

NEW NUCLEAR POWER STATIONS – SAFETY ASSESSMENT IN AN INTERNATIONAL CONTEXT

Version 2

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Introduction and aim

The nuclear power industry is global in scale. Any reactors that might be proposed for the UK are likely to be of a similar design to those being constructed or under consideration in other countries.

HSE's Nuclear Installations Inspectorate (NII) will undertake a rigorous assessment of any new nuclear power stations that may be built in the UK in a process called Generic Design Assessment (a description of which can be found at <http://www.hse.gov.uk/newreactors/background.htm>)

This report discusses the international context of GDA and it shows how HSE takes account of this while discharging its duty to protect people and society in the UK. In this report we aim to demonstrate how we:

- have a reasonable approach that takes account of international good practice, international standards and the assessments undertaken by overseas nuclear regulators,
- avoid duplication of assessment work already done elsewhere.
- prevent “gold-plating” of reactor designs for use in the UK, by ensuring that our standards are similar to those in other countries.
- work with overseas regulators and in order to benefit from their work where appropriate.

However, first we aim to answer the question – why does NII need to do an assessment at all – why can't we just accept the overseas assessments?

Why we need to assess new reactor designs

The status of overseas nuclear regulators assessments of new reactors

Some people ask why the UK cannot just accept the regulatory decisions of other countries, where the reactor proposed in the UK is the same as one already accepted elsewhere.

This raises a number of questions.

- Have the proposed designs actually been licensed elsewhere?

The status of overseas regulator assessments of the reactors currently of interest to the UK is summarised in the HSE report “*GDA Step 2 summary of overseas regulatory assessments*” which is available at <http://www.hse.gov.uk/newreactors/reports/overseas.pdf>. From this we can see that none of the reactors proposed for the UK have actually been licensed for operation anywhere in the world.

- Isn't it true that some of the designs are "certified" by regulators in other countries?

Yes, however, there are significant exclusions within the certifications that have been issued. In France and Finland, the regulatory agreements so far issued only permit construction to begin – nuclear fuel cannot be brought onto the sites, less still the reactors operated. In the US, certification has been issued for the AP1000, but there are significant exclusions to that certification, including protection against aircraft crash, protection against earthquakes, radioactive waste management arrangements and the reactor control system. To address some of these issues the AP1000 is currently being re-examined by the NRC (the US equivalent of NII). We want our GDA assessment to be more complete than these overseas assessments so that it can be as wide ranging and as finalised as possible. This will minimise the design review work that will be needed if any of the designs is submitted for site licensing assessment. We will therefore be seeking to deal with as many significant issues as possible within the scope of the GDA.

- Where some form of regulator design certification has been issued, why can't this be valid in the UK?

It is not obvious that we can select some countries' opinions and reject others – which ones would we accept or reject? For example, for some countries, we do not have an in-depth knowledge of their regulatory systems at present (ways of improving this knowledge are under development, for example with the MDEP programme described below). Also, regulatory decisions in other countries, for example design certificates, have a specific meaning within the legal system of the issuing country. They may be totally inappropriate / invalid within the UK legal system.

- If we were to accept overseas decision making - would it be right for the UK to give-up its regulatory responsibility in this manner?

If this happened, who in the UK would take responsibility? It is important to remember that every country has a sovereign right to decide on whether to have nuclear power, and to determine regulatory standards relevant to the needs of its own people and society. This is why there are international conventions that ensure that each individual nation retains regulatory decision making responsibilities, and that there is a commonality in the general approach to regulation and regulatory standards setting. In the UK, NII is responsible for this.

- How could the public contribute to the GDA process if overseas regulator certification is transferred to the UK?

If we were to accept overseas decision making, the public would have less opportunity to have an input into our assessment process. Currently, within GDA, the regulators are conducting their assessments in an open and transparent way with a lot of information being made available and comments invited from the public. These comments are being taken into account as appropriate during the assessments. It is right that the public

should expect that they will continue to have the opportunity to make such a contribution to the assessment of any new nuclear power stations in the UK and therefore adoption of regulatory decisions made overseas would be inappropriate .

■ How could we ensure consistency across UK nuclear sites?

If we were to adopt an overseas regulator decision for a new reactor there would be an inconsistency between the regulatory approach for these new reactors and on the approach applied to existing licensed sites. This is in contravention of one of our basic responsibilities, which is to apply a consistent regulatory approach on all UK nuclear facilities.

International convention obligations and national sovereignty

The Convention for Nuclear Safety (CNS) is an international convention that around 65 countries have signed-up to, see www.iaea.org/Publications/Documents/Conventions/nukesafety.html . It is coordinated by the United Nation's International Atomic Energy Agency (IAEA). The objective of this Convention is to achieve and maintain a high level of nuclear safety worldwide through enhancement of national measures and international co-operation. The CNS commits each country to, for example, having a nuclear regulator.

Within the CNS, there is an undertaking that each member state must undertake safety assessment of its nuclear facilities and each state must make its own regulatory decisions about the safety of operation of those facilities. This means that even if a country fully accepted a reactor certification produced in another country, it is still bound by the CNS to conduct its own assessment and decide for itself whether that reactor is fit to operate in its country.

Therefore NII's statutory duty cannot be passed on to regulators overseas. So, although we can make use of overseas regulators efforts, we cannot totally rely on it or use it to replace our regulatory duty. The public and other stakeholders of course expect to be assured that NII is not shirking its responsibilities in this area in order to shorten the assessment process. Equally, it would not be acceptable for NII to be seen as just "rubber stamping" designs.

The UK legal context

Some aspects of UK nuclear regulation are specific to the UK legal system, and must be addressed independently of other countries. The same applies to all countries operating nuclear power plant. Examples in the UK are the Health and Safety at Work (HSW) Act and the Nuclear Installations Act (NIA). For example, in the HSW Act, there is a requirement to demonstrate that risks have been reduced "*so far as is reasonably practicable*". This is a unique UK requirement and can be onerous to demonstrate (see www.hse.gov.uk/risk/theory/alarp.htm for further information).

Similarly, the NIA introduces the requirement for Nuclear Site Licences and these have a set of 36 largely goal-setting conditions attached to them. Although similar (generally more prescriptive) requirements exist in other

countries, there are some specific UK requirements within these Licence Conditions (for example the UK puts a lot of emphasis on organisational and management issues) and we have to satisfy ourselves that these will be met before we can issue a Nuclear Site Licence.

How we take account of international safety standards

NII's safety assessment principles - SAPs

The NII assess the safety of nuclear facilities by examination against a series of safety assessment principles (see www.hse.gov.uk/nuclear/saps/index.htm). These apply to all nuclear facilities in the UK, reactors, waste stores, reprocessing plants, etc (compared with some countries that use specific regulations for each type of plant). NII have used these SAPs for many years and we believe they have served us well in examining the safety of nuclear plants. We will therefore apply these principles in the assessment of new nuclear power stations.

We believe that reactors built in the UK should be at least as safe as modern reactors anywhere else in the world. Of course, as technology progresses, standards and working practices evolve, so from time to time we revise our SAPs to make sure they are up-to-date. The last major update was at the end of 2006 and took into account latest IAEA international standards, WENRA Reference Levels (see below) and the results of a public engagement programme. We therefore believe that our SAPs are appropriate for assessing these modern reactors, and that they are consistent with the standards that would be applied in other countries.

To ensure transparency in our processes and to provide further details about how we interpret and apply the SAPs, NII publish a range of more detailed Technical Assessment Guides (see www.hse.gov.uk/foi/internalops/nsd/tech_asst_guides/index.htm). We are currently updating these.

IAEA international nuclear safety standards

It is in the interest of everyone that there are no nuclear accidents anywhere in the world and one of the tasks of IAEA is to promote good nuclear safety standards across the globe (see www.iaea.org). One of the ways they do this is by producing high-level safety guides and standards documents, for governments and industry, across a range of topics (nuclear regulator frameworks, safety assessment standards, reactor design requirements etc) and the expectation is that IAEA member states will base their approach to nuclear safety on these standards.

As part of our recent work to update our SAPs, we benchmarked them against the appropriate IAEA guides and standards and made changes where necessary (see above). The SAPs are the main method by which we seek to implement the IAEA standards in the UK legal context and they are therefore centred on

demonstrating that risks are reduced so far as is reasonably practicable. Other countries may choose to implement the international standards by other means (eg through prescriptive rule making) which suits their legal context but would not be appropriate for the UK.

One IAEA guide of particular note is GS-G-1.2 (Review and Assessment of Nuclear Facilities by the Regulatory Body), para 3.37 of which states that even if a similar design has been authorised in another state, the regulatory body should still perform its own independent review and assessment.

Engineering Design Codes and Standards

The detailed design codes and standards that we expect to see used in the engineering (for example, the detailed design guides for pipework, electrical systems, and building structures) of any new nuclear plant should reflect good modern international practice. Unlike other countries we do not prescribe which standards must be used – we leave that choice to the designers. The standards may be from UK or elsewhere. We just expect to see their choice of codes and standards justified to convince us that they are relevant and represent modern good practice.

The standards that have been used by some vendors in reactor design may not necessarily meet our requirements, for example, the reactors may have been designed some years ago and the standards used may have been updated and improved since then. So this is something we need to check – after all, the UK public would not want us to accept anything that was not representative of good practice, or that was outdated.

International Standardisation of Designs

We believe that reactors built in the UK should be as safe as modern reactors anywhere else in the world – this is what the British public expects – but we do not seek to “gold plate” or unnecessarily adapt the design especially for the UK. In any event, as stated above, none of the reactors we are considering under GDA are licensed to operate anywhere in the world, so there is not yet any final accepted design.

One of the reactors we are considering, the EPR, is being constructed in France and Finland and although their designs are not yet complete there are some significant differences between them. Also, the EPR design that has been submitted for assessment in the US has some further differences. Some of these differences are driven by national regulatory requirements and some arise from operator preferences. So it's not a simple picture and the position on standardisation is not that clear.

On the other hand, the vendors of the reactors being proposed for the UK all claim that the risk of an accident is very low. If our assessment agrees that these low levels of risk are fully justified then there should be no need for additional modifications solely for use in the UK.

How we take account of the work of overseas nuclear regulators

Information and staff exchanges with overseas nuclear regulators

To help promote the exchange of information among the nuclear regulators of a range of countries, the HSE has formal information exchange arrangements with the nuclear safety regulators of Australia, Canada, Finland, France, Japan and the USA. These facilitate exchange of information on an as-required basis. This includes sharing of documents, and specific exchange visits and meetings, usually on a specific topic, down to simple telephone discussions. We have in the past shared information in this manner on operational problems and technical assessments on a variety of nuclear installations. More recently we have been exchanging information to help us understand the scope and extent of the assessments for new reactors that have been carried out overseas and we have started exchanging detailed documentation.

To help promote understanding of the ways of working of other nuclear regulator bodies, NII participate in exchange of inspectors on a long term basis. Continuously over about the last 10 years, there has been a UK NII inspector in the French Nuclear Safety Authority, and one of the French inspectors has worked in NII. In addition, one NII inspector has worked for 6 months on new reactor assessment in the USA, and we have hosted inspectors on extended secondments from Sweden and Japan. NII has also regularly seconded inspectors to IAEA. We have recently written to a number of overseas regulators with a view to increasing the number of such secondees, and employing them on our GDA assessments.

Through these means we are seeking to learn from other regulators abroad – and they are looking to learn from us. For example, we recently invited regulators from USA, Canada, Finland and France to assist us in inspection the design offices of the four companies whose reactors we have assessed in GDA Step 2. This proved to be of good mutual benefit and is something we are looking to build on in future to help us be as effective as possible in our assessment of new reactors.

To take direct account of the work of overseas regulators in GDA, our strategy is to target the USA, France and Finland for particularly close working (because they are looking at the same designs as us). We have had exchanges with them to explore what information already exists, and we are now discussing how we can work together in future on issues of joint interest. In addition we are working within the MDEP programme (see below) and sharing information on a multi-country basis.

OECD Nuclear Energy Agency (NEA)

NII participates in the nuclear safety work of the OECD's Nuclear Energy Agency (see www.nea.fr), through various committees. Through these, NII is kept up-to-date with regulatory and inspection practices in other countries. Also, international working groups are set-up on an as-required basis to promote consistent approaches to a range of specific technical subjects. As well as sharing information on the latest developments, this ensures that NII take an

approach to safety assessment that is consistent with many other countries. There are also international collaborative research projects in which NII participates as appropriate.

One of the major areas where immediate benefit is gained from international collaboration is in validation of analysis by comparing independent analyses of the same reactor design by different countries. Such comparisons are extremely valuable in increasing confidence in the reliability of the information. Similarly another method of increasing such confidence is by the sharing of test results.

Multi-National Design Evaluation programme - MDEP

In recognition of the increased internationalisation of the nuclear reactor industry, the OECD's Nuclear Energy Agency (www.nea.fr) set-up the MDEP programme in 2006.

The aim is to promote the international sharing of information between regulators on their new nuclear power station safety assessments and to promote consistent nuclear safety assessment standards among different countries. The participants are 10 countries where new nuclear power station programmes are commencing. These are: USA, Canada, China, France, Japan, the Russian Federation, UK, Republic of Korea, South Africa and Finland, plus the IAEA. NII represent the UK and takes a full part in the information sharing activities.

WENRA

WENRA is the Western European Nuclear Regulators Association and is made up of the Heads and senior staff members of Nuclear Regulatory Authorities of European countries with nuclear power plants. The main objectives of WENRA are to develop a common approach to nuclear safety and promote exchange of experience and discussions among regulators on significant safety issues. This is help ensure that consistent safety standards for reactors are adopted across Europe.

WENRA have developed a common set of "reference levels" for existing nuclear reactors, decommissioning and the storage of radioactive waste and spent fuel. Each member is in the process of implementation of the reference levels in their own country. Through NII, the UK participates fully in this work and we are ensuring that the reference levels are captured within the SAPs and the ongoing revision to the Technical Assessment Guides that support the SAPs.

How we take account of international experience and good practice

IAEA International Regulatory Review Service - IRRS

The IAEA also carry out reviews of national regulatory bodies. The UK's NII was subject to such a review in 2006, to evaluate the effectiveness of NII's regulation

of existing nuclear power plants and its preparedness to licence any new reactor designs. The review was carried out by a team of senior regulators from other countries.

The findings are published at www.hse.gov.uk/nuclear/regulatoryreview/. The IAEA report gives a balanced picture, noting the robustness of the UK's regulatory regime, and the expertise and experience of our nuclear inspectors. There were a number of identified good practices in NII and a number of areas where improvements were recommended. We have subsequently been working to address these improvements.

This review should give the UK public confidence that the nuclear regulatory system is robust and effective and is in-line with international good practice.

IAEA Technical Review in support of GDA

To help provide NII with additional technical advice from a pool of international experts, we contracted the IAEA in support of STEP 2 of the GDA assessment. The work involved a comparison of the new reactor safety cases with the relevant IAEA safety standards. This has also helped ensure that our assessment is not unduly based on UK experience, but benefits from a range of international experience.

International TSOs

NII have a fairly small team of inspectors working on the GDA assessment of the reactors being considered for UK. To supplement them, we are planning to contract-out some independent verification analyses to a range of Technical Support Organisations, some of which may be based overseas, and provide assessment advice to their national regulatory bodies. As well as providing extra technical resource to help NII, this will also help ensure that consistent nuclear safety assessment standards are being applied across different countries. In addition, where these TSOs have already performed assessment work for their national regulator, we hope to be able to gain access to this and share the results. This would have the additional benefit of increasing the efficiency and effectiveness of NII's efforts, but does not take away the responsibility from NII for making the regulatory decisions.

In conclusion

HSE has a duty to protect people and society and we cannot "short-cut" that. We will respect our international obligations and the expectations of the British public and we will conduct our own rigorous assessment of any new nuclear power stations that will be built in the UK. In doing this we will seek input from the public to reassure them that our assessment is thorough.

We will work with overseas regulators and wherever possible use information from them to improve our own effectiveness, but we will take our own regulatory decisions, based on our own assessment standards, applied within

the UK legal context. We are confident that these standards reflect modern international practices and that they are in-line with IAEA guidance and should therefore be similar to the standards that would be applied in other countries.

There are differing legal, regulatory and operator requirements being applied across the world and so it is likely that not all reactors will be identical. However, if the reactors are as safe as their designers claim them to be, then HSE should not require specific modifications just for the UK market.

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