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Dear Mr Jenkins

NUCLEAR INDUSTRY ASSOCIATION'S (NIA) APPLICATION TO JUSTIFY NEW NUCLEAR POWER STATIONS

Thank you for consulting HSE¹ on the application from the NIA.

HSE's comments on this application are focused on providing a view on the radiological health detriment arising from the proposed new nuclear power stations in the NIA application. HSE will also comment on the validity of the assessment of radiological health detriment provided by the NIA. It is not within HSE's remit to comment on any benefits the NIA propose which flow from the introduction of new nuclear power stations.

HSE through its Nuclear Installations Inspectorate (NII) has day to day responsibility for the safety regulation of current nuclear facilities operating in the UK. NII regulates nuclear power stations by means of a licensing and permissioning regime. A site cannot have a nuclear installation on it unless the user has been granted a site licence by the HSE. NII, acting for HSE, has the power to attach conditions in the interests of safety to the nuclear site licence providing for the general requirements for safety on the site through a permissioning regime. Within these conditions NII has certain primary legal powers to issue consents, approvals, specifications, agreements, notifications and directions, which define the permissioning arrangements. In addition, a licensee's licence condition compliance arrangements provide mechanisms for NII to permission activities in more detail via licence instruments issued under powers derived from the arrangements themselves². At these permission stages or hold points the nuclear site licensee must seek 'permission' to commence the activity. The regime requires that at each hold point identified by the Inspectorate the licensee must submit safety documentation to substantiate each request. NII examines or 'assesses' these submissions, termed 'safety cases' against a set of safety criteria, the NII Safety Assessment Principles (SAPs)³. The latest version of the SAPs when they were recently revised were benchmarked against the IAEA Safety Standards, as they existed in 2004, and are thus indicative of international good practice in

¹ HSE the Health and Safety Executive is the primary regulatory body in the UK for all health and safety risks arising out of work activities

² Further details of this regime can be found on the HSE web site <http://www.hse.gov.uk/nuclear/notesforapplicants.pdf>

³ HSE Safety Assessment Principles for Nuclear Facilities. First edition, 2006. Web version: www.hse.gov.uk/nuclear/saps/

nuclear safety⁴. One of the aims of the SAPs is the safety assessment of new (proposed) nuclear facilities. As the SAPs represent NII's view of good practice and modern standards the NII will expect modern facilities to have no difficulty in satisfying their overall intent.

This regime enables NII to systematically manage safety related activities on the site throughout the lifecycle of the plant including design, siting, construction, commissioning, operation and modification through to completion of decommissioning. Nuclear reactors in particular require consent from NII before initial operation or restart after shutdown. The purpose of this regime is to ensure the risks from nuclear installations are properly controlled, thus securing public confidence in high levels of health and safety without unduly compromising the industry's ability to operate. Thus NII's regulatory arrangements ensure that any radiological health detriment to both the public and the operator arising from nuclear installations in the UK will meet national and internationally recognised limits. In addition an important aspect of the UK regulatory regime is that there is legal duty under the Health and Safety at Work Act (HSWA) to reduce risk so far as is reasonably practicable (SFAIRP) to the worker and public from all work activities. The judgement using the principles in the SAPs is always subject to consideration of SFAIRP. This consideration will, particularly with regard to new plants, drive the risk significantly lower than the Basic Safety Level (BSL) requirement in the SAPs. Thus any new nuclear facility built and operated in the UK under this regime will result in a low radiological health detriment.

NII has examined the validity of the NIA assessment of radiological health detriment. The radiological health detriment from new nuclear power stations can be split into 2 broad categories: detriment that will arise as a result of normal operations to the public and potential detriment that could be received in the event of an accident. These categories are considered separately.

The NIA has provided information on the radiological health detriment as a result of normal operations as compared to the legal limits set out in the Ionising Radiations Regulations 1999 (IRR99). That information indicates that all radiation doses to the worker and to the public will be lower (in the case of the public substantially lower) than the legal limits in IRR99 (20 mSv/y and 1mSv/y respectively). The figures presented by the NIA with respect to radiation exposure to the worker and to the public have been compared with information held by HSE⁵ and that publically available data from other agencies⁶. The figures presented by the NIA are in good agreement with this data and thus HSE considers that the NIA data is valid for the purposes of justification.

Potential radiological health detriment resulting from an accidental release of radioactive material from nuclear power stations can never be completely ruled out. However, the risk of this type of release can be demonstrated to be low by considering the measures taken to ensure the overall safety of the plant. The Tolerability of Risk from Nuclear Power Stations (TOR) was published in 1992⁷ and defined risks that are so high they are unacceptable unless there are exceptional circumstances and risks which are so low that they may be considered broadly acceptable and, in general, no further regulatory pressure to reduce risks should be applied. The area between these levels is often thought of as the ALARP (as low as reasonably practicable⁸) region in which further improvement is sought and implemented unless it is shown that the sacrifice involved is grossly disproportionate to the risk reduction achieved. In reality, though, the legal duty⁹ to demonstrate risks are ALARP is ever present. NII has translated the TOR framework into guidance for inspectors with the development of numerical targets termed the Basic Safety Level (BSL) and the Basic Safety Objective (BSO) in the Safety Assessment Principles for Nuclear Facilities (SAPs). The BSLs effectively form a 'cap' on the level of radiological detriment from any facility that would be allowed to proceed. The BSOs form benchmarks that reflect modern nuclear safety standards and expectations. The background

⁴ Safety assessment and verification for nuclear power plants IAEA Safety Standards Series No. NS-G-1.2 2001.

⁵ Sources are the Central Index for Dose Information (CIDI), Nuclear Energy Agency (NEA) Information System on Occupational Exposure (ISOE), and reports to NII from Sizewell B.

⁶ Radioactivity in Food and the Environment 2007, RIFE –13 Centre For The Environment, Fisheries and Aquaculture Science 2008 <http://www.food.gov.uk/science/surveillance/radiosurv/rife13>

⁷ HSE The tolerability of risk from nuclear power stations. The Stationary Office 1992 ISBN 0 11 886368 1. Web version: www.hse.gov.uk/nuclear/tolerability.pdf

⁸ ALARP is analogous to the legal duty of SFAIRP.

⁹ HSWA and IRRS 99 provide for this the legal duty (SFAIRP).

to these numerical targets and clarification for the numbers chosen can be found in an explanatory note issued shortly after the SAPs¹⁰.

The SAPs assist inspectors in the judgement of whether, in their opinion, the dutyholder's safety case has satisfactorily demonstrated that the requirements of the law have been met. The basis for demonstrably adequate safety is that the normal requirements of good practice in engineering, operation and safety management are met. The judgement using the principles in the SAPs is always subject to consideration of SFAIRP. This consideration will, particularly with regard to new plants, will in drive the risk significantly lower than the BSL. Thus any new nuclear facility built and operated in the UK under this regime will result in a low radiological health detriment.

The NIA have provided in their submission information comparing the proposed reactor designs with the SAPs, including the appropriate numerical targets. They indicate that all designs will meet the BSLs. NII as part of the generic design assessment¹¹ process has conducted a preliminary assessment of each proposed design. Overall these assessments conclude that each of the designs should be capable of meeting the SAPs numerical targets and thus NII considers that the NIA data is valid for the purposes of this assessment. (See Annex 1 for details)

NII considers that because the radiological health detriment from new nuclear power stations will be strictly regulated in line with UK law and international standards that any radiological health detriment will be low.

Yours sincerely,

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¹⁰ Numerical targets and legal limits in Safety Assessment Principles for Nuclear Facilities. An explanatory note. HSE November 2006. Web version: www.hse.gov.uk/nuclear/saps/

¹¹ Link to GDA website <http://www.hse.gov.uk/newreactors/reports.htm>

Annex 1 - Validity of NIA Data

Routine Operations.

The NIA data has been compared with that available from the Central Index of Dose Information (CIDI) (2004 data is the latest on the HSE website¹²). This data indicates that the majority of classified workers in the UK working in either reactor operation or maintenance incur annual radiation doses of less than 6 mSv; none exceeded the dose limit. Data from Sizewell B has also been used to validate the NIA data. Sizewell B is a pressurised water reactor (PWR) based on the American SNUPPS design that has been operating in the UK for 13 years. This type of station is similar in many respects to the 4 designs included in the NIA proposal. Sizewell data for operators indicate that the highest individual exposure since operations began was 6.22 milliSievert (mSv) in 1997¹³; subsequent years have seen significant reductions in dose maxima. The average worker annual dose is significantly less than these maxima. This compares favourably with the Sizewell B maximum occupational dose target declared at the time of construction of 10 mSv per year. (note at the time of design and start of operations the annual dose limit for workers was 50mSv not 20mSv as it is now). In addition a recent inspection on the management of occupational exposures on the site indicates that these exposures are well managed and low. The annual collective dose (a figure often used to compare performance of reactors worldwide where individual countries dose limits are different) is always well below 1 manSv/year. This compares very favourably with other reactors worldwide as quoted in the Nuclear Energy Agency (NEA) Information System on Occupational Exposure (ISOE) database¹⁴. UK experience with Sizewell B indicates that reactors of a broadly foreign design can be effectively constructed and operated within the UK regulatory regime, successfully achieving lower than average occupational exposures.

With respect to public doses from all sources (direct, liquid and aerial discharges) the Licensee has reported that the annual dose to the public is less than 0.025mSv (2003 latest data). The latest data published in the Radioactivity in food and the Environment (RIFE) report estimates all exposures to be < 0.005mSv respectively. This work is carried out independently from the licensee by the Centre for Environment, Fisheries and Aquaculture (CEFAS) on behalf of the Environment Agencies and Food Standards Agency. These estimates are well below the statutory dose limit of 1 mSv per year, the single source dose constraint recommended by the Health Protection Agency of 300 microSieverts and are similar to the BSO of 20 microSieverts.

In conclusion the routine operations data presented by the NIA for each proposed design appears in line with both UK and international experience.

Potential Faults

As stated earlier potential radiological health detriment resulting from an accidental release of radioactive material from nuclear power stations can never be completely ruled out. However, the risk of this type of release can be demonstrated to be tolerably low by considering the measures taken to ensure the safety of the plant. NII regulates the safety of nuclear plant by requiring the Licensee to provide a safety case justifying the safety of the facility. This case is assessed against the criteria developed in the SAPs, which provide both engineering standards and numerical standards with respect to risk. As indicated previously it is NII's view that all new nuclear facilities should at least be able to meet the BSLs and will be designed to meet modern engineering standards. The BSOs form benchmarks that reflect modern nuclear safety standards and expectations. For a new facility NII will assess safety cases against these standards.

In response to a request from Government (following the Energy Review¹⁵ in 2006) NII in conjunction with the Environment Agency have developed a Generic Design Assessment (GDA) process for new nuclear power stations. This allows companies to submit information on reactor designs for assessment in advance of any application to build a nuclear power station at a particular site in the UK. This process will allow a rigorous and

¹² <http://www.hse.gov.uk/radiation/ionising/doses/cidi.htm>

¹³ Information provided by Sizewell B as part of normal regulatory correspondence.

¹⁴ Occupational Exposures at Nuclear power Plants: Sixteenth Annual Report of the ISOE Programme, 2006 (ISBN 978-92-64-99042-5) <http://www.nea.fr/html/rp/reports/2008/nea6318-isoe.pdf>

¹⁵ <http://www.berr.gov.uk/whatwedo/energy/whitepaper/review/page31995.html>

structured examination of the detailed safety aspects of the design. Further information on this process can be found in GDA guidance documents¹⁶. Although this process allows NII to look at the detail of a particular design there is no guarantee that a site licence would be granted in response to an application based on that design. Step 2 of the GDA process, which considered the fundamental acceptability of each design within the UK regulatory regime, has now been completed. Reports on the conclusions for all the designs submitted for the GDA process have now been completed. These have concluded that NII has not found any safety shortfalls that are so serious as to rule out at this stage eventual construction of any of these designs on licensed sites in the UK¹⁷. Comparison against the BSL's also concluded that all designs should be able to meet these standards. Also as part of the step 2 assessment NII requested that IAEA¹⁸ undertook a technical review of all four designs against the relevant IAEA standards. IAEA consideration did not reveal any fundamental safety problems with the designs examined. These assessments, both national and international, indicate that the data provided by the NIA on the safety of the proposed designs is valid for the purposes of justification.

¹⁶ <http://www.hse.gov.uk/newreactors/guidance.htm>

¹⁷ <http://www.hse.gov.uk/newreactors/technicalreports.htm>

¹⁸ International Atomic Energy Agency <http://www.iaea.org/>