important because, as will be discussed later, the totality of the new practices which the Government is being asked to justify are not detailed in this application, most specifically in terms of all on-site aspects of the new practices.

In relation to this we note (NIA2, 4.39) that the application states:

Ahead of completing the optimisation stage, which will take place after justification as part of UK licensing and authorisation for a particular design on a particular site, it is not possible to present definitive figures against these constraints. However the Environment Agency has published its conclusions following the completion of stage 2 of the Generic Design Assessment process for each of the 4 reactor designs which are cited in this application as examples of the proposed practice. These reports include the statement that each of the designs is expected to be capable of meeting the 0.3mSv per year constraint. (emphasis added).

The above exposes how the new practices, and all activities which come under them, are being addressed through different 'facilitative actions' for new build. The application shows a number of different figures for doses, but no attempt is made to place a health detriment on them e.g. the number of cancers, non-fatal cancers etc which are expected to arise from the new practices as a whole - from uranium mining through to final waste disposal (and in particular from reactor operations, spent fuel storage, encapsulation and disposal).

Assessment of collective doses and the potential impact of them in terms of estimates of the number of cancers - over time and across populations - are thus ignored. These should have been included despite what the application claims is the ICRP's caution against this.

It should also be noted the application only appears to deal with reactor designs as new practices and touches briefly on transport. It is virtually bereft of information on spent fuel storage and encapsulation, yet these are key constituents of 'reactor operations' - and indeed are the subject of discussion in other Government deliberations e.g. the Funded Decommissioning Programme and GDA processes.

### **Radiation doses**

As noted, in terms of health detriments from the new practices, the application should show how all three aspects of the ICRP's radiological protection principles will be implemented across all parts of the new practices.

The application does not give a clear overview of what each of the new practices in total would entail including all essential and associated facilities. What the new practices as a whole might entail, in terms of dose, is unknown.

The application discusses dose constraints. In (NIA 2 4.38) it notes:

*As explained, the UK environment agencies have been directed to assess any future proposal for an authorisation to discharge radioactivity against dose constraints set at levels below the national dose limits for members of the public. This approach is in line with that set down in the Euratom Basic Safety Standards Directive relating to implementation of the optimisation principle as part of overall radiological protection.*

*The UK dose constraint applicable to a new single source (such as a new power station) is currently 0.3mSv per year; the constraint for a single site (on which there could be more than one facility with authorisations to discharge radioactivity) is currently 0.5mSv per year. The single site constraint protects members of the public from the cumulative effect of exposure to radioactivity from different facilities located on the same site.*

The application (NIA 2, 4.96) refers the reader to a table on page 54, in which it notes:

*'doses from normal operations of a modern evolutionary design water cooled reactor falling within the proposed proposed (sic) practice. It states the dose will be 'less than 0.3' (mSV. The same paragraph also notes: The UK's single site dose constraint of 0.5mSv/y would protect the public from excessive exposure as the result of several different facilities being located at the same site.*

The application does not explain that 1mSv is the *maximum* legally permitted exposure - the limit above which risks are deemed unacceptable.

The application does not explicitly state whether the applicant views that all parts of new practices (on-site) come under the 0.5mSv single site constraint. <sup>x</sup>

It does not explain which activities of the new practice(s) on a multiple-source site or how

they might contribute different fractions to the overall dose.<sup>xi</sup>

Thus if the (reactor) designs will meet the constraint of 0.3mSv (NIA 2, 4.39) what will other operations, such as spent fuel stores and encapsulation plants, contribute? Further, if a company decides to operate 2-3 reactors on site, with accompanying facilities, what would the sum of exposures add up to?

It does not address the matter of the Health Protection Agency's (HPA) more recent recommendation that a new, maximum dose constraint for the public of 0.15 mSv per year should be set 'for new nuclear power stations' and also whether this should be extended to the design of all new sources.<sup>xii</sup>

How the HPA constraint of 0.15mSv would be applied on sites with existing plant (operational, waste storage or decommissioning) and with several reactors but possibly with shared facilities (e.g. spent fuel stores) needs to be fully explored in detail.

In addition, the application does not address how it will seek to achieve the BSO of 0.02mSv for new practices in the context of the NII's SAPs for nuclear plants (SAPs 573, 589).<sup>xiii</sup> The application does not explain whether it will achieve a BSO for specific plants or combined/linked facilities (i.e. those joined as part of new practices). On this we note the HSE:

*HSE's current view is that a single source should be interpreted as a site under a single duty holder's control, in that it is an entity for which radiological protection can be optimised as a whole.*<sup>xiv</sup>

The application should have explained how the expectations for modern plants are higher than that for older plants in terms of the BSO.

We note that brief reference is made to optimisation as part of the description of the new practices to operate an AP1000 (NIA 3, page 5, para 67) and EPR (NIA 3, page 88, paragraph 3.4), but these brief references do not explain the difference between the Basic Safety Limit (BSL) and the Basic Safety Objective modern plants might be expected to achieve. To use the BSL, but not explain the BSO, is misleading. However, because the application takes justification as a separate matter from optimisation it patently appears it does not feel the need to cover BSO.

It should also be noted that there are some parts of the new practices which the NIA has no control over and on which it can only provide information (information which is questionable) on doses e.g. from uranium mining overseas.

It is not clear which countries will supply the reactors mentioned in the application. Therefore it is not known what processes (e.g. Justification) all parts of the new practices have gone through overseas. In addition, it is not clear what might happen to supply (and therefore radiation exposures) for a very large new build programme over a considerable amount of time. The application (NIA 2, 2.18) implies that the impact of the overseas parts of the new practices would be small because it is based on a replacement programme of 10 reactors. It does not give any idea of impact if there was to be a much expanded nuclear programme.<sup>xv</sup>

Similarly, on fuel enrichment, conversion and fabrication - if not undertaken here. The possible health detriments arising from the new practices may not be subject to the same controls as in the UK. In the same vein, the benefits of those parts of the new practices

undertaken here will not be shared by those exposed as a result of the operations of the parts of the new practices undertaken overseas. This application cannot properly seek to 'justify' any part of the new practices which are outside the control of the UK Government and regulatory authorities.

There is no summation of all possible health detriments and all doses from all sources across the whole population - from all the activities - which come under the new practices for which Justification is sought.

There is no indication of how new plant for expanded parts of new practices might be 'justified' in the UK (e.g. fuel fabrication, conversion or enrichment) if they are required. Yet according to the application, these parts of the new practices may give rise to the largest doses (as estimated by the applicant, NIA 2, 4.95). Is it expected that this application will cover all such eventualities? Is the NIA asking *now* that the potential additional parts of the new practices be justified?

We also note, the (NIA 2, 4.36) refers to Best Practicable Means (BPM), but the application does not reference the Environment Agency's Draft *Radioactive Substances Regulation Environmental Principles* (REPs) and the requirements these place on operators.<sup>xvi</sup>

#### **On radiological emergencies - accidents - but not terrorism**

The application (NIA2) - in discussing accidents:

4.75. The justification stage is too early a point for the evolutionary reactor types, which are at the heart of the proposed new practice, to have been through a full licensing assessment against the NII criteria. However, all four designs identified as examples of the proposed practice have evolved from existing designs, with the aim of providing improvements in safety and reliability and Step 2 of the HSE's Generic Design Assessment does provide an initial assessment indicating that each of the four examples is capable of meeting the regulatory expectations set out in paragraphs 4.73 and 4.74 above. In each of their statements recording the results of Step 2 for the 4 designs, the NII comments that, while the arguments and evidence relating to the Basic Safety Objectives will be assessed in the next stage, the claims from the 4 vendors on the calculated core damage frequency, in conjunction with other arguments presented, gives them a strong indication that the BSOs will be met. (emphasis added)

The application does not explain when stage 3 of the GDA process will be finished, nor how the vendors/utilities are assessing the risk to spent fuel stores and encapsulation plants alongside those of reactors. Given this, the claims made by the NIA cannot be substantiated.

It is noted that whilst the application provides information on the predicted frequency of an accident - it does not comment on the possible outcome e.g. potential doses to the local and wider population.

The application does not inform the reader that if there were an accident then the permitted exposures which might be allowed could be between 20mSv and 100 mSv.<sup>xvii</sup> Of course, the actual doses received could be much higher, the doses the HPA refers to assume a degree of control over an accident situation which many would be very sceptical about. The application does not mention that to avoid very large doses after an accident

people may have to be evacuated from their homes or that counter measures may need to be in place for decades.<sup>xviii</sup> In fact the application claims (NIA 2, 4.97) that: *The radiological health detriment from potential accidents has also been shown to be small.*' The radiological health detriment cannot be shown to be small - it is unknown.

In addition to the problems of controlling doses following an accident and major release, trying to control doses following a terrorist attack might be impossible. This brings us to a crucial issue of how the NIA seeks to avoid any real discussion of terrorist actions and possible doses from an attack, for example, on a spent fuel store. The application talks about the robustness of reactors and references one report which has looked at spent fuel stores (from 2001). The application should have addressed the issue of new reactors, spent fuel stores and encapsulation plants in the context of what the proposals are for the new practices as a whole over 60 years of reactor operations and a possible 100 years of spent fuel storage.

Of course it is not possible to ascribe a probability to terrorist actions, but the application's reference to laws on security - which do not necessarily mean there can never be a 'successful' terrorist action involving a new reactor and associated facilities containing large inventories of radioactive materials - do not in any way 'justify' the new practices. That such a major issue is being dealt with in such an off-hand way is not acceptable - particularly at a time the Prime Minister is quoting the head of MI15 on terrorism as saying: "There is no cause for complacency; there is plenty of activity and the threat level remains at severe."<sup>xix</sup>

The application also ignores substantial pieces of independent research into the potential for terrorist attacks on nuclear installations, such as the Parliamentary Office for Science and Technology's (POST) 148-page report in 2004.<sup>xx</sup> The report looked at information on spent fuel storage and security in the UK - noting that (as at 2004) there were no published analyses relating specifically to the risk of terrorist attacks at UK spent fuel cooling ponds although the issue has been raised by some analysts (page 71 of the report). The POST report is a substantial body of work which the Government would do well to reconsider in the light of the application. That the application lacks so much detail on security issues - and the consequences of a terrorist attack on a nuclear installation - is a further reason why it should be rejected.

There is nothing in the application which would inform the reader that a number of the issues raised in the application, which relate to the aftermath of a major accident or terrorist attack, are also linked to other decision making processes on new build. For example, under the Strategic Siting Assessment process, the Government decided to leave the criterion on emergency planning as a 'local level' issue. Yet, emergency planning and the capacity to respond to a major accident/terrorist attack would most certainly involve resources at a national, regional and local level. This issue is not however addressed in the application. The impact of any major release - the doses people might be exposed to or measures to reduce/avoid dose and the resource cost of emergency services - is not included in the application as something to be 'justified' against the benefits of the new practices.

Of course, that the Government has sought to leave emergency planning as a local level issue only serves to underline the lack of 'joined-up thinking' across all the various consultations on the facilitative actions. The Government's approach permits the NIA to ignore matters of public concern on safety and security, by allowing it to claim that such matters will be dealt with 'elsewhere.'

## **Economic impact.**

Another area of potential disadvantage to the UK as a whole, from a major accident or terrorist attack, is the issue of financial liability. That the changes to the UK law, brought about by changes to the international liability regimes (with a much expanded remit) are to be consulted on later this year, should have been discussed within the economic assessment of the NIA's application.

The insurance for liability is to cover all parts of a practice<sup>xxi</sup> including:

- Land based reactors, ancillary buildings, nuclear fuel and generally all other property on the designated site.
- Plants for any manufacture, fabrication or processing of nuclear fuel, other than natural uranium, including the reprocessing of irradiated nuclear fuel.
- Plants for processing or disposal of nuclear waste arising from the nuclear fuel cycle.
- Factories for the separation of isotopes of nuclear fuel.
- Buildings concerned with the storage of enriched or irradiated fuel used or to be used in any reactor, or nuclear waste arising from nuclear fuel (not being incidental to or temporarily used in connection with transport of such nuclear fuel or waste).
- Research establishments using nuclear substances.
- Construction work taking place on a designated nuclear site.
- Any other installation considered by National Law to be a nuclear installation and for which the operator is obliged to insure for third party risks up to the minimum sums set out in the Paris or Vienna Nuclear Liability Conventions.
- Nuclear liability insurance for the international or national transportation of nuclear materials.

The application should have explained what is covered now, and what is expected to be covered. It makes no mention however of the problems envisaged with the possible 'uninsurability' of certain impacts of an accident (and terrorist attacks?) under the new regime.<sup>xxii</sup> Nor, that the nuclear industry has expressed concerns over how it will cover liability in the event of an accident, and has lobbied the Government on this.<sup>xxiii</sup>

The application (NIA 2) states:

7.26 The government's analysis does not seek to monetise the detriment due to potential severe accidents when calculating the welfare balance. Its reasons for not doing so are:

*"Evidence suggests that the likelihood of such accidents is negligible, particularly in the UK context"*

*"The assumption is that this can be managed through design of regulatory and corporate governance arrangements for the nuclear industry"*

The application also notes (NIA 2, 7.28) that:

*The Government's April 2007 consultation document noted that "to the extent that commercial cover cannot be secured for all aspects of the new operator liabilities, the Government will explore the alternative options available".*

What it means in terms of subsidy to the industry - that the Government will cover aspects the industry's liability will not cover - is not quantified.

Most unacceptable is that the application then goes on to claim (NIA 2)

7.29 It is concluded that deployment of the practice is not expected to impose an economic detriment on the wider UK economy associated with the risk of a severe accident.

It is one thing for the NIA to argue the risk of major accident is low, it is quite another for it to completely ignore what the possible costs might be if there is one. In particular, it fails to mention that the costs to some of its member organisations would be limited if there was an accident: potentially a massive subsidy for the industry that should be discussed as part of the economic benefits and disadvantages.

Moreover, the industry cannot claim that because it believes the risk of accident is low then *'the deployment of the practice is not expected to impose an economic detriment on the wider UK economy associated with the risk of a severe accident.'* It has to fully address the possible economic impact of an accident (and terrorist attack) and use worst case scenarios.

As noted earlier, insurance commentators have stated that some of the new areas to be covered under the updated liability regime may be 'uninsurable.' If this is the case then would the public believe new build is 'justifiable'?

That the consultation on the new liability regime - and the changes to UK law to accommodate it - is due to start mid year is another example of how premature the Justification process is, in terms of Parliamentary and public processes.

It is also noticeable that major issues such as proliferation and impacts of climate change (on reactor sites) are also skated over in the 'other considerations' section. Greenpeace does not view this is in keeping with the Guidance as set out by BERR.

Proliferation is raised briefly in the application (NIA 2, 8.3). On this we refer to the recent report from IPPR on the issue of the proliferation and how a UK new build programme might be fuelled (see also the paper on this from the Sustainable Development Commission).<sup>xxiv</sup> The IPPR paper is particularly relevant because it highlights the risks of pursuing the nuclear new build option in the UK and how this can impact globally. The Government has to ask can it 'justify' promoting a power generation system which has significant risks in terms of increasing global demand for, and access to, the technology and materials essential for the development of nuclear weapons?

## **Transport**

No mention is made on how certain types of transport (e.g. road transport of new build spent fuel) might impact on workers or the public. The application (NIA 2, 4.53) notes:

*All these types of transport are already undertaken within the UK and have been justified on a generic basis.*

This implies the transport of the more radioactive spent fuel from new build presents no new issues.

The application does not explain that new transport regulations will probably be required, or that under some modes of transport there may be an additional dose to workers or the public.<sup>xxv</sup> The NIREX report, which the application references in part, looks at how spent fuel from new build may impact in some areas of the new practices (e.g. disposal of wastes), but many of key matters raised in the NIREX report are underplayed.

Further on transport, the application (NIA 2, 4.62- 4.67) does not give any indication as to how the transport containers would resist an attack (e.g. a grenade launcher, a large amount of explosive). It looks only at accidents.

### **Wastes - ethics and process for new build wastes**

The application misrepresents what CoRWM said on this matter; it refers to the early statement on new build wastes which CoRWM published in 2006. It does not provide copies of CoRWM's later statements (CoRWM doc 2162, March 2007 and CoRWM document 2126.2, September 2007). These were very challenging in terms of the assumptions that creating waste through new build is automatically acceptable or that dealing with new build wastes along with legacy wastes is the correct thing to do. In ignoring CoRWM's papers, the application ignores the ethical aspects of generating more waste and the potential impact on future generations. This is inexcusable.

In general the application only looks at the implications of spent fuel and ILW on a repository's size (and then seeks to minimise the impact), but fails to address what impact reprocessing of spent fuel might have - even though some of the applications 'supporting' utilities still believe this should be included as a possibility under the new practices (see later discussion). The application covers waste disposal in terms of volume and impact on the size of a repository, but not in terms of radioactive inventory - this is particularly important in terms of spent fuel disposal.

When it does mention the inventory the application still manages to skillfully avoid detailed discussion of the radioactive inventory - even when responding to the questions put on this matter.<sup>xxvi</sup>

#### **Question 4**

*Do you have any other comments on the Government's preliminary view of the classes or types of practice, on the approach preferred by the NIA, or any other options?*

*and*

#### **Question 5**

*Do you have any comments on how best the Government might accommodate changes or developments of the named reactors in its classes or types of practice?*

For the purposes of this response these two questions will be answered together.

What is meant by the 'approach preferred by the NIA' needs clarification. Does it mean how it has submitted the application, or how it (or rather member organisations) intends to implement the new practices to be justified? The question the consultation should really be asking is whether the NIA's application - and the new practices described - lie within the framework of possible new build practices the Government envisages will occur (as discussed in other consultations e.g. the Funded Decommissioning Programme).<sup>xxvii</sup>

Neither of these questions are particularly clear - but that is probably as much because the Government has left open a wide range of possible activities which might happen under the new practices.

## **Reprocessing**

The application (NIA 2) notes the Government's stance on this in:

4.35 Spent fuel would be stored on site until transported to another nuclear site for further interim storage, disposal or, possibly, reprocessing. The potential radiological health detriments of on-site or offsite storage are included here as part of normal station operation; the radiological detriments of its transport and disposal are covered in later sections. Reprocessing is not addressed further here as it is not a process required in support of this application and is a separate practice. This approach is in line with the statement by Government who have reaffirmed that: "Our view remains that in the absence of any proposals from industry, new nuclear power stations built in the UK should proceed on the basis that spent fuel will not be reprocessed." <sup>xxviii</sup>

As reprocessing has not been ruled out altogether, it gives the NIA room to refer to it. It does this though without going into the implications (radiological, waste creation, waste volumes, economics) in any depth. This again appears at odds with BERR's guidance on this matter. <sup>xxix</sup>

In relation to this we also note the possibility of central storage for spent fuel has also not been ruled out. That encapsulation might not take place at reactor sites is now creeping into the frame because some vendors/utilities keep discussing this (despite what the consultation on Funded Decommissioning Programme says).

The idea of a central store for spent fuel, or a central encapsulation plant (at the head of a yet to be decided on repository site?) and/or reprocessing are all major issues which have not been fully discussed in any consultations. On spent fuel storage in general, and encapsulation in particular, the application has chosen to virtually ignore these issues. The application should have discussed each step of each of the new practices which might give rise to doses, which will incur costs and which involves facilities which could have major releases if there were accidents or attacks.

On the idea of reprocessing and central spent fuel stores the application casually raises the issues (NIA 3) where it states:

1.15 After storage in the ponds there are two main options available to the plant owner. The first is transfer of fuel to engineered wet or dry storage awaiting a final repository for disposal. With this option, fuel could be stored on site throughout the life of the station or transported to a central location. The second option, which Government has made clear would be subject to further consultation and policy approval, would be for transfer to a reprocessing facility where useful fissile material (plutonium and/or reprocessed uranium) within the spent fuel could be recovered for future reactor re-use and the smaller quantity of remaining waste fission products separated for subsequent encapsulation and storage in a repository<sup>xxx</sup>.

Why is reprocessing being referred to in the part of the application which discusses the reactor designs? Either the NIA is saying this is a 'to-be-expected' part of the new practices (in which case it should be examined in depth) or not.

We note that in discussing the AP1000, the application (NIA 3, page 59, paragraph 2.6) states:

Spent Fuel Storage – Spent fuel is stored underwater in high-density racks, which include integral neutron-absorbing material to maintain the required degree of subcriticality. The racks are designed to store fuel of the maximum design basis enrichment. The racks rest on the floor of the spent fuel pool. The spent fuel pool storage capacity is 889 fuel assemblies. This allows storage of spent fuel for up to approximately 18 years of operation prior to being moved for example to the onsite storage facility. Spent fuel can also be placed in a storage cask and stored at an onsite facility. Two storage casks can contain all of the spent fuel from one 18-month fuel cycle. Approximately 1,200-1,400 tons of uranium in spent fuel will be generated over the lifetime of the plant.

No mention is made of the need to provide sufficient storage (for 100 years) for the total spent fuel arisings of 60 years of reactor operation, nor the anticipated encapsulation plant. We also note the plans of the AP1000 and EPR in the application do not indicate exactly where spent fuel stores and/or encapsulation plants will be located.

In discussing the EPR and spent fuel (NIA 3, page 91) notes:

On average, about 40 to 60 fuel assemblies (each with approximately 0.5275 te of uranium) are needed every year depending on the fuel management strategy adopted. Spent fuel will be stored in the spent fuel pool and if necessary in a further interim storage facility pending a decision for either reprocessing or final deep geological disposal. The interim storage facilities would have the capacity to cover up to 60 years of operation of the nuclear unit (equivalent to approximately 1,500 te of uranium). For a wet interim storage option, the pool fuel racks would cover an area of approximately 250m<sup>2</sup>. If fuel were to be flaked and shipped off site, between four and six lorry trips would be required per year.

Again, the above does not mention 100 years spent fuel storage, nor is on-site encapsulation mentioned. Reprocessing is however raised with reference to the EPR. Does this indicate a different preference between the vendors? If so, then it also indicates that separate applications for the different designs, with clear preferences for the vendors and utilities, should have been submitted - not a 'one size fits all' (in fact fits nothing) application.<sup>xxxix</sup>

Reprocessing rightly has a bad reputation - and nowhere more so than in the UK where there has been failure after failure to make reprocessing environmentally sound and economically viable. That the Sellafield Mox Plant has also failed is a further embarrassment to industry and Government. It is amazing then that the possibility of reprocessing in the future can be raised, but not addressed now, if indeed this is the intention of the parties who wish to pursue new build.

On MOX use, we also note both the AP1000 and EPR are said to be able to use MOX fuel<sup>xxxix</sup>. If the vendors or operators intend to use MOX fuel sometime in the future this should be covered in this application.

It also has to be asked whether the mention of reprocessing, in connection with the EPR, means that there is interest in the possibility of reprocessing in France? This could have

many implications e.g. the marine transport of spent fuel and the return of waste shipments for disposal here. If this is the case, or an 'option', then it should be fully discussed now.

That the NIA can suggest reprocessing of spent fuel - an intermediate step (in so far as it does not dispose of spent fuel but is a process which can be employed on the way to disposition of spent fuel), as a separate practice is particularly disingenuous. If the industry wants reprocessing then it should put in an application which includes options involving reprocessing.

### **Spent fuel - storage, disposal and encapsulation**

On spent fuel disposal the application does not fully discuss the range of possible impacts of new build spent fuel disposal in a repository with legacy wastes. It does not reference any of the papers which raise issues about the difficulties of disposing of higher burn up spent fuel. On these vital issues we refer DECC to papers which discuss this matter.<sup>xxxiii</sup> Reference to the potential for a second repository (which might be needed for spent fuel and other wastes from new build) - either for technical reasons or because of the size of the programme - is fleeting. Yet this is clearly flagged in government documents.<sup>xxxiv</sup>

Given the size of the programme is not known, the application should have included details of what might be needed if a new build programme goes above a certain size e.g. over 10 new reactors. In particular, the possibility of finding a second repository would be a major concern (particularly as the process of finding a first repository is in its infancy). The application should have noted there is no operating repository for HLW or spent fuel disposal anywhere in the world. Indeed, there is little or no real information on the packaging requirements or disposal methods for spent fuel - again this is effectively treated as a separate part of the new practices, not an essential part of it. This is particularly remiss given that it is acknowledged the spent fuel accounts for the majority of the radioactive inventory arising from the new practices overall.

Encapsulation is not referred to in Vol 2 of the NIA's application. It is mentioned (NIA 3, 2.13) only in reference to encapsulation of high level waste *after* reprocessing.

The application (NIA 2, 5.44) does note on some aspects of packaging spent fuel that:

The assessment was preliminary and should not be taken as definitive ahead of a more detailed assessment of a particular programme size and choice of reactor design, as well as the type of packaging used in spent fuel disposal. The work pointed to how the figure could be somewhat lower for some design assumptions involving higher fuel burn-up but it is also possible that with different assumptions a somewhat larger increase in below ground repository footprint could be derived.

Again, this raises the idea of leaving key issues - which should be known and discussed under Justification - to be dealt with through later, unspecified, processes. This is not good enough - the NIA is asking now for all parts of the new practices to be Justified, not just bits of it.

It appears the application does not want to discuss on-site encapsulation because vendors and utilities are seeking to change policy on this. British Energy's response to the *Consultation on funded decommissioning programme: Guidance for new nuclear power stations (May 2008)* questions whether there should be one central encapsulation plant for spent fuel, as does the Westinghouse submission, EDF's and RWE's. Interestingly, on this

point RWE notes:

Irrespective of whether there is a central spent fuel packaging facility or facilities at each power station, there is currently no clearly documented and accepted UK system for packaging spent fuel for disposal. Government will need to advise utilities what will be acceptable both in terms of technology and cost.

As noted above with the NIA's remarks on packaging, it appears encapsulation is virtually being ignored not just because of the on-site versus central plant discussion, but because they don't know how to encapsulate spent fuel. Is this a good basis on which to 'justify' a whole set of new practices?

It is also noted (NIA 2, 5.43) that the period given for storage of spent fuel (after it leaves the reactor prior to disposal) does not accord with figures given by Government agencies e.g. the NDA has quoted a possible figure of an 50 years for storage for high-burn up fuels prior to disposal.

We also understand there has recently been discussion of the possibility of a requirement for an 'additional 50 years' of spent fuel storage prior to disposal over that for the spent fuel from older PWR's (approx 65 years). This is because of the high burn-up of the new build spent fuel. If this is the case, then this must be discussed in full as it pushes the 100-year storage timeline that is being envisaged for covering new build spent fuel storage prior to disposal.

The application does not explain if it intends to apply the 'safestore' approach to decommissioning new build in the UK (NIA 3, 5.54) and over what timeframes it envisages that part of the new practices will take place e.g. 50 or 100 years?

**Accommodate changes or developments.....in classes or types of practice?**

The consultation asks:

*Do you have any comments on how best the Government might accommodate changes or developments of the named reactors in its classes or types of practice?*

It is not clear what is meant by this question. Does it mean changes or developments after a Justification decision is made? It cannot mean changes to existing practices because the practices proposed in the application are new. As noted earlier, the Government should not treat any of the application, or parts of the practices proposed, as if they are existing practices.

Equally importantly, the Government cannot think it can justify new practices now and then allow major changes to those practices through other processes or separate justification applications.

The reasons for this are clear. The industry is seeking *now* to Justify whole new practices from uranium mining through to final waste disposal. Within the application (and in other documents from vendors and utilities) it is clear that there are a number of possible variations the vendor/utilities would like to see in the future which are different to current thinking on a new build programme and waste management. Had the industry not already made clear it is considering the possibility of reprocessing, off-site encapsulation or a central store for spent fuel then - if such ideas were raised in the future - it could perhaps be claimed that these changed options were unforeseen and might have to be dealt with separately. On that point, Greenpeace would argue such changes would entail a major

review of the Justification for the new practices as a whole, not simply Justifying the 'new' part of it.

However, as it is the vendors and some utilities have already indicated they are very much interested in other options e.g. for spent fuel management - which are different from those set out in White Papers and other consultation documents. The whole of the new practices, and variations on them, should therefore be re-presented in new applications so that all possible scenarios can be considered.

Of course, the Government has not helped in this because it - and its agencies - has also mooted the idea of different approaches to the 100-year on-site spent fuel storage and encapsulation policy (or what seems to be policy from the documents on decommissioning programmes).

Here are references to some of the possible scenarios and variations:

- Spent fuel is to be kept on site at reactors <sup>xxxv</sup>
- However pending a period of on-site storage it could be stored on-site or in a regional or central store <sup>xxxvi</sup>
- It may be stored for only 5 years (pending removal to a storage facility or reprocessing?) or 10 years (before disposal?) <sup>xxxvii</sup> but possibly up to 50 years or 100 years (on or off-site).<sup>xxxviii</sup> Or, depending on the outcome of the waste disposal/repository process (which could be delayed) it may be stored longer.
- Spent fuel will be encapsulated on site<sup>xxxix</sup> or at a central site - depending on industry lobbying.
- Stores may or may not need to be replaced. <sup>xi</sup>
- Stores may be above ground or underground. <sup>xii</sup>
- The expectation is that spent fuel will be disposed of 'in tact' in a deep geological facility(ies)<sup>xiii</sup>
- Title and liability stays with owner until it leaves the site or, if no geological facility eventuates, the Government/NDA would take title and liability. <sup>xiiii</sup>
- Spent fuel is stored, pending reprocessing and then disposal.<sup>xliv</sup> Or, it could even be stored in a repository pending reprocessing? <sup>xlv</sup>

We reference here the issue of when the Government takes title and liability of the spent fuel because some in the industry have questioned not only whether encapsulation should take place at a central site, but also if it should be included in the fixed unit price. There is the possibility that if a central encapsulation facility was established (by the NDA) that this would mean the Government taking title to, and liability for, the fuel at an earlier stage in the management process (i.e. before encapsulation) than currently envisaged. This could also change funding systems and may increase the risk of additional subsidy to the industry. This is another example of a potential economic disadvantage which could well arise as a result of the new practices.

### **Too many different proposals**

Given what some of the member organisations of the NIA are saying about reprocessing and encapsulation and spent fuel storage, and given that some of these key players are those 'supporting' the application, it is not clear exactly what the JA is being asked to be 'justify'. There are too many potential variations on a theme.

If the Government were serious in wanting to hold a full and proper consultation on new build - and all that it entails - it would not have accepted this application. It should send the

application back to the NIA and should have directed the organisations that will be responsible for design, construction, operations and waste management (and financial liabilities) to it to put in application(s) to cover the following:

- reactor operations with on-site storage and encapsulation of spent fuel as the option - as per Government 'plans.'
- reactor operations with central storage of spent fuel and encapsulation as the option
- reactor operations with central storage and reprocessing of spent fuel as the option.

If this also entails separate applications for each different reactor design then that will have to be done.

That way the health detriments of all possible scenarios which the industry is discussing can be judged against the benefits to local and national populations.

### **Question 6**

*Do you have any suggestions about the way in which the Government proposes to engage with the public in the later stage of the consultation process?*

#### **In general**

Overall there is no explanation about how this process links into other processes and where the public might find information on those other areas which link to Justification e.g. the SSA/SEA process which should look at whether there are alternative uses for sites, but which is also connected to Justification and which should answer questions on the disadvantages - 'the opportunity costs' (at a regional level, to future transmission infrastructure, to the renewables industry) of having new build as opposed to renewables.

It is also telling there is no cut-off date as to when 'Justification' allowed in 2009, as envisaged in the Government's timeline, might expire. Is this application for all of the proposed new practices for all time? How long does the decision 'last'?

It is clear from this response that there are too many unknowns - in terms of spent fuel management (let alone disposal - which we have not discussed in depth) for the application to be able to stand. It is out of step with the timelines, and possible decision making points, from other key processes. For Justification to be decided upon before the GDA process in particular, and without examination of how the new practices might impact on a particular site (see the HPA's response on SSA on this matter)<sup>xlvi</sup> makes it clear that the processes are not joined up, but fragmented and ill-ordered.

All of this is too important to be decided through written responses to consultation documents and applications which are wholly inadequate. It is contrary to any good practice that the major issues of substance around Justification are left to closed door discussions of officials. This whole process - and the issues it considers - must be opened to public scrutiny and challenge.

It is clear that for many reasons, including the need for full and transparent scrutiny, the testing of the evidence and public participation in this vital process, that the Government should hold an inquiry, as allowed under the *The Justification of Practices Involving Ionising Radiation Regulations 2004 (No. 1769), Regulation 17*.

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- ii <http://www.berr.gov.uk/files/file45384.pdf>. See para 1.25
- iii 0.14 This justification application is being made by the Nuclear Industry Association (NIA) of Carlton House, 22a St James's Square, London, SW1Y 4JH ("the Applicant") with the support of six utilities British Energy Group; EDF; E.ON RWE Vattenfall Iberdrola The application includes information on four specific reactor designs provided by the nuclear construction vendors, : Atomic Energy of Canada Limited; AREVA; GE-Hitachi; Westinghouse.
- iv In referring to the application, NIA 2 means Vol 2 of the Justification documents as they appear on the DECC website and NIA 3 relates to the third document, Vol 3 - even though in effect they are Volumes 1 and 2 of the application.
- v On this the application, page 1 of 11 Chapter 1 addendum, the application notes: It is important to note that whether a design is, or is not, "evolutionary" is determined by the technical features of that design and how those technical features relate to features within designs that have already been deployed and for which there is therefore prior experience.' The application does not note that neither the AP1000 nor the EPR have operational experience.
- vi On new practices, a few examples. The application (NIA 2, 4.8) notes:  
'The single source constraint specified above of 0.3mSv per year for new (post May 2000) facilities has therefore been adopted in this application as a useful parameter in describing the maximum individual public dose (and health detriment) from new facilities developed in the UK as part of the new practice.'  
NIA 2. 4.14 This application does not attempt to quantify the *collective* radiation dose for all potential sources of exposure associated with the new practice. (The concept of collective dose is described in the third Box)  
NIA 2, 4.57: 'The contribution to public radiological detriment from the new practice would therefore be at most comparable with the very low level reported in the HPA survey.'  
See also first sentence para NIA 2 4.75
- vii <http://www.hse.gov.uk/nuclear/saps/saps2006.pdf>
- viii Recommendations of the International Committee on Radiological Protection. ICRP Publication 26. Annals of the ICRP, vol. 1, no. 3. Oxford, New York: Pergamon Press, 1977, p. 3. ICRP 1991, p. 28.
- ix see [https://ssl.note-ip.org/What\\_is\\_NOTE](https://ssl.note-ip.org/What_is_NOTE)  
The Chernobyl Accident 20 Years On: An Assessment of the Health Consequences and the International Response <http://ukpmc.ac.uk/articlerender.cgi?artid=742558>. This considers the 'unknowns' in terms of the health effects of low level radiation. See also  
Kaatsch P, Spix C, Schulze-Rath R, Schmiedel S, Blettner M. Leukaemias in young children living in the vicinity of German NPPs. Int J Cancer. 2008;122:721–726.  
Epidemiological Study on Childhood Cancer in the Vicinity of Nuclear Power Plants (KiKK Study). [http://www.bfs.de/de/bfs/druck/Ufoplan/4334\\_KiKK\\_Zusamm.pdf](http://www.bfs.de/de/bfs/druck/Ufoplan/4334_KiKK_Zusamm.pdf) (p 13 for the English version).  
Report of the Committee Examining Radiation Risks of Internal Emitters (CERRIE), 2004. <http://www.cerrie.org/>  
Wald, M. Report faults US measure of cancer risk. New York Times, January 7, 2009. [http://www.nytimes.com/2009/01/08/us/08nuke.html?\\_r=2&emc=tnt&tntemail0=y](http://www.nytimes.com/2009/01/08/us/08nuke.html?_r=2&emc=tnt&tntemail0=y)  
IEER Press Release 7th January 2009. <http://www.ieer.org/campaign/pressrel090107.pdf>
- x <http://www.defra.gov.uk/ENVIRONMENT/radioactivity/government/legislation/pdf/rsd2000.pdf>
- xi HSE Numerical targets and legal limits in Safety Assessment Principles for Nuclear Facilities An explanatory note December 2006 <http://www.hse.gov.uk/nuclear/saps/explanation.pdf>: 5. In estimating doses for comparison with these targets, all relevant sources of ionising radiation should be considered. If the target relates to the site, all sources on the site should be included, not just those in a particular facility. Where relevant, the dose contribution from any authorised discharge of radioactivity arising from planned operations should also be taken into account. Natural background radiation should however be omitted from the dose estimates, although radon may require consideration. The sources of interest are those that are introduced to the site by man for the purposes of work with ionising radiation, or that result from such work.
- xii HPA press release  
[http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb\\_C/1219302583837?p=1204186170287](http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1219302583837?p=1204186170287)  
and consultation document  
[http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb\\_C/1205741916373](http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1205741916373)  
See also letter from the Environment Agency to Dr Roger Cox at HPA, dated 29<sup>th</sup> January 2009  
[http://www.hpa.org.uk/web/HPAwebFile/HPAweb\\_C/1234946179590](http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1234946179590)  
and HPA Advice on Radiological Protection Objectives for the Land-based Disposal of Solid Radioactive Waste, HPA, March 2008. [http://www.hpa.org.uk/web/HPAwebFile/HPAweb\\_C/1205741917946](http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1205741917946)
- xiii <http://www.hse.gov.uk/nuclear/saps/saps2006.pdf>

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- xiv <http://www.hse.gov.uk/nuclear/saps/explanation.pdf> HSE Numerical targets and legal limits in Safety Assessment Principles for Nuclear Facilities An explanatory note December 2006 Para 26 on sites and para 25 on new plant.: It (BSO 0.02mSv) is appropriate therefore for new facilities designed to modern standards, although a less onerous ALARP level may be more realistic on multi-facility sites housing older facilities.
- xv For completeness the application should have provided figures for the amounts of waste produced in uranium mining - and should have mentioned that 80% of the activity of the ore can be left in waste at the mine sites
- xvi <http://www.environment-agency.gov.uk/static/documents/11-GEHO0606BLSO-e-e.pdf>
- xvii HPA's advice on the application of the ICRP's 2007 recommendations to the UK - table 5.5.1).
- xviii Nucleonics Week Volume 48 / Number 51 / December 20, 2007 EC drafting regulations to manage post-accident radiation protection
- xix We are about to take the war against terror to a new level, Gordon Brown, The Observer, Sunday 22 March 2009 <http://www.guardian.co.uk/commentisfree/2009/mar/22/gordon-brown-terrorism>
- xx <http://www.parliament.uk/documents/upload/POSTpr222.pdf>
- xxi <http://www.nuclear-risk.com/onlineBrochure.asp>
- xxii See power point presentation from Nuclear Risk Insurers <http://www.westminsterenergy.org/Upload/2006-2008-public-events/20080207/3.3%20Tetley.pdf> and also the Memorandum submitted by Nuclear Risk Insurers Ltd, to the Environmental Audit Committee 2005 <http://www.publications.parliament.uk/pa/cm200506/cmselect/cmenvaud/584/584we56.htm>
- xxiii Insurance: nuclear threat, New Civil Engineer: 23 January 2008 [http://www.nce.co.uk/news/2008/01/insurance\\_\\_nuclear\\_threat.html](http://www.nce.co.uk/news/2008/01/insurance__nuclear_threat.html) Insurance law changes threaten nuclear build 8 August, 2008 <http://www.building.co.uk/story.asp?storycode=3120025>
- xxiv press release IPPR <http://www.ippr.org.uk/publicationsandreports/publication.asp?id=650>. For full report see: <http://www.ippr.org.uk/members/download.asp?f=%2Fecomm%2Ffiles%2Fnuclear%5Frenaissance%2Epdf>. For the SDC on proliferation <http://www.sd-commission.org.uk/publications.php?id=341> and on uranium supply see <http://www.sd-commission.org.uk/publications.php?id=343>
- xxv NIREX TECHNICAL NOTE The Gate Process: Preliminary analysis of radioactive waste implications associated with new build reactors February 2007 Number: 528386
- xxvi (NIA 2, chapter 5 addendum) it claims that: In terms of justification we believe that the disposal "footprint" and the volume of packaged spent fuel are more important parameters in terms of detriment than the mass or volume of the fuel rods or assemblies themselves. Both the former quantities take into account the amount of radioactivity within the spent fuel, not just its weight or volume. And (continuing the explanation set out above) the amount of radioactivity within the spent fuel depends in turn on the number of U-235 fissions that have occurred within it.
- xxvii <http://www.berr.gov.uk/energy/sources/nuclear/whitepaper/actions/waste-decommissioning/page47722.html/sources/nuclear/whitepaper/actions/waste-decommissioning/page47722.html>
- xxviii From the application it is in fact not clear what contribution the storage of 60 years worth of spent fuel, over a possible 100 year time frame, might have on radiation doses.
- xxix <http://www.berr.gov.uk/files/file45384.pdf>  
1.14. An important issue is defining the scope of the practice. Nuclear reactors need to be supported by facilities for fuel manufacture and for managing spent fuel and various categories of radioactive waste. ICRP emphasises that waste management and disposal operations are an integral part of the practice generating the waste and that it is wrong to regard them as a free-standing practice that requires its own Justification.
- xxx see also para 2.13 on reference to storage or reprocessing,
- xxxi On reprocessing of spent fuel, EDF, the major player in the UK new build market notes in its response to the FDP consultation that: *Para 4.1.9, 10th bullet (reprocessing): We note the assumption in the Guidance that there will be no reprocessing. However, we consider that the statement in respect of reprocessing in the White Paper on Nuclear Power (CM7296, page 116), namely that future proposals for reprocessing "would need to be considered on their merits at the time and the Government would expect to consult on them", should be acknowledged. We accept that the fixed price we agree with Government will assume that no reprocessing will occur and that, should the position change in future, a new DWMP would require Government approval.* In their responses to the same consultation, Iberdrola, Vattenfall and Scottish and Southern Electric also appear to believe the matter of reprocessing should be left open.
- xxxii see NIA 3, page 60 para 2.15 on AP100 and MOX, see NIA 3, para 2.4 page 79 on EPR and MOX fuel
- xxxiii <http://www.no2nuclearpower.org.uk/reports/buryingthetruth08.pdf>

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[http://www.nuclearconsult.com/Too\\_Hot\\_to\\_Handle.pdf](http://www.nuclearconsult.com/Too_Hot_to_Handle.pdf)

<http://www.greenpeace.org.uk/tags/posiva>

- xxxiv Consultation on Funded Decommissioning Programme Guidance for New Nuclear Power Stations February 2008, page 45. We also note the application appears to assume all LLW from a new build programme could be accommodated in the current facility at Drigg in Cumbria. This may not be the case.
- xxxv The Future of Nuclear Power, 2007 (para 12.16) <http://www.berr.gov.uk/files/file39197.pdf>  
Towards a Nuclear National Policy Statement: Applying the proposed Strategic Siting Assessment Criteria: a study of the potential environmental and sustainability effect, July 2008 (para F.31)  
<http://www.berr.gov.uk/files/file47137.pdf> . The Energy Bill 2008 Consultation on Funded Decommissioning Programme Guidance for New Nuclear Power Stations p 65
- xxxvi Towards a Nuclear National Policy Statement: Applying the proposed Strategic Siting Assessment Criteria: a study of the potential environmental and sustainability effect, July 2008 (para F.36)  
<http://www.berr.gov.uk/files/file47137.pdf>
- xxxvii NIA Vol 3, para 2.13, NIA Vol 2 5.43
- xxxviii On 50 years, in email from NDA 9th January 2008. On 100 years, see The Energy Bill 2008 Consultation on Funded Decommissioning Programme Guidance for New Nuclear Power Stations para 4.2.42
- xxxix The energy Bill 2008 Consultation on Funded Decommissioning Programme guidance for new nuclear Power Stations
- xl The Energy Bill 2008 Consultation on Funded Decommissioning Programme Guidance for New Nuclear Power Stations p 46
- xli Towards a Nuclear National Policy Statement: Applying the proposed Strategic Siting Assessment Criteria: a study of the potential environmental and sustainability effect, July 2008 (para F.30)  
<http://www.berr.gov.uk>  
[www.berr.gov.uk/files/file47137.pdf](http://www.berr.gov.uk/files/file47137.pdf)
- xlii The Energy Bill 2008 Consultation on Funded Decommissioning Programme Guidance for New Nuclear Power Stations p 46- *The size of a programme of new nuclear power stations and the specification of the site chosen for the geological disposal facility may impact on whether all of the spent fuel from new nuclear power stations could be stored in the same disposal facility as legacy waste.*  
A White Paper on Nuclear Power, para 41. <http://www.berr.gov.uk/files/file43006.pdf>
- xliii The Energy Bill 2008 Consultation on Funded Decommissioning Programme Guidance for New Nuclear Power Stations para 2.15
- xliv NIA Vol 2 4.35
- xlv Email from NDA 8 July 2008. <http://www.greenpeace.org.uk/files/pdfs/nuclear/NDAAstorage0608.pdf>
- xlvi HPA response on BERR/DECC 'Consultation on the Strategic Siting Assessment (SSA) Process and Siting Criteria for New Nuclear Power Stations in the UK' September 2008.  
<http://www.berr.gov.uk/energy/sources/nuclear/consultations/closed-response/page47749.html>