

# **R**eport on the Construction Oversight Survey

Working Group on the  
Regulation of New Reactors



**Unclassified**

**NEA/CNRA/R(2015)3**

Organisation de Coopération et de Développement Économiques  
Organisation for Economic Co-operation and Development

**28-Sep-2015**

**English text only**

**NUCLEAR ENERGY AGENCY  
COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES**

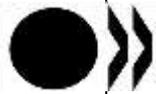
**Working Group on the Regulation of New Reactors**

**Report on the Construction Oversight Survey**

**JT03382552**

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The mission of the NEA is:

- to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes;
- to provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include the safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information.

The NEA Data Bank provides nuclear data and computer program services for participating countries. In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

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## COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

The Committee on Nuclear Regulatory Activities (CNRA) shall be responsible for the programme of the Agency concerning the regulation, licensing and inspection of nuclear installations with regard to safety. The Committee shall constitute a forum for the effective exchange of safety-relevant information and experience among regulatory organisations. To the extent appropriate, the Committee shall review developments which could affect regulatory requirements with the objective of providing members with an understanding of the motivation for new regulatory requirements under consideration and an opportunity to offer suggestions that might improve them and assist in the development of a common understanding among member countries. In particular it shall review current management strategies and safety management practices and operating experiences at nuclear facilities with a view to disseminating lessons learnt. In accordance with the NEA Strategic Plan for 2011-2016 and the Joint CSNI/CNRA Strategic Plan and Mandates for 2011-2016, the Committee shall promote co-operation among member countries to use the feedback from experience to develop measures to ensure high standards of safety, to further enhance efficiency and effectiveness in the regulatory process and to maintain adequate infrastructure and competence in the nuclear safety field.

The Committee shall promote transparency of nuclear safety work and open public communication. The Committee shall maintain an oversight of all NEA work that may impinge on the development of effective and efficient regulation.

The Committee shall focus primarily on the regulatory aspects of existing power reactors, other nuclear installations and the construction of new power reactors; it may also consider the regulatory implications of new designs of power reactors and other types of nuclear installations. Furthermore it shall examine any other matters referred to it by the Steering Committee. The Committee shall collaborate with, and assist, as appropriate, other international organisations for co-operation among regulators and consider, upon request, issues raised by these organisations. The Committee shall organise its own activities. It may sponsor specialist meetings and working groups to further its objectives.

In implementing its programme the Committee shall establish co-operative mechanisms with the Committee on the Safety of Nuclear Installations in order to work with that Committee on matters of common interest, avoiding unnecessary duplications. The Committee shall also co-operate with the Committee on Radiation Protection and Public Health and the Radioactive Waste Management Committee on matters of common interest.

## FOREWORD

The Committee on Nuclear Regulatory Activities (CNRA) of the OECD Nuclear Energy Agency (NEA) is an international committee composed primarily of senior nuclear regulators. It was set up in 1989 as a forum for the exchange of information and experience among regulatory organisations and for the review of developments which could affect regulatory requirements. The Committee is responsible for the NEA programme concerning the regulation, licensing and inspection of nuclear installations. In particular, the Committee reviews current practices and operating experience.

The CNRA created the Working Group on the Regulation of New Reactors (WGRNR) at the Bureau meeting of December 2007. Its mandate was to “be responsible for the programme of work in the CNRA dealing with regulatory activities in the primary programme areas of siting, licensing and oversight for new commercial nuclear power reactors (Generation III+ and Generation IV)”.

During the fourth meeting of the WGRNR in September 2009, the Working Group discussed a draft survey containing an extensive variety of questions related to the member countries’ licensing processes, design reviews and regulatory structures. It was then decided to divide the survey into three parts: General, Design and Construction Oversight.

Part One (General) of the survey has been completed with the results published in NEA/CNRA/R(2011)13<sup>1</sup>, Report of the Survey on the Review of New Reactor Applications, dated March 2012. Part Two (Design) of the Licensing Process Survey focuses on the design review of new reactor applications and covers 12 technical categories and 69 specific technical topics. At the March 2013 meeting, the Working Group decided that Part 2 of the Licensing Process Survey Report will be divided into smaller volumes covering one to two categories at a time. The first volume, NEA/CNRA/R(2014)7<sup>2</sup>, Report of the Survey on the Design Review of New Reactor Applications, Volume 1, Instrumentation and Control, dated July 2014, provides a discussion of the survey responses related to Instrumentation and Control (I&C).

At the eleventh meeting of the WGRNR in October 2013, the Working Group agreed to proceed with Part Three (Construction Oversight) of the Licensing Process Survey. The draft construction oversight survey was distributed to members subsequent to this meeting. It was agreed that only those countries with construction oversight experience were expected to respond to the survey. At the twelfth meeting of the WGRNR in March 2014, comments on the draft construction oversight survey were discussed with members and the final construction oversight survey was distributed subsequent to this meeting.

This report on the construction oversight survey is meant to facilitate sharing of information related to the on-site oversight of new reactor construction in various countries, including scope of areas addressed through oversight programmes, level of effort and depth of expertise planned for each area covered, and any special/unique oversight practices. As such, this report could benefit the international community by allowing for benchmarking of practices or providing reference material for countries developing their construction oversight programmes.

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<sup>1</sup> To download the report, see [www.oecd-nea.org/nsd/docs/2011/cnra-r2011-13.pdf](http://www.oecd-nea.org/nsd/docs/2011/cnra-r2011-13.pdf)

<sup>2</sup> To download the report, see [www.oecd-nea.org/nsd/docs/2014/cnra-r2014-7.pdf](http://www.oecd-nea.org/nsd/docs/2014/cnra-r2014-7.pdf)

## **ACKNOWLEDGMENTS**

Mr Thomas Kozak (NRC, United States) compiled the survey responses and prepared this report. Answers to the survey were provided by Canada (CNSC), Finland (STUK), France (ASN), Hungary (HAEA), Korea (KINS), Netherlands (ANVS), Russia (SEC NRS), United Kingdom (ONR) and United States of America (NRC). Aurélie Lorin has been the responsible NEA official.



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## INTRODUCTION

During the five decades of commercial nuclear power operation, nuclear programmes in NEA countries have grown significantly. Over the years, communication among member countries has been a major reason for the steady improvements to nuclear plant safety and performance around the world. Member countries continue to learn from each other, incorporating past experience and lessons learnt in their regulatory programmes. They consult each other when reviewing applications and maintain bilateral agreements to keep the communication channel open. This has been vital and will continue to be extremely important to the success of the new fleet of reactors being built.

The Licensing Process Survey Reports will continue along these lines by providing detailed information on the design-related technical topics that are reviewed by the regulatory organisation as part of the regulatory authorisation process. This document, which is the report on the results of the third phase of the Licensing Process Survey, focuses on Nuclear Reactor Construction Oversight.



## **SURVEY**

The third phase, or Construction Oversight, of the Licensing Process Survey conducted by the CNRA Working Group on the Regulation of New Reactors (WGRNR) is divided into three basic areas of oversight: Inspection, Assessment and Enforcement. Countries are at various stages in commercial nuclear power plant construction. Some are in advanced stages while others are in early stages. A report summarising practices of the countries could benefit the international community by allowing for benchmarking of practices or providing reference material for countries developing their oversight programmes.

The following pages present high level summaries provided by the members and a discussion of the survey results. Complete survey responses are presented in the appendices.



## HIGH LEVEL SUMMARIES

### Canada

In Canada, there are no new nuclear reactors under construction. Although a “licence to prepare site” was issued by the Canadian Nuclear Safety Commission (CNSC) for new nuclear power plants at the Darlington site, this was set aside after a judicial review found shortcomings in the environmental impact assessment which had been performed for a joint review panel of the CNSC and Canadian Environmental Assessment Agency. The judicial review is being appealed in court but until this is resolved, no activities are taking place on the Darlington site. Further, although the CNSC has performed pre-project reviews of a number of nuclear power plant (NPP) designs, no design has yet been selected for the Darlington site, should the project proceed.

#### *On-site inspection of new reactor construction*

The authority to conduct inspections comes from the Nuclear Safety and Control Act. It is the practice in Canada to locate inspectors on-site with operating reactors; this will also be done for new build. The documents in the regulatory framework which will define particular elements of the inspection of new reactor construction are still being developed. Draft REGDOC-2.3.1 *Conduct of Licensed Activities: Construction of Reactor Facilities* was issued for public comment in summer 2014. It is expected to be presented to the Commission for approval to publish by the end of 2015. Canada will be able to respond further on this topic once REGDOC-2.3.1 has been published.

#### *Enforcement*

The CNSC has a number of regulatory enforcement tools available. These begin at the level of a regulatory request, to which a licensee would be expected to respond appropriately. If the licensee does not respond appropriately, or if the finding is more serious, an Action Item could be opened, which would allow the shortcoming to be documented and tracked by means of a mutually-agreed process. Within the heading of “action item”, several levels are defined, the highest being a directive. If the finding merits action beyond being tracked as an action item, it is possible for the CNSC to levy a fine (known as an “administrative monetary penalty”). Another option as severity increases is to amend the construction licence to require the licensee to take action. Should the finding appear to pose an immediate hazard to health, safety, security or the environment and should the licensee not be responding to rectify it, certain staff have been named as “Designated Officers” (or “DOs”) and given powers to issue orders under which the licensee must take any action the DO considers necessary. Beyond the above, depending on the severity and duration of the finding, and depending on the licensee’s response, the CNSC is able to suspend or revoke a licence or even to prosecute. Other regulatory bodies which also issue licences required for NPP construction have their own, separate enforcement practices.

## **Finland**

In Finland, there is one reactor under construction (Olkiluoto 3). In addition, construction licence phase started for Fennovoima, Hanhikivi 1 (FH1) in September 2015.

### ***On-site inspection of new reactor construction***

There is predefined division of inspection responsibilities between STUK and an authorised inspection body. The division of inspection responsibilities can be supplemented by issuing separate decisions concerning buildings and structures that STUK will inspect (such as structures for physical protection, fuel pools and pressure tests). The inspection organisation shall be authorised and approved in accordance with Guide YVL E.1, and it shall have the prerequisites for the inspection. The licensee shall request an inspection from STUK or an authorised inspection body approximately two weeks before the intended date. STUK or inspection organisation issues a protocol to the licensee as a result of the inspection. Construction inspection programme (CIP) inspection findings are processed and notified to the licensee by regulatory decisions and regulatory findings and additional given requirements are recorded to the STUK's record keeping system. In each STUK's regulatory decision, there are requirements stating how and when the licensee shall respond to each additional requirement and is there a need for a separate plan how the issues are going to be addressed.

STUK is using resident inspectors at the construction site and also dispatches STUK headquarters (HQ) inspectors to carry out regulatory inspections. STUK reviews and approves detailed design documentation (e.g. construction plans) for structures, systems and components (SSCs) before the start of construction and manufacturing. STUK develops inspection programmes based on this detailed design review. Inspections during and at the end of manufacturing verify that the manufacturer, vendor and licensee have implemented their oversight as presented in the manufacturing documents and that the results are acceptable.

The evaluation of the safety culture during the construction is conducted under construction inspection programme by inspections of licensee safety culture management plans and procedures as well as evaluating licensee's self-assessments, available expertise and also by conducting third party safety culture assessments during the various phases of construction.

Construction experience is evaluated after each construction inspection programme (CIP) inspection and also in weekly meetings with the regulatory inspection team (both site and HQ inspectors).

### ***Assessment of licensee performance during new reactor construction***

STUK will conduct and report quarterly and annually the effectiveness of licensee performance during construction. In the most significant findings, a regulatory investigation could be carried out and the investigation reports are made available. Also STUK publishes the safety significant decisions concerning the construction findings on the internet. STUK organises meetings with the public and press on operation and construction experience in the vicinity of the construction site. The CIP is changed and adjusted by the progress of construction and the regulatory findings and observations.

### ***Enforcement***

In practice, the enforcement tools include: oral notice or written request for action by the inspector, and written notice or order for actions by STUK. Actions can include stopping the works at site location. Legally stronger instruments would be 1) setting a conditional imposition of a fine, 2) threatening with interruption or limiting the operation. The repertoire of these tools together with some practical examples for implementing them has been presented in an internal policy document as part of STUK's quality system.

## France

In France, there is one reactor under construction (Flamanville 3). The general process for on-site construction of a nuclear reactor is similar to the process for the operating nuclear reactors.

### *On-site inspection of new reactor construction*

There are no resident inspectors at the construction site. The on-site inspections are performed by inspectors from the Nuclear Safety Authority (ASN) regional office. In the regional office, a team of four inspectors is dedicated to the construction oversight of Flamanville 3. ASN also performs inspections in design and engineering departments as well as in subcontractors' workshops. ASN has developed objectives for the inspection of reactors under construction and criteria on how to achieve these objectives. For Flamanville 3, ASN performs at least 24 on-site inspections each year. Inspections comprise, on the one hand, standards inspections that have normally to be announced or notified to the licensee a few weeks in advance, and, on the other hand, unannounced inspections and reactive inspections in particular after occurrence of an event. Several construction hold points have been predefined. Safety culture is addressed and assessed during all inspections and particularly in case of any non-compliance detected. It is a regulatory requirement for the operator to analyse operating experience feedback.

At the end of inspections, a factual record signed by the inspectors and the licensee's representative containing major negative findings, if any, is produced. Within approximately 3 weeks after the inspection, a follow-up letter is provided to the licensee stating the main positive and negative findings. After receiving the follow-up letter, the licensee has two months to send to ASN a plan to address the findings or the additional information required. When a finding is detected during an inspection, ASN mostly checks during a next inspection that the findings have been adequately addressed.

### *Assessment of licensee performance during new reactor construction*

Each year, ASN conducts an overall assessment of the licensee performance for all reactors including reactors under construction. From year to year, inspection programme is influenced by ASN overall assessment. When a weakness is detected on a topic, ASN increases the frequency of inspections on this topic for the coming year.

### *Enforcement*

ASN may impose the penalties provided by law. The principles of ASN's actions in this respect are:

1. Penalties that are impartial, justified and appropriate to the level of risk presented by the situation concerned.
2. Administrative sanctions on proposal of the inspectors and decided by ASN in order to remedy risk situations and non-compliance with the legislative and regulatory requirements observed during the inspections.

To assess the seriousness of the deviations observed and impose appropriate penalties, ASN has drawn up procedures and decision-making tools. These documents provide a structured framework enabling an impartial decision to be reached that is proportionate to the deviation detected, and consistent between all the inspectors.

## **Hungary**

In Hungary, there are no reactors under construction. Licensing of new reactors has just started with the evaluation of the application for site survey and assessment licence. The information provided is based on Nuclear Safety Code (NSC) requirements, on Hungarian Atomic Energy Authority (HAEA) intentions and on the present inspection activities during modification of Paks NPP existing units.

### ***On-site inspection of new reactor construction***

HAEA has a resident inspectorate at Paks site with eight inspectors (during the construction of new units the staff will be increased). Inspections are also performed by inspectors from HAEA headquarters. Government Decree 118/2011 on the nuclear safety requirements of nuclear facilities and on related regulatory activities specifies inspection requirements at nuclear facilities. NSC 1 specifies the required inspections during construction. Besides these inspections, HAEA has the right to point out additional inspections in construction licence, in manufacturing licences and in procurement licences.

There are three types of nuclear safety authority inspections (according to NSC 1): comprehensive inspection, revealing inspection and ad hoc inspection. Revealing and ad hoc inspections will be carried out both in the licensee and in its contactors' organisations. Safety culture is a cross cutting issue. HAEA inspectors evaluate the inspected areas, fields and activities from this point of view during each inspection. Evaluation of safety culture is one of key areas of the Comprehensive inspection. Evaluation of the construction experience is required from the licensee.

Inspection findings are registered. The licensee (or its contactor) shall evaluate the finding, and then defines corrective measures. The regulator may accept or refuse corrective measures or may prescribe additional actions. If the finding has high safety significance, or is repetitive, HAEA involves the management of the licensee to draw necessary lessons.

### ***Assessment of licensee performance during new reactor construction***

HAEA has a safety performance evaluation programme on operating nuclear facilities. Similar safety performance evaluation programme will be developed for the new NPPs. In case of operating nuclear facilities the results of safety performance evaluation programme have significant impact on the programme of regulatory inspection programme of next year. HAEA plans to use a similar approach in the case of new NPPs.

### ***Enforcement***

According to the Atomic act, "If the regulator confirms a violation of or failing to comply with this act or any other law promulgated to execute this act, or a resolution issued based on this act or the laws promulgated to execute this act, the regulator [...] may require the licensee obliged to data supply under the competence of regulator to pay a fine". Besides penalty HAEA uses warnings or prescribe additional conditions – according to its enforcement policy.

## **Korea**

### ***On-site inspection of new reactor construction***

The all authority on nuclear safety regulation has been endowed to the NSSC (Nuclear Safety and Security Commission) in Korea. However, KINS (Korea Institute of Nuclear Safety) is in charge of regulatory inspection for the on-site inspection of new reactor construction under entrustment from the NSSC.

In KINS, the inspection of new reactor construction is primarily carried out by the staffs from seven technical departments under the management and co-ordination of regulation project managers. These staffs at technical departments are engaged in both safety review and inspection activities, and as such, the connectivity between the two different types of regulatory activities has been strengthened. NSSC and

KINS also operate a combined on-site resident office at each site of new reactor and the inspectors of the office perform daily inspections on the nuclear power plants under construction and in operation.

The on-site inspection process and timing are prescribed in AESA (Atomic Energy Safety Act) Enforcement Decree. Inspection items are determined by the NSSC Notice for pre-operational inspection and inspection methods are given by the KINS inspection guidelines. A number of different types of inspections are performed during construction of a nuclear power reactor and related facilities: 1) a pre-operation inspection that is carried out with respect to all safety-related SSCs and SSCs import to safety during the whole period of construction; 2) on-site daily inspection; 3) quality assurance inspection; and 4) special inspections (including investigation of an incident and failure). A plan for the inspections is developed considering construction experience of previous plant.

KINS inspectors fill out the inspection finding form based on the confirmed findings following the inspection, and submit it to the Inspection project manager. The project manager in turn requests NSSC (resident officer (minor safety significant) or NSSC headquarters (major safety significant)) to officially issue the inspection findings. The licensee is then required to take the corrective or supplementary measures by the due date specified in the inspection finding form. The regulatory body has established a tracking/management procedure by which the regulatory body closes the inspection finding and notifies the licensee of the closure, provided that it is verified, through an on-site investigation if necessary, that the corrective or supplementary measures have been properly implemented. The operating licence of new reactor is not issued until all of the safety-significant inspection findings are cleared.

In 2010, the regulatory body performed a special safety culture inspection for the NPPs including new reactor under construction. Following a review of safety culture from a regulatory perspective and an assessment of the relevant voluntary efforts of the licensees, the regulatory body is planning to develop an integrated management strategy for nuclear safety cultures such as the guidelines for safety culture monitoring for resident office, and evaluation methods.

#### ***Assessment of licensee performance during new reactor construction***

Comprehensive reviews are conducted before operating licence for the overall inspection results up to then and if any non-conformance with the criteria is identified the operating licence is not granted until the non-conformance is appropriately addressed. Future inspection programme for the reactor itself and for future reactors is affected as appropriately by the comprehensive review. Comprehensive review is also conducted before commercial operating after commissioning inspection. Inspection experience accumulated during the commission inspection is applied to the applicable reactors inspection programme. In general, KINS does not change inspection programme to address the comprehensive review results. Additional inspection item may be added to the original inspection items to address the comprehensive review results.

#### ***Enforcement***

Pursuant to the Atomic Energy Safety Act (AESA), the regulatory body has established and is implementing an enforcement policy for non-compliances that occur at nuclear facilities. The AESA stipulates the authorised parties manage nuclear power utilisation facilities in compliance with regulations and implement the conditional requirements imposed by the regulatory body. It is verified through a variety of inspections prescribed by law determining whether or not the authorised parties comply with the regulations and meet the imposed requirements. Once non-compliance is discovered, the regulatory body takes corrective measures commensurate with the safety significance of the non-compliance. In the case where an undue risk is confirmed including that was not anticipated during the authorisation process, the regulatory body has a legal basis to request the authorised parties to take appropriate corrective action.

## **Netherlands**

At the moment there are no nuclear reactors under construction in the Netherlands. However, there are plans to build a new research reactor. The regulatory organisation is preparing itself for these new build activities. For the preparation on new build projects, construction experience from other (foreign) projects is gathered. This is done by attending relevant international meeting and by direct contacts with different regulatory bodies. With respect to the construction of a new installation a similar approach as that taken for existing installations is foreseen.

## **Russia**

### ***On-site inspection of new reactor construction***

Construction inspections are carried out in an integrated manner by officials from the State Construction Supervision Body and officials from the Federal State Supervision in the Field of Atomic Energy Use.

The State Construction Supervision Body conducts inspections in accordance with an inspection programme developed by an official from the State Construction Supervision Body. The objective of the state construction supervision is prevention, detection and preclusion of violations with regard to town-planning legislation, including technical regulations and design documentation, committed by the builder, customer or building contractor. These inspections include verification of adherence to work execution requirements, adherence to state oversight procedures, elimination of non-conformances and observance of other requirements established by technical regulations. In the case of detected non-conformances, the state construction supervision body draws up a certificate which is the ground for issuing of a non-conformance elimination prescription to the customer, builder or contractor, depending on who is responsible for the non-conformance.

The Federal State Supervision in the Field of Atomic Energy Use conducts inspections with the objective of detection and preclusion of violations from the side of legal entities, their leadership or other officials performing activities in the field of atomic energy use with regard to requirements established in accordance with the international treaties of the Russian Federation, the Federal Law “On the Use of Atomic Energy”, other federal laws and regulatory legal acts of Russia in the field of atomic energy use. These inspections include inspections of documents submitted by the operating organisation to verify the availability of various technical requirements in the documents; in situ inspections; inspections in between stages of a unit construction; target inspections; and an integrated inspection that is conducted once per three years by multidisciplinary working groups.

The nuclear facility construction licence contains conditions requiring notification of the appropriate Rostechnadzor Interregional Territorial Department for Supervision over Nuclear and Radiation Safety at various stages of a unit construction. Selective inspections are conducted in between construction stages. In case of any comments or detected violations, the inspection department shall issue a refusal for continuation of work until the detected non-conformances (violations) are eliminated.

The target inspection objective is to ensure adherence to the regulations and rules in the field of atomic energy use in the course of mounting of equipment, pipelines (elements) of safety systems and systems important to safety. Target inspections include a kick-off meeting with the leadership of the operating organisation, document reviews, facility walk-downs, interviews, documentation of inspection results, a closing meeting and the issuance of a certificate based on the positive results of the inspection.

The evaluation of safety culture is limited to evaluation of observance of legislation of Russia concerning labour protection.

Workshops are held each year to review construction experience and, based on the results of such workshops and with the purpose to improve the quality of the supervision activity at construction of NPP

units, amendments are introduced into Rostekhnadzor Orders, and new regulatory documents are developed, if necessary.

### ***Assessment of licensee performance during new reactor construction***

The regulatory organisation fulfils an overall assessment of the effectiveness of licensee performance during construction. However there is no specific regulation or guide on performing such assessment. Results of previous inspections as well as other relevant information are considered in course of confirmation of upcoming inspection frequency and thematic areas.

### ***Enforcement***

The regulatory body is authorised to have recourse to enforcement in case of detected violations. If violations to the requirements of legislation, regulations in the field of atomic energy use, licence terms and conditions are identified, an official of the regulatory body shall bring the offenders to responsibility in accordance with the procedure established by the Code of Administrative Offences of the Russian Federation. Moreover, a question on suspension or revocation of the construction licence can be raised.

### **United Kingdom**

A nuclear site licence has been granted for the construction of two European Pressurized Reactor (EPR) at Hinkley Point in Somerset. However, nuclear-related construction has not yet commenced (September 2015). Consequently, the United Kingdom response to the survey is based on established regulatory approaches and experience gained from interacting with the licensee in its development to date. The Office for Nuclear Regulation (ONR) will continue to review the suitability of its approaches, and adapt them where necessary, throughout the construction phase.

### ***On-site inspection of new reactor construction***

An inspector is typically programmed to spend around four days per month on site. However actual inspection on site is dependent upon, and governed by, the licensee's construction activities. In addition to the nominated site inspector, specialist inspectors will attend site to conduct inspections relevant to their discipline.

The ONR inspection plan for a construction site is informed by the construction intervention strategy, comprising four cornerstone areas of licence compliance, organisational capability, design and safety case, and security. The construction intervention strategy includes the objectives of ONR's interventions. Individual inspectors use this strategy to develop topic specific strategies and plans for inspection in their particular discipline under each of the cornerstone areas. Construction and operating experience is applied to help guide ONR's inspection intervention strategies and plans.

During pre-licensing inspections, ONR seeks assurance that the prospective licensee will be in control of decisions that have the potential to affect safety at the point of licensing. This includes the development and demonstration of the licensee's readiness to maintain control and oversight of site construction activities. Post-licensing, ONR's inspection programme develops to match the anticipated growth in site-based activities, the continued development of the detailed design and the management of key safety-related assessments, procurement and installation.

Under a licensee's arrangements for compliance with the nuclear site licence, the licensee divides the project into stages separated by "hold points". Under the licence, ONR has the option to exercise power to permission progress beyond a hold point. ONR's intention to permission a hold point is notified by issue of a licence instrument (i.e. a "Specification"); and a further licence instrument (i.e. a "Consent") is then required before the licensee can progress beyond the hold point.

ONR places considerable emphasis on seeking assurance that the licensee takes safety culture seriously, from the top of the organisation down, and that it monitors continually its culture, including that of its

contractors. ONR is currently developing a “leadership and management for safety review process” which includes aspects of safety culture, and which is being rolled out across all licensees.

Inspection findings are reported in the inspection intervention report as issues. These issues are categorised by ONR as either 1-4. The category is dependent upon the significance of the issue. ONR’s governance processes consider and endorse the categorisation of the issues and maintain oversight of the progress and closure via monthly meetings. For issues designated as levels 1-3, the licensee is formally notified by a letter from ONR. Issues of level 4 are tracked by the inspector who raised the issue and discussed with the licensee at monthly intervals as part of the normal project progress activities.

### ***Assessment of licensee performance during new reactor construction***

A licensee’s performance and its capability to undertake construction of the installation is a significant consideration of ONR’s decision to permission construction activities. As such, this will be reported in the cornerstone assessment reports and overall assessment report for permissioning of each regulated hold point. The licensee is formally communicated the decision by the issue (or not) of the license instrument i.e. the “consent”. ONR places its report supporting the decision on its webpage.

### ***Enforcement***

ONR does take action against a licensee in response to identified findings or violations. Such action is always proportionate, targeted, transparent and consistent. For serious violations or non-compliance with the licence or breaches of legislation ONR will use its enforcement management model to determine the appropriate action to take.

### **United States**

There are currently (September 2015) five reactor units at three sites that are under construction in the United States. Four of these units are Westinghouse AP1000 units that were recently licensed (2012). These units were licensed under a one-step licensing process where a construction permit and operating licence, with conditions, were issued at once. One unit began construction in the 1980s. Construction on this unit was suspended for many years and was recommenced several years ago. This unit was licensed under a two-step licensing process, where a construction permit was issued for constructing the unit, and an operating licence must be applied for after construction has been completed. The answers to this survey are based on the one-step licensing process.

### ***On-site inspection of new reactor construction***

The Atomic Energy Act of 1954, as amended, is the fundamental United States law on both the civilian and the military uses of nuclear materials. The Energy Reorganization Act of 1974 established the Nuclear Regulatory Commission (NRC). NRC's regulations impose requirements that licensees must meet to obtain or retain a licence to construct a nuclear facility.

The construction reactor oversight process was modeled after the NRC’s reactor oversight process that is implemented at all operating reactors. Therefore, the inspection, assessment and enforcement approach for new reactor construction is very similar to the approach implemented at operating reactors. As part of the construction reactor oversight process, the construction inspection programme is primarily implemented by the NRC Region II Office in Atlanta, Georgia, USA. Region II dispatches as many as five resident construction inspectors to a new reactor site during the pre-operational phase of construction to oversee the day-to-day activities of the licensee and its contractors, and may supplement this inspection staff with additional personnel from Region II and other regional offices, and headquarters technical staff, as needed, to ensure that the as-built facility conforms to the conditions of the combined licence.

For new reactor facilities, the NRC reviews applications submitted by prospective licensees and (when appropriate) issues combined licences. A combined licence enables the licensee to construct a plant and

operate it once construction is complete if certain standards identified in the combined licence are satisfied. These standards are called Inspections, Tests, Analyses and Acceptance Criteria (ITAAC).

As part of the overall construction inspection programme, the NRC developed a baseline inspection programme, which is to be completed at all reactors under construction in order to meet objectives identified for the inspection programme. Construction and operating experience is considered in the planning stages for inspections. As part of the baseline inspection programme, the NRC's inspectors devote significant time and resources to verify the licensee's completion of the ITAAC. The NRC's inspectors also review the adequacy of the development and implementation of licensee programmes that support construction of a plant (e.g. quality assurance programme, corrective action programme, preoperational test programme, etc.) and the development of operational programmes (e.g. radiation protection programme, emergency preparedness programme, in-service testing programme, etc.) that must be implemented at various milestones listed in the combined licence. The NRC does not employ the use of inspection hold points. However, close communication is maintained with the licensee to ensure that the NRC is aware of significant construction activities so that desired inspections can be planned and accomplished. The on-site contingent of resident inspectors is also key to ensuring inspection planners are aware of planned construction activities.

Once the inspection is complete, a publicly available inspection report containing a scope of activities inspected and associated inspection findings that were identified during the inspection is issued to the licensee. If there are findings identified during the inspection, inspectors will follow-up by reviewing the licensee's corrective actions during a subsequent inspection. The significance of inspection findings is determined in accordance with the construction significance determination process and is represented by a colour scheme (i.e. green, white, yellow, red). The significance determination process provides a repeatable and objective means for inspectors to determine the significance of a finding.

The NRC has issued a safety culture policy statement to set forth the Commission's expectation that individuals and organisations establish and maintain a positive safety culture commensurate with the safety and security significance of their activities and the nature and complexity of their organisations and functions. NRC routinely reviews issues important to safety culture during inspections. In addition, the NRC can require a licensee to conduct an independent safety culture assessment. In cases where there is significant performance degradation, the NRC conducts an independent safety culture assessment to assess the licensee's safety culture.

#### ***Assessment of licensee performance during new reactor construction***

The construction assessment programme consists of a review system that provides for continuous, quarterly, mid-cycle and end-of-cycle (annual) reviews of licensee performance data (inspection results). The system is designed so that the continuous and quarterly reviews are informal reviews of performance data and are not resource intensive. The mid-cycle and end-of-cycle reviews are more formal and include licensee performance review meetings. The NRC employs a graded approach in addressing performance issues with the philosophy that, within a certain level of safety performance (i.e. no safety-significant findings), licensees would address their performance issues without additional NRC engagement beyond the baseline inspection programme. For plants that have safety-significant finding(s), the NRC will perform additional inspections beyond the baseline programme and initiate other actions commensurate with the safety significance of the issues. The communication of assessment results involves quarterly updates of assessment data, semi-annual inspection planning letters and semi-annual assessment reports. A public meeting with the licensee is held near the licensee's facility after the conclusion of the annual assessment cycle. Annual assessment letters will be made publicly available prior to the public meetings and the annual Commission meeting.

***Enforcement***

The NRC Enforcement Policy governs the processes and procedures for the initiation and review of violations of NRC requirements and the NRC Enforcement Manual contains implementation guidance. Most violations associated with construction reactor oversight process inspection findings are not normally subject to fines, although fines are considered for any violation that involves actual consequences.

## DISCUSSION

The construction oversight survey covered three basic areas of oversight: On-site inspection of new reactor construction, Assessment of licensee performance during new reactor construction and Enforcement. The member countries were asked questions in order to gather insights into these areas of oversight.

### *On-site inspection of new reactor construction*

In all cases, the regulatory organisations that responded to the survey have established legal authority to conduct on-site construction inspections. All respondents either plan to or have developed objectives for their on-site construction inspection programmes.

In all cases, on-site construction inspections are being or will be conducted by office-based inspectors. Canada, Finland, Hungary, Korea and the United States also operate or plan to operate resident inspector offices. Also, in all cases, construction and operating experience is utilised during the inspection planning process. Finland, France, Hungary, Korea, Russia, the United Kingdom and the United States have systematic, well-defined approaches to determine which construction activities to inspect.

France, Hungary, Korea, Russia and the United Kingdom all identified the use of inspection hold points at which time the regulatory body must provide authorisation to proceed past the hold point. The United States does not employ hold points; however, licensees must meet certain licence conditions prior to proceeding with construction activities. One licence condition specifies that the NRC must verify that the plant has been built in accordance with the approved design prior to loading fuel.

In all cases, inspection findings are communicated with the licensee in a meeting at the end of the inspections and are documented in some form of an inspection report. Also, licensees are required to develop corrective actions to address the inspection findings and the regulatory body conducts reviews of the actions in subsequent inspections.

Finland, France, Hungary, Korea, Russia, the United Kingdom and the United States described various approaches for reviewing safety culture. All consider safety culture to be an important aspect of new reactor construction.

### *Assessment of licensee performance during new reactor construction*

In all cases, the regulatory body either conducts or plans to conduct an assessment of licensee performance. The results of this assessment can influence subsequent inspection activities based on the results of the performance assessment.

### *Enforcement*

While the approach differs amongst countries, in all cases, the regulatory body has authority to take actions against licensees in order to enforce its regulations.

## CONCLUSIONS

This report focused on the results of the construction oversight survey. There were nine respondents to this survey, five of which have new reactors under construction, and four who do not. Therefore, many of the responses to questions were based on plans for construction oversight implementation, rather than actual experience implementing the construction oversight programme.

Amongst the regulatory organisations that responded to the survey, there are many similarities in the approach planned or underway for construction oversight. All regulatory organisations either have or plan to have clear objectives for their construction oversight programmes; have declined systematic, well-defined approaches to determine which construction activities to inspect; utilise construction and operating experience during the inspection planning process; communicate inspection findings to the licensee in a meeting at the end of the inspections and document the findings in some form of an inspection report; believe that a healthy safety culture is an important aspect of new reactor construction; conduct performance assessments that influence subsequent inspection activities; and use actions against licensees to enforce regulations.

There were also some differences in the approaches to construction oversight. Hold points were employed by most but not all respondents. In addition, some countries operate or plan to operate resident inspector offices while others do not.

Many countries have future plans to build new nuclear reactors. It may be of benefit to conduct a similar survey once more countries have new reactors under construction and can provide insights based on actual construction oversight experiences.

## APPENDIX A WGRNR CONSTRUCTION OVERSIGHT SURVEY

### 1. Background

The objective of this survey is to facilitate sharing of information related to the on-site oversight of new reactor construction in various countries, including scope of areas addressed through oversight programmes, level of effort and depth of expertise planned for each area covered, and any special/unique oversight practices (e.g. regulatory hold points or approvals). As discussed and agreed to at the 11<sup>th</sup> Working Group on the Regulation of New Reactors (WGRNR) meeting in Paris, France on 7-9 October 2013, the survey that follows was developed to meet this objective. The survey is divided into 3 basic areas of oversight: Inspection, Assessment and Enforcement. Countries are at various stages in commercial nuclear power plant construction. Some are in advanced stages while others are in early stages. A report summarising practices of the countries could benefit the international community by allowing for benchmarking of practices or providing reference material for countries developing their oversight programmes.

### 2. Survey

#### *Part 1: On-site inspection of new reactor construction*

- 1.1 Provide a description on the general process for the on-site inspection of nuclear reactors that are under construction. For example, describe the authority to conduct inspections; presence of inspectors on site; preparation for inspections; the notification of inspection hold points and if so, how are hold points fixed (in a licence, separate from the licence, in general regulation?); inspection outputs; training of inspectors; follow-up of inspections; and the target inspection time per installation each year and/or over the course of facility construction.
- 1.2 Have you developed objectives for your new reactor construction inspection/oversight programme? If so, what are the stated objectives?
- 1.3 How do you determine which activities to inspect? Are pre-licensing inspections carried out? If so, what items/subjects are inspected? What items/subjects are inspected post-licensing?
- 1.4 Do you evaluate the safety culture at construction sites? If so, how is this evaluation conducted?
- 1.5 How are inspection findings processed? For instance, how is the significance of an inspection finding determined, how are licensees notified of the finding, are licensees required to respond to the regulatory authority with a plan to address the findings, and are additional inspections conducted to ensure the findings have been adequately addressed?
- 1.6 Is construction experience evaluated and incorporated into the reactor construction inspection programme?

- 1.7 Describe any differences with regard to inspections performed at large research reactors that are under construction.

***Part 2: Assessment of licensee performance during new reactor construction***

- 2.1 Do you conduct an overall assessment of the effectiveness of licensee performance during construction? If so, describe how the overall assessment of licensee performance is conducted including frequency, communication of results to the licensee and public, and the regulatory organisation response to licensee performance issues?
- 2.2 Can your comprehensive reviews lead to changes to inspection priorities and inspection plans, establish a possible need for regulatory authority response to performance issues, and lead to a change in the inspection programme?

***Part 3: Enforcement***

- 3.1 Does the regulatory authority take action against a licensee in response to identified findings or violations of regulations? If so, describe the process by which the regulatory authority determines the appropriate action to take against the licensee.

**APPENDIX B**  
**DETAILED REPOSSES TO THE CONSTRUCTION OVERSIGHT SURVEY**

The detailed responses by the member countries are listed in alphabetical order.



## RESPONSE ON BEHALF OF CANADA

### 1. Background for construction oversight in Canada

Although a “licence to prepare site” was issued by the Canadian Nuclear Safety Commission (CNSC) for new NPPs at the Darlington site, this was set aside after a judicial review found shortcomings in the environmental impact assessment which had been performed for a joint review panel of the CNSC and Canadian Environmental Assessment Agency. The judicial review is being appealed in court but until this is resolved, no activities are taking place on the Darlington site. Further, although the CNSC has performed pre-project reviews of a number of NPP designs, no design has yet been selected for the Darlington site, should the project proceed. As a result, no regulatory activities are currently underway to prepare for oversight of construction, other than in the area of regulatory framework. General information on new build can be found in INFO-0756 *Licensing Process for New Nuclear Power Plants in Canada*.

### 2. Survey

#### *Part 1: On-site inspection of new reactor construction*

**1.1 Provide a description on the general process for the on-site inspection of nuclear reactors that are under construction. For example, describe the authority to conduct inspections; presence of inspectors on site; preparation for inspections; the notification of inspection hold points and if so, how are hold points fixed (in a licence, separate from the licence, in general regulation?); inspection outputs; training of inspectors; follow-up of inspections; and the target inspection time per installation each year and/or over the course of facility construction.**

The authority to conduct inspections comes from the Nuclear Safety and Control Act, which defines such things as what may be inspected, how and by whom (Articles 30, 31 and 32). It is the practice in Canada to locate inspectors on-site with operating reactors; this will also be done for new build.

**1.2 Have you developed objectives for your new reactor construction inspection/oversight programme? If so, what are the stated objectives?**

The documents which will define particular elements of the inspection of new reactor construction are still being developed. The combined standard and guide known as RD/GD-369 *Licence Application Guide – Licence to Construct a Nuclear Power Plant* was issued in 2011. This is due to be revised and become REGDOC-1.1.2 starting in 2016/2017. Draft REGDOC-2.3.1 *Conduct of Licensed Activities: Construction of Reactor Facilities* was issued for public comment in summer 2014. It is expected to be presented to the Commission for approval to publish by the end of 2015. At the detail level, the CNSC oversees the safety of the facilities it regulates by means of fourteen “Safety and Control Areas” (SCAs) which cover the full range of activities relevant to safety. Within these fourteen SCAs, requirements and guidance continue to be developed and revised under CNSC regulatory framework. Canada will be able to respond further on this topic once REGDOC-2.3.1 has been published.

**1.3 How do you determine which activities to inspect? Are pre-licensing inspections carried out? If so, what items/subjects are inspected? What items/subjects are inspected post-licensing?**

Not applicable at this time.

**1.4 Do you evaluate the safety culture at construction sites? If so, how is this evaluation conducted?**

Not applicable at this time.

**1.5 How are inspection findings processed? For instance, how is the significance of an inspection finding determined, how are licensees notified of the finding, are licensee's required to respond to the regulatory authority with a plan to address the findings, and are additional inspections conducted to ensure the findings have been adequately addressed?**

Not applicable at this time.

**1.6 Is construction experience evaluated and incorporated into the reactor construction inspection programme?**

Not applicable at this time.

**1.7 Describe any differences with regard to inspections performed at large research reactors that are under construction.**

Not applicable at this time.

***Part 2: Assessment of licensee performance during new reactor construction***

**2.1 Do you conduct an overall assessment of the effectiveness of licensee performance during construction? If so, describe how the overall assessment of licensee performance is conducted including frequency, communication of results to the licensee and public, and the regulatory organisation response to licensee performance issues?**

Not applicable at this time.

**2.2 Can your comprehensive reviews lead to changes to inspection priorities and inspection plans, establish a possible need for regulatory authority response to performance issues, and lead to a change in the inspection programme?**

Not applicable at this time.

***Part 3: Enforcement***

**3.1 Does the regulatory authority take action against a licensee in response to identified findings or violations of regulations? If so, describe the process by which the regulatory authority determines the appropriate action to take against the licensee.**

The CNSC has a number of regulatory enforcement tools available. These begin at the level of a regulatory request, to which a licensee would be expected to respond appropriately. If the licensee does not respond appropriately, or if the finding is more serious, an action item could be opened, which would allow the shortcoming to be documented and tracked by means of a mutually-agreed process. Within the heading of "action item", several levels are defined, the highest being a Directive. If the finding merits action beyond being tracked as an "action item", it is possible for the CNSC to levy a fine (known as an "administrative

monetary penalty”). Another option as severity increases is to amend the “construction licence” to require the licensee to take action. Should the finding appear to pose an immediate hazard to health, safety, security or the environment and should the licensee not be responding to rectify it, certain staff have been named as “Designated Officers” (or “DOs”) and given powers to issue orders under which the licensee must take any action the DO considers necessary. Beyond the above, depending on the severity and duration of the finding, and depending on the licensee’s response, the CNSC is able to suspend or revoke a licence or even to prosecute. Other regulatory bodies which also issue licences required for NPP construction have their own, separate enforcement practices.



## RESPONSE ON BEHALF OF FINLAND

### 1. Background for construction oversight in Finland

Finnish government granted the construction licence to construct an EPR, Olkiluoto 3 (OL3), on 17 February 2005. On 17 January 2002, the Government made a favourable decision-in-principle on the project and Parliament ratified it on 24 May 2002. Olkiluoto 3 NPP project has been under construction since and the nuclear related construction is completed at site (2015). Plant is ready for automation installations. Commissioning has been commenced in Turbine Island area.

For next reactors, Finnish government granted in 2010 two decision-in-principles: Olkiluoto 4 (OL4) and Fennovoima, Hanhikivi 1 (FH1). Construction licence application review phase started for FH1 in September 2015. As for OL4, the project ended as Teollisuuden Voima Ltd did not file a construction license application. The Finnish government declined the applicant's request for five year-time extension for OL4 decision-in-principle.

### 2. Survey

#### *Part 1: On-site inspection of new reactor construction*

**1.1 Provide a description on the general process for the on-site inspection of nuclear reactors that are under construction. For example, describe the authority to conduct inspections; presence of inspectors on site; preparation for inspections; the notification of inspection hold points and if so, how are hold points fixed (in a licence, separate from the licence, in general regulation?); inspection outputs; training of inspectors; follow-up of inspections; and the target inspection time per installation each year and/or over the course of facility construction.**

STUK – Radiation and Nuclear Safety Authority, Finland – reviews and approves detailed design documentation (e.g. construction plans) for SSCs before the start of construction and manufacturing. STUK develops inspection programmes based on this detailed design review. Inspections during and at the end of manufacturing verify that the manufacturer, vendor and licensee have implemented their oversight as presented in the manufacturing documents and that the results are acceptable (within the predefined and approved acceptance criteria). STUK does not perform its own non-destructive testing or material analyses other than in very specific cases. STUK will carry out inspections on safety classes 1 and 2 components and has delegated lower safety class inspections to the inspection organisations STUK inspects and approves the plans for concrete, steel and composite structures in safety classes 2 and 3, and performs concreting readiness inspections and construction inspections for steel structures and the steel components of composite structures at key locations. There is predefined division of inspection responsibilities between STUK and an authorised inspection body. The division of inspection responsibilities can be supplemented by issuing separate decisions concerning buildings and structures that STUK will inspect (such as structures for physical protection, fuel pools and pressure tests). The inspection organisation shall be authorised and approved in accordance with Guide YVL E.1, and it shall have the prerequisites for the inspection.

STUK is using resident inspectors at site and also dispatched STUK headquarters (HQ) inspectors to carry out regulatory inspections. The accredited inspection organisations could be also to carry out regulatory inspections according. The licensee, manufacturer and plant supplier shall ensure beforehand, by conducting their own inspections, that the requirements for starting the construction inspection are met and that the steel structures or their components to be inspected can be inspected and approved in the construction inspection. The licensee shall request an inspection from STUK or an authorised inspection body approximately two weeks before the intended date. The manufacturer, the plant supplier (in plant deliveries), a third party and the licensee shall establish in advance using their own inspections that the conditions for the requested inspections exist. STUK or inspection organisation issues a protocol to the licensee as a result of the inspection.

For civil constructions, a concreting readiness inspection of a concrete structure or a composite structure performed by STUK consists of the verification of the conformity of the reinforcement and formwork against the construction plan, the review of the result documentation of the installation of embedded steel components and formwork, and the inspection of the readiness for concreting at the site of casting. The construction inspection is usually performed on the completed steel structure (components to be embedded in concrete, for example) or on steel components of steel or composite structures on the manufacturer's premises before delivery or installation. If the construction inspection is conducted at the plant site, the licensee shall, during the acceptance inspection, ensure that the requirements for conducting a construction inspection have been fulfilled.

**1.2 Have you developed objectives for your new reactor construction inspection/oversight programme? If so, what are the stated objectives?**

New Regulatory Guides (YVL) include safety objectives for new reactor construction and therefore there is not a need for special set of new build guidance.

**1.3 How do you determine which activities to inspect? Are pre-licensing inspections carried out? If so, what items/subjects are inspected? What items/subjects are inspected post-licensing?**

Requirements in the YVL Guides determine the scope and depth of STUK's construction inspection activities. There are no pre-licensing inspections in Finland.

STUK's construction inspection programme starts when construction licence application is filed to the contact authority (The Ministry of Employment and the Economy) as well as STUK has received licensing documentation defined in the Nuclear Energy Decree. STUK oversees the construction of nuclear facilities by means of a construction inspection programme (CIP). The purpose of the CIP is to verify that the holder of the construction licence has operations in place to ensure high-quality construction and implementation in accordance with the approved plans and designs, while complying with the applicable regulations and regulatory decisions.

The following, in particular, are assessed and controlled under the CIP:

- the licensee's operations as a whole with a view to constructing the facility;
- the detailed procedures in various fields of technology used for implementing the facility;
- the due consideration given to safety aspects in management procedures;
- the licensee's expertise and use of expertise; and
- quality management and quality control.

**1.4 Do you evaluate the safety culture at construction sites? If so, how is this evaluation conducted?**

The evaluation of the safety culture during the construction is conducted under construction inspection programme by inspections of licensee's safety culture management plans and procedures as well as evaluating its self-assessments, available expertise and also by conducting third party safety culture assessments during the various phases of construction.

**1.5 How are inspection findings processed? For instance, how is the significance of an inspection finding determined, how are licensees notified of the finding, are licensee's required to respond to the regulatory authority with a plan to address the findings, and are additional inspections conducted to ensure the findings have been adequately addressed?**

CIP inspection findings are processed and notified to the licensee by regulatory decisions and regulatory findings and additional given requirements are recorded to the STUK's record keeping system. In each STUK's regulatory decision, there are requirements stating, how and when the licensee shall respond to each additional requirement and is there a need for a separate plan how the issues are going to be addressed. STUK will control by follow-up inspections and regulatory correspondence that the findings have been adequately addressed and closed. In the regulatory decisions, the graded approach shall be used and the safety significance of the findings should be justified in the regulators justification memorandums, which are attached to the each regulatory decision.

**1.6 Is construction experience evaluated and incorporated into the reactor construction inspection programme?**

Construction experience is evaluated after each CIP inspection and also in weekly meetings with the regulatory inspection team (both site and HQ inspectors). If there are safety significant findings, those are evaluated by larger group of experts (cross-cutting review) and the influence to the CIP is evaluated as well as new reactive inspection(s) are planned.

**1.7 Describe any differences with regard to inspections performed at large research reactors that are under construction.**

Not applicable.

***Part 2: Assessment of licensee performance during new reactor construction*****2.1 Do you conduct an overall assessment of the effectiveness of licensee performance during construction? If so, describe how the overall assessment of licensee performance is conducted including frequency, communication of results to the licensee and public, and the regulatory organisation response to licensee performance issues?**

STUK will conduct and report quarterly and annually the effectiveness of licensee performance during construction. STUK's reports are filed to the nuclear licensing contact authority, The Ministry of Employment and the Economy (MEE) and the STUK's reports are published and publicly available. In the most significant findings, a regulatory investigation could be carried out and the investigation reports are made available. Also STUK is publishing the safety significant decisions concerning the construction findings in internet. STUK is organising meetings with public and press on operation and construction experience in the vicinity of the construction site independently on the construction organisations.

**2.2 Can your comprehensive reviews lead to changes to inspection priorities and inspection plans, establish a possible need for regulatory authority response to performance issues, and lead to a change in the inspection programme?**

Yes, the CIP is changed and adjusted by the progress of construction and the regulatory findings and observations.

***Part 3: Enforcement***

**3.1 Does the regulatory authority take action against a licensee in response to identified findings or violations of regulations? If so, describe the process by which the regulatory authority determines the appropriate action to take against the licensee.**

In practice, the enforcement tools include: oral notice or written request for action by the inspector, and written notice or order for actions by STUK. Actions can include stopping the works at site location. Legally stronger instruments would be 1) setting a conditional imposition of a fine, 2) threatening with interruption or limiting the operation. The repertoire of these tools together with some practical examples for implementing them has been presented in an internal policy document as part of STUK's quality system.

Reference: The IAEA publication Safety Report Series No.81 "Development of a Regulatory Inspection Programme for a New Nuclear Power Plant Project" 2014.

## RESPONSE ON BEHALF OF FRANCE

### 1. Background for construction oversight in France

There are 58 operating reactors in France (located on 19 sites) and one reactor under construction in Flamanville. This reactor is named Flamanville 3 and is an EPR. On Flamanville site, there are two other 1 300 MW<sub>e</sub> reactors.

EDF (Electricité de France) is the licensee and the operator of these 59 reactors. In the French regulation, the operator has the primary responsibility for safety. As a consequence, this operator has to ensure the quality, the control and the supervision of the construction activities. For construction oversight, ASN is supported by a technical support organisation called “Institut de radioprotection et de sûreté nucléaire (IRSN)”.

### 2. Survey

#### *Part 1: On-site inspection of new reactor construction*

#### **1.1 Provide a description on the general process for the on-site inspection of nuclear reactors that are under construction. For example, describe the authority to conduct inspections; presence of inspectors on site; preparation for inspections; the notification of inspection hold points and if so, how are hold points fixed (in a license, separate from the license, in general regulation?); inspection outputs; training of inspectors; follow-up of inspections; and the target inspection time per installation each year and/or over the course of facility construction.**

In France, the general process for on-site construction of nuclear reactor is not really different from the process for the operating nuclear reactors.

In order to preserve the prime responsibility of the licensee and the independence of ASN’s inspectors, there are no resident inspectors in France. The on-site inspections are performed by inspectors from ASN regional offices who perform the on-site inspections. For Flamanville, the regional office is located in Caen, less than two hour-drive from the site.

In the regional office, a team of four inspectors is dedicated to the construction oversight of Flamanville 3. It includes one labour inspector.

Inspections are performed by ASN and comprise, on the one hand, standards inspections that have normally to be announced or notified to the licensee a few weeks in advance, and, on the other hand, unexpected inspections and reactive inspections in particular after occurrence of an event that are not announced. These inspections are usually carried out, for nuclear installations, by a team of two inspectors, with the potential support of an IRSN representative (expert on the inspection topic or in charge of the facility). ASN can also mandate third-party bodies to perform inspections related to the nuclear pressurised equipment installation.

ASN inspectors are appointed by the ASN Chairman. Before this appointment, they have to acquire the requisite legal and technical skills through training courses, professional experience or mentoring.

There are specific trainings for inspectors dedicated to Flamanville 3 construction oversight: these trainings are, for example, dedicated to civil works activities or to EPR design specificities.

For Flamanville 3 construction, several hold points have been predefined for the test of the vessel (specified in the technical requirements for the start-up tests) as well as for the partial and full commissioning of the facility. Some hold points can also be imposed by ASN for some pressurised nuclear equipment, to assess their conformity.

Each inspection in a nuclear facility gives rise to drafting of:

- at the end of the inspection, a factual record (signed by the inspectors and the licensee's representative) of major negative findings if any;
- within a few weeks (~3 weeks) after the inspection:
  - a follow-up letter to the licensee stating, in addition to an overall synthesis of the main positive and negative findings:
    - anomalies in the facility or aspects warranting additional justifications;
    - deviations between the situation observed during the inspection and the regulations or documents produced by the licensee pursuant to the regulations;
    - ASN requirements to correct, within a fixed period of time, the deviations or non-compliances observed by the inspectors or to improve the situation;
  - an ASN internal inspection report.

Inspection follow-up letters are available on ASN website (<http://www.asn.fr/>).

Since 2008, the objective of ASN for Flamanville 3 is to perform 24 on-site inspections each year (except for nuclear pressurised equipment installation), despite of the delay observed on site construction.

ASN also performed inspections in EDF design and engineering departments as well as in subcontractors' workshops.

## **1.2 Have you developed objectives for your new reactor construction inspection/oversight programme? If so, what are the stated objectives?**

For Flamanville 3, objectives of ASN oversight are:

- to ensure that the plant operator and the manufacturers of pressurised nuclear systems take on their responsibilities;
- to review the construction of the reactor in order to be confident in the safety level of the construction activities;
- to verify that the installation as-built complies/will comply with national regulations and with ASN requirements.

To achieve these objectives, ASN checks that the construction activities of the plant are performed in accordance with:

- the regulatory requirements;
- the regulation concerning nuclear pressurised equipment;
- the ministerial order concerning general rules for nuclear installations;
- the authorisation decree for FLA3 and associated ASN licence conditions;
- the safety case provided by the licensee to get the authorisation decree (preliminary safety case);
- the technical guidelines for new pressurised water reactors (PWR) endorsed in 2004 by ASN for EPR;
- the state of the art construction practices.

**1.3 How do you determine which activities to inspect? Are pre-licensing inspections carried out? If so, what items/subjects are inspected? What items/subjects are inspected post-licensing?**

ASN inspections are based on:

- “sampling” of activities according to the relevance of the topics with safety, radiation protection and environmental protection;
- exhaustive inspections dedicated to some nuclear pressurised components.

On the basis of the major tasks scheduled on Flamanville 3, ASN uses input of IRSN to identify the main relevant safety activities to be inspected.

Moreover, some conclusions of the detailed design assessment need to be checked during on-site inspections to ensure the link between studies and construction.

ASN started inspections before the deliverance of FLA3 authorisation’s decree on-site and in the workshops of manufacturers of nuclear pressurised equipment and performs regularly inspections on FLA3 nuclear site since the authorisation decree in 2007.

Items inspected in Flamanville, during the last years include: civil work activities, concreting and welding, non-compliances follow-up, organisational and human factors, hazards that EPR construction may induce on the two adjacent operating NPPs, management of radioactive sources, mechanical installations, organisation for commissioning tests, environmental issues, electrical installation, subcontractors supervision and management, preparation of the future operating teams, ...

**1.4 Do you evaluate the safety culture at construction sites? If so, how is this evaluation conducted?**

Safety culture is not a specific inspection topic but is part of all inspection topics. It has to be addressed and assessed during all inspections and particularly in case of any non-compliance detected. Safety culture is first assessed during the analysis of the preliminary safety report. Then during on-site inspections, ASN checks that:

- the contracts put by the operator to external contractors or suppliers mention concrete provisions for the development of safety culture;
- the contracts include the requirement for the contractor to inform the licensee in case of an anomaly affecting the manufacturing of an equipment, in particular:
  - the supply of raw materials;

- the manufacturing processes;
- the non-compliance with the specified requirements with the obligation to analyse the effects of the deviations;
- safety culture is taken into account in the preparation and in the achievement of safety significant activities;
- each worker is sufficiently aware of the significance of the activity he has to perform for the safety of the future installation (information, training...).

**1.5 How are inspection findings processed? For instance, how is the significance of an inspection finding determined, how are licensees notified of the finding, are licensee's required to respond to the regulatory authority with a plan to address the findings, and are additional inspections conducted to ensure the findings have been adequately addressed?**

See answer to question n°1.1 for notification of the findings to the licensee.

After receiving the follow-up letter, the licensee has two months to send to ASN a plan to address the findings or the additional information required.

When a finding is detected during an inspection, ASN mostly checks during a next inspection that the findings have been adequately addressed.

**1.6 Is construction experience evaluated and incorporated into the reactor construction inspection programme?**

It is a regulatory requirement for the operator to analyse the operating experience feedback. ASN and IRSN analyse deviations and events notified by the operator and also exploit international feedback. For new NPP's construction such as EPR in Flamanville, it is checked during the safety assessment that the insights deduced from operating experience feedback have correctly been taken into account for the construction.

During the inspection performed on construction site or when a non-compliance is detected, ASN checks how EDF takes into account the experience of the construction. For non-compliances detected in reactors under operation and linked with the construction, ASN asks EDF about the provisions taken to prevent them.

**1.7 Describe any differences with regard to inspections performed at large research reactors that are under construction.**

There are no big differences between inspections performed in FLA3 and inspections performed in a research reactor in construction in France except the number of inspections performed per year.

***Part 2: Assessment of licensee performance during new reactor construction***

**2.1 Do you conduct an overall assessment of the effectiveness of licensee performance during construction? If so, describe how the overall assessment of licensee performance is conducted including frequency, communication of results to the licensee and public, and the regulatory organisation response to licensee performance issues?**

Each year, ASN conduct an overall assessment of the licensee performance for all reactors including reactors under construction (monographs). This assessment is performed for all inspections topics and

takes into account all inspections findings during the past year and the follow-up of the non-compliances.

This assessment is available in ASN annual report and is used for the programme of inspections for the coming year.

**2.2 Can your comprehensive reviews lead to changes to inspection priorities and inspection plans, establish a possible need for regulatory organisation response to performance issues, and lead to a change in the inspection programme?**

From year to year, inspection programme is influenced by ASN overall assessment. When a weakness is detected on a topic, ASN increases the frequency of inspections on this topic for the coming year.

***Part 3: Enforcement***

**3.1 Does the regulatory organisation take action against a licensee in response to identified findings or violations of regulations? If so, describe the process by which the regulatory organisation determines the appropriate action to take against the licensee.**

In certain situations where the licensee fails to comply with the regulations, or when it is important that appropriate action be taken by it to remedy the most serious risks without any delay, ASN may impose the penalties provided by law. The principles of ASN's actions in this respect are:

- penalties that are impartial, justified and appropriate to the level of risk presented by the situation concerned. Their scale is proportionate to the health and environmental consequences associated with the deviation detected and also takes account of intrinsic factors relating to the behaviour of the party at fault and external factors relating to the context of the deviation;
- administrative sanctions on proposal of the inspectors and decided by ASN in order to remedy risk situations and non-compliance with the legislative and regulatory requirements observed during the inspections.

ASN has a range of tools at its disposal, in particular:

- remarks made by the inspector to the licensee;
- the official letter from the ASN departments to the licensee (follow-up letter);
- formal notice from ASN to the licensee to regularise its administrative situation or meet certain specified conditions, within a given time-frame;
- administrative penalties applied after formal notice.

In parallel with ASN's administrative action, reports can be drafted by the inspector and sent to the Public Prosecutor's Office.

To provide the inspectors with the tools they need to assess the seriousness of the deviations observed and impose appropriate penalties, ASN has drawn up procedures and decision-making tools. These documents provide a structured framework enabling an impartial decision to be reached that is proportionate to the deviation detected, and consistent between all the inspectors.

The decision to take enforcement measures is based on the observed risk for people or for the environment and takes account of factors specific to the licensee (history, behaviour, repeated nature of the problem), contextual factors and the nature of the infringements observed (regulations, standards, "rules of good practice", etc.).

In order to have a more graded approach, ASN has asked for a revision of the Act on transparency and nuclear security (Act on energy transition for green economic growth currently under discussion in French Parliament) that should comprise the ability for ASN to impose administrative penalties, daily penalties decided by a sanction committee that would be independent from ASN Commission.

## RESPONSE ON BEHALF OF HUNGARY

### *Part 1: On-site inspection of new reactor construction*

Licensing of new reactors has just started in Hungary with the evaluation of the application for site survey and assessment licence. There is no new NPP construction at present. So the answers provide information of the future inspection activities based on Nuclear Safety Code (NSC) requirements, on HAEA intentions and on the present inspection activities during modification of Paks NPP existing units.

**1.1 Provide a description on the general process for the on-site inspection of nuclear reactors that are under construction. For example, describe the authority to conduct inspections; presence of inspectors on site; preparation for inspections; the notification of inspection hold points and if so, how are hold points fixed (in a licence, separate from the licence, in general regulation?); inspection outputs; training of inspectors; follow-up of inspections; and the target inspection time per installation each year and/or over the course of facility construction.**

HAEA has a resident inspectorate at Paks site with height inspectors (during the construction of new units the staff will be increased). The inspectors of the headquarters also conduct inspections.

According to Govt. Decree 118/2011 on the nuclear safety requirements of nuclear facilities and on related regulatory activities, in order to maintain nuclear safety, in each phase of the life cycles of nuclear facilities, at least the following shall be inspected by the nuclear safety authority on a regular, scheduled basis:

- the nuclear facilities and their systems, structures and components are in compliance with requirements specified in the licences and laws;
- the design, [...] construction, commissioning [...] of the nuclear facility comply with the nuclear safety requirements and the conditions and circumstances supporting the authority licences and the provisions of the licence; furthermore
- the compliance of the licensee's management system with the requirements specified in the present decree at least in terms of the following:
  - the relevant documents and instructions are in conformance with the design requirements for the actual condition of the systems, structures and components and they are valid and complied with;
  - the employees and suppliers employed by the licensee comply with the requirements specified by laws;
  - the licensee develops and operates a qualification system in compliance with the provisions for the selection of suppliers and the verification of their suitability;
  - the licensee fulfils its reporting obligation, composes reports having a content compliant with the provisions, and implements corrective measures determined subsequent to the investigation of events relevant to safety;
  - the licensee identifies the discrepancies and deviations without unjustified delay, then remedies or justifies the permissibility thereof;

- the licensee utilises the gathered experience, and forwards the results to the suppliers and the nuclear safety authority;
- the internal system of regulations of the licensee is suitable for the regulation of the processes, including the activity of the employed suppliers related to the nuclear power plant unit; and
- the licensee manages nuclear safety in accordance with both the legal requirements and internal regulations.

According to NSC 1: Nuclear safety authority procedures of nuclear facilities, HAEA provides the following inspections during construction:

- manufacturing, construction and assembly of system components with safety classification, preparation activities necessary for commissioning, thus in particular (cleaning and flushing works, operational tests of active system components), furthermore performance of inactive function tests, which can be performed with fuel containing no nuclear material;
- in the case of on-site construction and assembly works which cannot be or are difficult to examine, thus in particular foundations, insulations and isolation system components;
- activities with regard to main equipment, systems important to nuclear safety, especially the nuclear reactor, fuel storage parts, barriers preventing the release of radioactive material into the environment;
- regulation and power supply systems with safety classifications;
- function tests of safety protective systems under inactive circumstances; and
- training of the operational and maintenance personnel.

Hold points for inspection have been determined as follows:

- 1.7.5.0100. The licensee shall submit a condition-based report to the nuclear safety authority during the construction lifecycle phase 30 days prior to the following design and construction phases:
  - preparation of tender documentation of designer, construction, production and assembly contracts important to nuclear safety;
  - commencing construction of buildings of the nuclear island;
  - commencing the most important concrete works;
  - lifting of main circulation loop equipment to place;
  - commencing clean assembly works;
  - commencing laying safety cables;
  - commencing assembly of safety instrumentation and control systems; also
  - commencing the commissioning of specific systems.

Besides these inspections HAEA has the right to point out additional inspections in construction licence, in manufacturing licences and in procurement licences. After the evaluation of the applications of these licences, the HAEA points out the necessary hold points.

**1.2 Have you developed objectives for your new reactor construction inspection/oversight programme? If so, what are the stated objectives?**

The objectives of HAEA inspection activities have been written in Govt. Decree 118/2011 as it mentioned above. More detailed description of the objectives is written in internal procedures, but inspection procedures for new reactors have not been elaborated yet.

**1.3 How do you determine which activities to inspect? Are pre-licensing inspections carried out? If so, what items/subjects are inspected? What items/subjects are inspected post-licensing?**

There are three types of nuclear safety authority inspections (according to NSC 1):

*Comprehensive inspection*

1.6.2.0200. A comprehensive inspection is performed on pre-specified areas of the licensee's activity by the nuclear safety authority. The purpose is to examine the functioning of the licensee's organisation and of entire processes.

*Revealing inspection*

1.6.2.0700. If the nuclear safety authority detects deviation from the provisions or from good practice in connection with a part process, activity and event, it performs revealing inspections. Such inspections may be performed regarding event investigation.

*Ad hoc inspection*

1.6.2.1100. The nuclear safety authority shall perform ad hoc inspections in order to examine specific resolution conditions, actions, deviations, information, states or locations. Ad hoc inspections may be announced in advance or may take place unannounced.

Revealing and ad hoc inspections will be carried out both in the licensee any in its contactors' organisations.

HAEA has an annual plan for inspection. It is elaborated based on the experience of previous inspections, the safety evaluation of the licensee activities (i.e. safety indicators, events analysis) and experience of the licensing processes. In case of new reactor construction activities the inspection plan will be elaborated based on construction plan.

**1.4 Do you evaluate the safety culture at construction sites? If so, how is this evaluation conducted?**

Safety culture is a cross cutting issue. HAEA inspectors evaluate the inspected areas, fields and activities from this point of view during each inspection.

Evaluation of safety culture is one of key arias of the comprehensive inspection. The questioner on inspection of safety culture comprises following questions:

- How management demonstrate a commitment to safety?
- How staff members feel their personal responsibility for safety?
- How questioning attitude of staff members was promoted by management?
- What issues potentially impacting safety were identified and evaluated in last year? Which lessons have been learnt from these evaluations?
- Etc.

**1.5 How are inspection findings processed? For instance, how is the significance of an inspection finding determined, how are licensees notified of the finding, are licensee's required to respond to the regulatory organisation with a plan to address the findings, and are additional inspections conducted to ensure the findings have been adequately addressed?**

First of all, inspection findings are registered. The licensee (or its contactor) shall evaluate the finding and then it shall define corrective measures. The regulatory organisation may accept or refuse corrective measures or may prescribe additional actions. If the finding has high safety significance or is repetitive, the regulatory organisation involves the management of the licensee to draw necessary lessons.

**1.6 Is construction experience evaluated and incorporated into the reactor construction inspection programme?**

Evaluation of the construction experience is required from the licensee. Regulatory evaluation of the construction experience will be one of the sources of inspection programme or plan.

**1.7 Describe any differences with regard to inspections performed at large research reactors that are under construction.**

There are no large research reactors under construction in Hungary at present and as known there is no such intention in the near future.

***Part 2: Assessment of licensee performance during new reactor construction***

**2.1 Do you conduct an overall assessment of the effectiveness of licensee performance during construction? If so, describe how the overall assessment of licensee performance is conducted including frequency, communication of results to the licensee and public, and the regulatory organisation response to licensee performance issues?**

There is no new reactor construction in Hungary yet. Nevertheless, HAEA intends to use its comprehensive inspection programme for overall assessment of the effectiveness of licensee performance. The questioner for this life cycle stage is not elaborated yet.

**2.2 Can your comprehensive reviews lead to changes to inspection priorities and inspection plans, establish a possible need for regulatory organisation response to performance issues, and lead to a change in the inspection programme?**

HAEA has a safety performance evaluation programme on operating nuclear facilities.

Similar safety performance evaluation programme will be developed for the new NPPs. In case of operating nuclear facilities, the results of safety performance evaluation programme have significant impact on the programme of regulatory inspection programme of next year. A similar approach is planned to be used in the case of new NPPs.

*Part 3: Enforcement*

**3.1 Does the regulatory organisation take action against a licensee in response to identified findings or violations of regulations? If so, describe the process by which the regulatory organisation determines the appropriate action to take against the licensee.**

According to the Atomic act “If the regulator confirms a violation of or failing to comply with this act or any other law promulgated to execute this act, or a resolution issued based on this act or the laws promulgated to execute this act, the regulator [...] may require the licensee obliged to data supply under the competence of regulator to pay a fine”.

Besides penalty, HAEA uses warnings or prescribes additional conditions – according to its enforcement policy.



## RESPONSE ON BEHALF OF KOREA

### *Part 1: On-site inspection of new reactor construction*

**1.1 Provide a description on the general process for the on-site inspection of nuclear reactors that are under construction. For example, describe the authority to conduct inspections, presence of inspectors on site, preparation for inspections, notification of inspection hold points, inspection outputs, training of inspectors, follow-up of inspections, and the target inspection time per installation each year and/or over the course of facility construction. Also, describe any differences with regard to inspections performed at operating installations.**

The all authority on nuclear safety regulation has been endowed to the NSSC (Nuclear Safety and Security Commission) in Korea. However, KINS (Korea Institute of Nuclear Safety) is in charge of regulatory inspection for the on-site inspection of new reactor construction under entrustment from the NSSC, such as.

The on-site inspection process and timing are prescribed in AESA (Atomic Energy Safety Act.) enforcement decree as follows:

- When construction on major structures of the nuclear reactor facilities has started when any strength test for each main process may be available (structure inspection);
- Before construction of the nuclear reactor facilities comes to a close for strength test, pressure test and functional tests of major equipment, parts, facilities and systems (installation inspection);
- When any functional tests for each system tests may be available upon completion of the nuclear facilities construction (cold functional tests inspection);
- When primary and secondary system hydrostatic tests and hot functional tests may be available (hydrostatic test and hot functional tests inspection);
- When nuclear fuel loading and commissioning tests may be available (nuclear fuel loading and commissioning tests inspection).

It also stipulates that inspections may be conducted before the construction of the nuclear reactor facilities is completed, where deemed necessary for strength test, pressure test and functional test of major equipment, parts, facilities and systems in accordance with the relevant NSSC notices.

In the case of pre-operational inspection, the respective licensee (installer) submits an application for pre-operational inspection according to enforcement decree of the AESA. A pre-operational inspection is then performed following the confirmation and notification of an inspection plan that addresses inspection items, associated inspection periods, inspection hold points, manpower to be engaged in the respective inspection, etc.

In KINS, the inspection of new reactor construction is primarily carried out by the staffs from seven technical departments under the management and co-ordination of regulation project managers. These staffs at technical departments are engaged in both safety review and inspection activities and, as such, the connectivity between the two different types of regulatory activities has been strengthened. NSSC and

KINS also operate a combined on-site resident office at each site of new reactor and the inspectors of the office perform daily inspections on the nuclear power plants under construction and in operation. Although this daily inspection of the nuclear reactor facilities under construction is the primary purpose, the resident office is also engaged in witnessing for the major surveillance tests, an investigation of the enforcement upon occurrence of an abnormal condition at the NPPs. Resident office is closely communicated with project managers who are in charge of pre-operational inspections and periodic inspections.

The qualification areas of the regulatory inspectors in KINS are classified into six areas, i.e. facility control, radiation control, quality assurance, radiological emergency preparedness, physical protection and international regulatory supplies. In addition, the qualification is granted only to those who have over two years of experience on the inspection activities for the respective area (including the period involved in the supplementary inspection activities), and also have received education longer than the minimum period of time. The regulatory inspectors must also receive retraining every three years to maintain the inspector qualification.

KINS inspectors fill out the inspection finding form based on the confirmed findings following the inspection, and submit it to the Inspection project manager. The project manager in turn requests NSSC (resident officer (minor safety significant) or NSSC headquarters (major safety significant)) to officially issue the inspection findings. NSSC may order the licensee of the respective facilities to take corrective measures based on the inspection results according to the management of inspection findings that is prescribed in NSSC notices. The issuance of an inspection finding requires necessary measures are required to be taken by a certain date. Following performance of each regulatory inspection, the inspection results are summarised and explained to the licensee during post-inspection meeting.

Inspection hold points for major inspection activities such as ILRT (integrated leak rate test), CHT (cold hydrostatic test) and hot functional test are notified to the licensee before the test is started. Those tests can be started only after the appropriate regulatory inspection is conducted and the next step can be advanced only after the test is confirmed as acceptable by KINS inspection result.

The pre-operational inspection of new reactor is performed to confirm whether or not: 1) the nuclear power reactor and related facilities are constructed in compliance with the conditions upon which the construction permit was granted, and 2) the constructed facilities could be safely operated during the design life by satisfying the licensing standards. This inspection is separated into facility installation inspection and facility performance inspection, and is carried out in the form of witnessing, interviewing and document review.

The periodic inspection of operating reactor is conducted by KINS staffs to verify whether the nuclear reactor facilities: 1) are operated in compliance with the conditions upon which the operating licence was granted, 2) can withstand the pressure, radiation or other operational environments; and 3) are maintained in the same state as the one for which the result of the pre-operational inspection was satisfactory. In the case of PWRs, the periodic inspection is performed during a planned overhaul outage, while it is done during a periodic maintenance period in the case of pressurised heavy water reactors (PHWRs). The periodic inspection in these two different types of plants is carried out in the form of witnessing and documentary inspection.

## **1.2 Have you developed objectives for your new reactor construction inspection/oversight programme? If so, what are the stated objectives?**

KINS inspection guidelines in the referenced materials below address the overview, scope, objective, criteria and basis, contents and methods, etc.

1. KINS/GI-N02, Pre-operational [Facility] Inspection Guidelines for PWR Nuclear Power Plants);
2. KINS/GI-N03, Pre-operational [Performance] Inspection Guidelines for PWR Nuclear Power Plants).

According to the KINS inspection guidelines, the pre-operational inspection is performed to confirm whether or not: 1) the nuclear power reactor and related facilities are constructed in compliance with the conditions upon which the construction permit was granted, and 2) the constructed facilities could be safely operated during the design life.

### **1.3 How do you determine which activities to inspect?**

Inspection items are determined by the NSSC notice for pre-operational inspection and inspection methods are given by the KINS inspection guidelines. Inspection is done for all items in the notice and additional item can be added.

As per the KINS inspection guidelines of KINS/GI-N02 (Pre-operational [Facility] Inspection Guidelines for PWR Nuclear Power Plants) and KINS/GI-N03 (Pre-operational [Performance] Inspection Guidelines for PWR Nuclear Power Plants), the preoperational inspection for a nuclear power plant under construction is carried out after classifying the items subject to inspection into the following 3 groups based on the safety significance: 1) witnessing inspection (A); 2) witnessing or documentary inspection (B); and 3) documentary inspection (C). Moreover, when an integrated safety assurance is deemed necessary, a team inspection is conducted instead of an individual inspection. KINS inspection guidelines also prescribe the inspection scope, associated regulatory requirements, inspection method, inspection content, etc. for each inspection item.

### **1.4 Do you evaluate the safety culture at construction sites? If so, how is this evaluation conducted?**

The regulatory organisation is exerting strategic efforts to expand and establish nuclear safety culture. In several discussion meetings since 2009 such as the one among the heads of nuclear power related institutions that was sponsored by the government, the ways to improve nuclear safety have been seriously discussed. Subsequently in 2010, the regulatory organisation performed a special safety culture inspection for the NPPs including new reactor under construction. Upon completing the inspections, the regulatory organisation made several recommendations to improve the safety culture of the authorised parties, such as clarification of the task performance structure to maximise the effectiveness of safety culture, improvement of a self-evaluation method for effectiveness of safety culture, etc. Following a review of safety culture from a regulatory perspective and an assessment of the relevant voluntary efforts of the licensees, the regulatory organisation is planning to develop an integrated management strategy for nuclear safety cultures such as the guidelines for safety culture monitoring for resident office, and evaluation methods.

NSSC and KINS are planning to do safety culture inspection against licensee's headquarter and nuclear site personnel during the year of 2014 and detailed inspection programme is being discussed. Inspection guideline is also being made.

**1.5 How are inspection findings processed? For instance, how is the significance of an inspection finding determined, how are licensees notified of the finding, are licensee's required to respond to the regulatory organisation with a plan to address the findings, and are additional inspections conducted to ensure the findings have been adequately addressed?**

In case where the regulatory inspection reveals non-compliance, an inspection finding is issued in accordance with the NSSC Notice (Regulation on Management of Inspection Findings from Nuclear Power Utilization Facilities, Reactor.010). The licensee is then required to take the corrective or supplementary measures by the due date specified in the inspection finding form. To clarify the content and basis of the inspection finding together with the requested corrective measures, the inspection finding form is required to be prepared as follows:

- Title the inspection finding in a concise and clearly understood manner;
- Describe the specific details of the inspection finding clearly and concisely;
- Describe the basis of the inspection finding (meaning, regulation, technical standard, procedure and so on) in detail;
- Provide a detailed description of the corrective or supplementary measures to be taken by the inspected organisation;
- Describe the exact account of the inspection finding with detailed explanation, issues in terms of technical and safety aspects, and expected benefits, and so on;
- Specify the due date for correction.

The operating licence of new reactor is not issued until all of the safety-significant inspection findings are cleared.

A recommendation is provided when the violation does not constitute an inspection finding but an action of the licensee is needed for improvement or supplementation. The licensee is encouraged to implement those recommendations. A recommendation is also issued, when a feedback of the latest regulatory or technological trends in Korea and abroad are deemed necessary even though the current licensing bases for nuclear power facilities are met. The licensees take actions to improve safety by actively accepting such recommendations. Provided that the results of corrective measures taken by the licensee turn out to be unsatisfactory, the regulatory organisation request licensee to take corrective actions by a certain date. The licensee receiving such a request should then report the implementation results to the regulatory organisation.

The regulatory organisation has established a tracking/management procedure by which the regulatory organisation closes the inspection finding and notifies the licensee of the closure, provided that it is verified, through an on-site investigation if necessary, that the corrective or supplementary measures have been properly implemented.

**1.6 Is construction experience evaluated and incorporated into the reactor construction inspection programme?**

Yes.

A plan for the pre-operational inspection is developed considering construction experience of previous plant. Given a schedule for the major construction processes, etc. by the project manager in charge of the inspection, the head of the technical department and the inspectors discuss and determine the specific items that should be inspected, considering previous construction experience.

***Part 2: Assessment of licensee performance during new reactor construction***

**2.1 Do you conduct an overall assessment of the effectiveness of licensee performance during construction? If so, describe how the overall assessment of licensee performance is conducted including frequency, communication of results to the licensee and public, and the regulatory organisation response to licensee performance issues?**

The KINS carries out pre-operational inspection on all the activities that the utility conducts in the construction and commissioning test stages. Permission for use of the facilities is then granted to the utility provided that the construction work and performance of the facilities meet the technical standards (as prescribed in the Regulation on Technical Standards for Nuclear Reactor Facilities, etc.) [AESAs Enforcement Decree Article 27 Preoperational Inspection]. The time of pre-operational inspection is defined by the AESAs Enforcement Decree Article 29 (Time of Pre-Operational Inspection, etc.).

**2.2 Can your comprehensive reviews lead to changes to inspection priorities and inspection plans, establish a possible need for regulatory organisation response to performance issues, and lead to a change in the inspection programme?**

Comprehensive reviews are conducted before operating licence for the overall inspection results up to then and if any non-conformance with the criteria is identified the operating licence is not granted until the non-conformance is appropriately addressed. Future inspection programme for the reactor itself and for future reactors is affected as appropriately by the comprehensive review. Comprehensive review is also conducted before commercial operating after commissioning inspection. Inspection experience accumulated during the commission inspection is applied to the applicable reactors inspection programme. In general, KINS does not change inspection programme to address the comprehensive review results. Additional inspection item may be added to the original inspection items to address the comprehensive review results.

***Part 3: Enforcement***

**3.1 Does the regulatory organisation take action against a licensee in response to identified findings or violations of regulations? If so, describe the process by which the regulatory organisation determines the appropriate action to take against the licensee.**

Pursuant to the Atomic Energy Safety Act (AESAs), the regulatory organisation has established and is implementing an enforcement policy for non-compliances that occur at nuclear facilities.

The AESAs stipulates the authorised parties manage nuclear power utilisation facilities in compliance with regulations and implement the conditional requirements imposed by the regulatory organisation. It is verified through a variety of inspections prescribed by law determining whether or not the authorised parties comply with the regulations and meet the imposed requirements. Once non-compliance is discovered, the regulatory organisation takes corrective measures commensurate with the safety significance of the non-compliance. In the case where an undue risk is confirmed including that was not anticipated during the authorisation process, the regulatory organisation has a legal basis to request the authorised parties to take appropriate corrective action.

The installer of a nuclear power reactor shall receive inspection following the AESAs Article 16 (Inspection). The regulatory organisation may impose corrective or supplementary measures on the authorised parties, if the inspection results indicate that: 1) the acceptance criteria prescribed in the AESAs Article 11 (Standards for Construction Permits) are not met; or 2) the matter prescribed in the attached documents for construction permit application as per Paragraph 2 of the AESAs Article 10 (Construction Permits) is violated. Also, if the items that need approval and permission for change are modified without

proper approval and permission, or the licence standard is not met, or the required conditions are not complied with, the construction permit can be revoked or the construction may be suspended for a period of up to one year based on the AESA Article 17 (Revocation of Construction Permits).

A number of different types of inspections are performed during construction of a nuclear power reactor and related facilities: 1) a pre-operation inspection that is carried out with respect to all safety-related SSCs and SSCs import to safety during the whole period of construction; 2) on-site daily inspection; 3) quality assurance inspection; and 4) special inspections (including investigation of an incident and failure).

If the licensee fails to meet the acceptance criteria or if the performance of the nuclear reactor facilities fails to meet the technical standards, the regulatory organisation may impose the following in accordance with AESA Articles 17 (Revocation of Construction Permits).

In cases where a failure or radiation hazard occurs in a nuclear power utilisation facility during the commissioning test after new fuel is loaded, the licensee must report it to NSSC per the AESA Article 92 (Protection Measures against Radiation Hazard and Report thereon) after taking safety measures. Upon receiving the report, the Chairman of NSSC may order the licensee to take measures such as suspension of use, transfer of radioactive material, decontamination or other actions necessary to prevent radiation hazard.

Paragraph 1 of the AESA Article 98 (Report and Inspection) prescribes that: if it is deemed necessary for the enforcement of this Act, NSSC may order any enterpriser participating in the construction or commissioning of nuclear reactor and related facilities, to submit a report or document on their business, or to complement the submitted documents. Paragraph 2 of the same Article prescribes that: the Chairman of NSSC may perform an on-site inspection or collect samples for a test, if deemed necessary for the sake of confirmation of the contents reported or documents submitted under Paragraph 1, safety of the nuclear power utilisation facility, or conduction of various inspections as stipulated by the Act. Paragraph 3 of the aforementioned Article prescribes that: if the result of the inspection conducted per Paragraph 2 of the AESA Article 98 shows that there is non-compliance to the AESA or the international commitments, the regulatory organisation may order corrective or complementary measures.

In case where the regulatory inspection reveals non-compliance, an inspection finding is issued in accordance with the NSSC Notice (Regulations on Management of Inspection Findings from Nuclear Power Utilization Facilities, NSSC.Reactor.010). The licensee is then required to take the corrective or supplementary measures by the due date specified in the inspection finding form.

A recommendation is issued, when a feedback of the latest regulatory or technological trends in Korea and abroad are deemed necessary even though the current licensing bases for nuclear power facilities are met. The licensees take actions to improve safety by actively accepting such recommendations.

## RESPONSE ON BEHALF OF NETHERLANDS

### *Part 1: On-site inspection of new reactor construction*

**1.1 Provide a description on the general process for the on-site inspection of nuclear reactors that are under construction. For example, describe the authority to conduct inspections; presence of inspectors on site; preparation for inspections; the notification of inspection hold points and if so, how are hold points fixed (in a licence, separate from the licence, in general regulation?); inspection outputs; training of inspectors; follow-up of inspections; and the target inspection time per installation each year and/or over the course of facility construction.**

At the moment there are no nuclear reactors under construction in the Netherlands. However, there are plans to build a new research reactor. The regulatory organisation is preparing itself for these new build activities. See further remarks at the end of the question regarding part 1.

**1.2 Have you developed objectives for your new reactor construction inspection/oversight programme? If so, what are the stated objectives?**

See remarks below.

**1.3 How do you determine which activities to inspect? Are pre-licensing inspections carried out? If so, what items/subjects are inspected? What items/subjects are inspected post-licensing?**

See remarks below.

The Human Environment and Transport Inspectorate's Nuclear Energy Service (KFD) is gathering international information on pre-licensing inspections. Pre-licensing inspections are under consideration. However, specific activities depend on the planning of the new build project. This project has not started yet.

**1.4 Do you evaluate the safety culture at construction sites? If so, how is this evaluation conducted?**

Not applicable at the moment; see remarks below.

**1.5 How are inspection findings processed? For instance, how is the significance of an inspection finding determined, how are licensees notified of the finding, are licensee's required to respond to the regulatory organisation with a plan to address the findings, and are additional inspections conducted to ensure the findings have been adequately addressed?**

Not applicable at the moment; see remarks below.

At the moment for existing installations the inspection findings are communicated to the licensee in reports. These reports can include action items for the licensee, including a time period to undo the non-

compliance. In follow-up inspections these deadlines will be an item to inspect on. With respect to the construction of a new installation a similar approach is foreseen.

**1.6 Is construction experience evaluated and incorporated into the reactor construction inspection programme?**

For the preparation on new build projects construction experience from other (foreign) projects is gathered. This is done by attending relevant international meeting and by direct contacts with different regulatory organisations. GRS (Gesellschaft für Anlagen- und Reaktorsicherheit – Germany’s central expert organisation in the field of nuclear safety and radioactive waste management) is contracted for assistance.

**1.7 Describe any differences with regard to inspections performed at large research reactors that are under construction.**

No new build activities at the moment. New build activities that are foreseen are related to a new research reactor. The preparation is aimed on that.

*Information that holds for Netherlands*

At the moment there are no construction activities ongoing. However, there are plans to build a new research reactor. The regulatory organisation is preparing itself for inspection and research and analysis (R&A) activities with respect to this new build project. There are no recent experiences with new builds in the Netherlands.

Activities that are undertaken at the moment are:

- Compilation of necessary hold points and witness points, leading towards an overall inspection approach. Operating Experience Feedback (e.g. international experiences) should be incorporated;
- Use of technical support organisations;
- Defining possible inspection activities in the pre-licensing phase. If long-lead items are being fabricated; inspections seem to be necessary. Next to this inspections on security issues are under consideration.

***Part 2: Assessment of licensee performance during new reactor construction***

**2.1 Do you conduct an overall assessment of the effectiveness of licensee performance during construction? If so, describe how the overall assessment of licensee performance is conducted including frequency, communication of results to the licensee and public, and the regulatory organisation response to licensee performance issues?**

Not applicable at the moment. This will be part of the licensing procedure and of inspections during the construction. This has to be specified by the regulatory organisation.

**2.2 Can your comprehensive reviews lead to changes to inspection priorities and inspection plans, establish a possible need for regulatory organisation response to performance issues, and lead to a change in the inspection programme?**

An assessment of the licensees’ performance will be part of the R&A activities. However, at the moment there are no activities in this field. The licensing is still in a very early stage.

*Part 3: Enforcement*

**3.1 Does the regulatory organisation take action against a licensee in response to identified findings or violations of regulations? If so, describe the process by which the regulatory organisation determines the appropriate action to take against the licensee.**

Not relevant at this moment. In principle the follow-up and enforcement policy that is now applied to existing nuclear installations will be applied as well.



## RESPONSE ON BEHALF OF RUSSIA

### *Part 1: On-site inspection of new reactor construction*

**1.1 Provide a description on the general process for the on-site inspection of nuclear reactors that are under construction. For example, describe the authority to conduct inspections; presence of inspectors on site; preparation for inspections; the notification of inspection hold points and if so, how are hold points fixed (in a licence, separate from the licence, in general regulation?); inspection outputs; training of inspectors; follow-up of inspections; and the target inspection time per installation each year and/or over the course of facility construction.**

Supervision over construction of NPP units is carried out in an integrated manner:

- In frames of the Town-Planning Code of the Russian Federation (State Construction Supervision);
- In frames of the Federal Law “On the Use of Atomic Energy” (Federal State Supervision in the Field of Atomic Energy Use).

A) Inspections of the State Construction Supervision.

Inspections are to be carried out in accordance with the following documents:

- Federal Law No. 190-FZ “Town-Planning Code of the Russian Federation” dated 29 December 2004;
- Decree of the Government of the Russian Federation No. 54 “On State Construction Supervision in the Russian Federation” dated of 1 February 2006;
- Rostehnadzor Order No. 446 “On Execution of State Construction Supervision by the Federal Environmental, Industrial and Nuclear supervision Service of Russia at Construction and Reconstruction of Buildings and Structures of Nuclear Facilities” dated of 1 October 2014.

Inspections are to be performed by an official of the state construction supervision body empowered on the basis of the appropriate directive (order) of the state construction supervision body in accordance with the inspection programme. The inspection programme is to be developed by an official of the state construction supervision body.

An official of the state construction supervision shall check as follows:

- adherence to the work execution requirements;
- adherence to the procedure of state oversight, keeping of the common and (or) special log-books, containing records on implementation of works, as-built documentation, drawing up of acceptance certificates for works, structures, sections of engineering networks;
- elimination of executed works’ non-conformances to the requirements of technical regulations (regulations and rules), other regulatory legal acts and design documentation, which were detected in the course of the construction oversight and state construction supervision, as well as

observance of the ban on continuation of works prior to drawing up of non-conformance elimination acts;

- observance of other requirements established by technical regulations (regulations and rules), other regulatory legal acts and design documentation in the course of execution of works.

In case of a detected non-conformance as a result of the inspection performed, an official of the state construction supervision body shall draw up a certificate, which is the ground for issuing of a non-conformance elimination prescription to the customer, builder or contractor (depending on who is responsible for the committed violation in compliance with the legislation of Russia). The prescription shall indicate the type of a non-conformance, a reference to the technical regulations (regulations and rules), other regulatory legal act, design documentation, the requirements of which were violated, and the timeframe for elimination of violations shall be specified with the account of design features or other specifics of the capital construction facility.

B) Inspections of the Federal State Supervision in the Field of Atomic Energy Use.

B) a) Conduct of supervision and oversight activities in frames of the permanent state supervision regime.

B) a) i) Selection of a facility (system, system elements) to be inspected.

It depends on fact sheets about the progress of the equipment or system mounting (to be submitted by the operating organisation), timeframes of mounting, classification of the equipment, as well as information collected by the inspectors from other information sources. Upon selection of a facility the operating organisation is requested to submit the relevant documents.

B) a) ii) Review of the submitted documents.

In the course of inspection the following documents are to be reviewed on a selective basis:

- availability of a design (detailed documentation, drawings) handed over to the production in accordance with the established procedure;
- availability of a work method statement (its compliance with the design);
- availability of engineering and manufacturing as well as manufacturing and oversight documentation for welding (build-up welding), approved by the principal material study organisation;
- availability of a certified welding procedure;
- availability of qualified personnel (including welders and super-intendants);
- availability of positive in-service inspection certificates for safety system elements important to safety (equipment, pipelines, materials and etc.);
- availability of construction preparedness (premises acceptance certificates for mounting, hidden works acceptance certificates, critical structures examination certificates).

For safety systems, safety related systems (except for the elements of localising safety systems), the following items are to be reviewed on a selective basis:

- compliance of the amount of weld joints inspection specified in the work method statement (manufacturing and oversight documentation for welding) and in the design with the requirements of the Federal Regulations PNAE G-7-010-89 “Equipment and Pipelines of Nuclear Power Plants. Weld Joints and Buildup Weldings. Inspection Rules”;

- compliance of the materials applied for manufacturing, mounting and repair of equipment and pipelines with the requirements of the Federal Regulations PNAE G-7-008-89 “Rules for Design and Safe Operation of Equipment and Pipelines of Nuclear Power Installations”;
- compliance of the applied welding materials and welding modes with the requirements of the Federal Regulations PNAE G-7-009-89 “Equipment and Pipelines of Nuclear Power Installations. Welding and Buildup Welding. General Provisions”.

For the elements of the localising safety systems the following items are to be reviewed on a selective basis:

- compliance of the amount of weld joints inspection specified in the work method statement (manufacturing and oversight documentation for welding) and in the design with the requirements of the Regulations PNAE G-10-031-92 “Rules for Inspection of Weld Joints of Localizing Safety System Elements of Nuclear Power Plants”;
- compliance of the materials applied for manufacturing, mounting and repair of equipment and pipelines with the requirements of the Federal Regulations NP-010-98 “Rules for Design and Operation of Localizing Safety Systems of Nuclear Power Plants”;
- compliance of the applied welding materials welding modes with the requirements of the Federal Regulations PNAE G-10-031-92 “Main Provisions on Welding of Localizing Safety System Elements of Nuclear Power Plants”.

B) a) iii) Inspection in situ.

Fulfilment of preparatory works, construction preparedness and premises acceptance for mounting are to be inspected.

Actual availability and state of the elements of systems, pipelines and equipment are to be checked.

In the course of inspections (walk-down tours) in situ the special attention shall be paid to welding.

In case of detected non-conformances with the legislation, the authorised persons are to take measures to preclude such non-conformances in compliance with the legislation. Preclusive measures to such non-conformances are as follows:

- issuing of compulsory prescriptions;
- imposition of administrative sanctions in accordance with the Code of Administrative Offences of Russia.

B) b) Conduct of inspections in between stages of a unit construction.

The condition is stated in the licence terms and conditions for organisations that execute works and render services at construction of nuclear facilities with regard to the necessity of notification of the appropriate Rostechndzor Interregional Territorial Department for Supervision over Nuclear and Radiation Safety about the planned date of commencement of works in order to allow for organisation and conduct of selective inspections. In case the decision not to conduct a selective inspection is taken, supervision shall be carried out in frames of the permanent supervision regime.

B) b) i) Review of the submitted documents:

- availability of a design (detailed documentation, drawings) issued for the production in accordance with the established procedure;

- availability of a work method statement (its compliance with the design);
- availability of engineering and manufacturing as well as manufacturing and oversight documentation for welding (build-up welding) and oversight, approved by the principal material study organisation (the requirement stated in item 8.1.4 of PNAE G-10-031-92);
- availability of a certified welding procedure;
- availability of qualified personnel (including welders and super-intendants);
- availability of positive in-service inspection certificates for system elements (equipment, pipelines, materials and etc.);
- availability of construction preparedness, premises acceptance certificates for mounting;
- availability of the reporting documentation for the previous stage;
- other.

B) b) ii) Inspection in situ.

Upon review of the documents an inspection in situ takes place. In case of availability of any comments or non-conformances the Inspection Department shall issue a refusal for continuation of works until the detected non-conformances (violations) are eliminated.

Inspections shall meet the following special requirements:

- check of a NPP unit preparedness to delivery of nuclear fuel;
- check of a NPP unit preparedness to reactor physical start-up (first criticality);
- check of a NPP unit preparedness to reactor power start-up.

If any non-conformances are detected, the Interregional Territorial Department shall issue a refusal for the operating organisation to continue works until the detected non-conformances are eliminated.

B) c) Target inspections envisage detailed check of one or several issues related to safety.

Inspection is to be carried out in compliance with the inspection plan specified in the inspection programme and consists of as follows:

1. Kick-off meeting with the leadership of the operating organisation with regard to issues of the upcoming inspection.
2. Review of the prepared documents.
3. Walk-down tours in situ.
4. Interview of officials.
5. Documentation of the inspection results.
6. Conduct of the closing meeting and submission of the inspection documented results to the leadership of the operating organisation.

A certificate shall be issued based on the positive inspection results. In case of detected non-conformances prescriptions and protocols are to be issued.

B) d) Integrated inspections.

Integrated inspections are to be carried out once per three years by multidisciplinary working groups in accordance with the established procedure.

The inspection procedure is established by the guideline documents, instructions of Rostekhnadzor and standard programmes.

Inspection covers quality assurance programmes, corrective action programmes and programmes for elimination of violations.

Hold points are specified in the construction licence terms and conditions. At construction of a NPP unit the inspections are carried out in between the construction stages in accordance with the construction licence terms and conditions. Divisions, executing supervision over nuclear and radiation safety and over construction of a nuclear facility shall organise and conduct selective inspections in the course of implementation of works:

- related to mounting of engineering structures of buildings and structures of Categories 1 and 2 according to PiN AE-5.6;
- related to mounting, adjustment, tests and trial runs of process systems and equipment (special attention shall be focused on systems important to safety) at all sub-stages of construction and commissioning;
- within the preparatory stage;
- tests and trial runs of equipment – Sub-stage A-1;
- tests of containment system – Sub-stage A-2;
- hydraulic tests and circulation flushing of the primary circuit – Phase A-3.1 Sub-stage A-3;
- hot trial run of the reactor installation equipment – Phase A-3.2 Sub-stage A-3;
- inspection of the reactor installation primary equipment – Sub-stage A-4;
- physical start-up of the unit – Stage B;
- power start-up of the unit and pilot commercial operation – Stage C.

## **1.2 Have you developed objectives for your new reactor construction inspection/oversight programme? If so, what are the stated objectives?**

Supervision over construction of NPP units is carried out in an integrated manner.

### **A) Inspections of the State Construction Supervision.**

The objective of the state construction supervision is prevention, detection and preclusion of violations with regard to town-planning legislation, including technical regulations and design documentation, committed by the Builder, Customer or Building Contractor (on the basis of a contract with the Builder or Customer).

### **B) Inspections of activities in the field of atomic energy use.**

B) a) Supervision over adherence to licence terms and conditions.

B) b) Supervision over adherence to the requirements of the federal regulations and rules in the field of atomic energy use.

Objectives: detection and preclusion of violations from the side of legal entities, their leadership or other officials performing activities in the field of atomic energy use with regard to requirements established in accordance with the international treaties of Russia, the Federal Law “On the Use of Atomic Energy”, other federal laws and regulatory legal acts of Russia in the field of atomic energy use.

B) c) Target inspections.

The objective of a target inspection is adherence to the regulations and rules in the field of atomic energy use in the course of mounting of equipment, pipelines (elements) of safety systems and systems important to safety.

B) d) Integrated inspections.

Integrated inspections are to be carried out once per three years by multidisciplinary working groups in accordance with the established procedure.

**1.3 How do you determine which activities to inspect? Are pre-licensing inspections carried out? If so, what items/subjects are inspected? What items/subjects are inspected post-licensing?**

A) Inspections of the State Construction Supervision.

Such inspections are to be carried out by an official of the state construction supervision body in compliance with the inspection programme. The inspection programme shall be developed by an the official mentioned above with the account of design features and other specifics of inspected facility and implementation of works related to its construction, reconstruction, conditions of its further operation, as well as other factors to be taken into account in compliance with the requirements of the technical regulations (regulations and rules), other regulatory legal acts and design documentation.

B) Inspections of the Federal State Supervision in the Field of Atomic Energy Use.

B) a) Conduct of supervision and oversight activities in frames of the permanent state supervision regime.

Selection of a facility (system, system elements) to be inspected depends on fact sheets about the progress of the equipment or system mounting (to be submitted by the operating organisation), timeframes of mounting, classification of the equipment, as well as information collected by the inspectors from other information sources.

B) b) Conduct of inspections in between stages of a unit construction.

The condition is stated in the licence terms and conditions for organisations that perform works and render services at construction of nuclear facilities with regard to the necessity of notification of the appropriate Interregional Territorial Department for Supervision over Nuclear and Radiation Safety about the planned date of commencement of works in order to allow for organisation and conduct of selective inspections. Divisions, executing supervision over construction of nuclear facilities shall analyse the incoming information about the works performed at the NPP under construction, organise and carry out the relevant inspections.

B) c) Target inspections shall be carried out in the following areas.

- Observance of the federal regulations at mounting of safety systems.
- Observance of the federal regulations at mounting of systems important to safety.
- Observance of the federal regulations at mounting, commissioning and operation of a physical protection system.
- Observance of the federal regulations at RW management.

- Observance of the federal regulations at storage and accounting of nuclear material and radioactive substances.
- Observance of the federal regulations at fresh and spent nuclear fuel management.

B) d) Integrated inspections.

Integrated inspections are to be carried out once per three years by multidisciplinary working groups in accordance with the established procedure.

**1.4 Do you evaluate the safety culture at construction sites? If so, how is this evaluation conducted?**

Evaluation of safety culture at organisation and execution of construction works is limited to evaluation of observance of legislation of Russia concerning labour protection in pursuance of the Decree of the Government of Russia No. 1160 “On Approval of the Provision on Development, Approval and Amendment of Regulatory Legal Acts Stipulating State Regulatory Requirements to Labor Protection” dated 27 December 2010.

**1.5 How are inspection findings processed? For instance, how is the significance of an inspection finding determined, how are licensees notified of the finding, are licensees required to respond to the regulatory organisation with a plan to address the findings, and are additional inspections conducted to ensure the findings have been adequately addressed?**

A) Inspections of the State Construction Supervision.

In case of detected violations as a result of the inspection performed, an official of the state construction supervision body shall issue an inspection certificate, which represents the ground for issuing of a prescription for elimination of such violations. The prescription states the type of violation, the reference to the technical regulation (regulations and rules), other regulatory legal act, design documentation, the requirements of which were violated, and the timeframe for elimination of such violations is to be specified taking into account the design features and other specifics of the capital construction facility.

The inspection certificate and the prescription shall be signed by the chairman and all members of the inspection commission and submitted to the inspected organisation against signature.

B) Inspections of the Federal State Supervision in the Field of Atomic Energy Use.

B) a) Conduct of supervision and oversight activities in frames of the permanent state supervision regime.

Information about the performed inspections and individual oversight activities in the course of supervision shall be recorded by officials into the permanent state supervision logbook.

In case any violations made by organisation (branch) and/or its officials with regard to the requirements of the legislation of Russia in the field of atomic energy use aimed at ensuring safety are detected in the course of inspections and other oversight activities, the authorised persons shall take measures to preclude such violations in accordance with the legislation of Russia.

Such preclusion measures are as follows:

- issuing of compulsory prescriptions;
- imposition of administrative sanctions in accordance with the Code of Administrative Offences of the Russian Federation.

B) b) Conduct of inspections in between stages of a unit construction.

In case of any comments or detected violations the Inspection Department shall issue a refusal for continuation of works until the detected non-conformances (violations) are eliminated. The inspection certificates are not issued in this case, and the results are to be recorded into the permanent supervision logbook. A copy of an entry shall be forwarded to the leader of the operating organisation.

B) c) Target inspections and integrated inspections

Based on the results of checks (inspections) an inspection certificate of the established format shall be issued, a copy of which shall be submitted to the inspected organisation.

If there are detected symptoms of violation, which are beyond the competence of Rostekhnadzor, such data shall be recorded into the inspection certificate and submitted to the relevant body upon completion of the inspection.

Besides, in case of detected violations Rostekhnadzor's officials shall issue protocols on administrative offences in addition to the prescription.

#### **1.6 Is construction experience evaluated and incorporated into the reactor construction inspection programme?**

Every year the Federal Environmental, Industrial and Nuclear Supervision Service of Russia holds a workshop on the topic "Arrangement and Execution of the State Construction Supervision at Construction, Reconstruction of Buildings and Structures of Nuclear Facilities" to discuss challenging issues related to supervision. Based on the results of such workshops and with the purpose to improve the quality of the supervision activity at construction of NPP units, amendments are introduced into Rostekhnadzor Orders, and new regulatory documents are developed, if necessary. Thus, the federal regulations "Requirements to Engineering Structures of NPP Buildings and Structures" are now in the process of development.

#### **1.7 Describe any differences with regard to inspections performed at large research reactors that are under construction.**

#### ***Part 2: Assessment of licensee performance during new reactor construction.***

#### **2.1 Do you conduct an overall assessment of the effectiveness of licensee performance during construction? If so, describe how the overall assessment of licensee performance is conducted including frequency, communication of results to the licensee and public, and the regulatory organisation response to licensee performance issues?**

Yes, the regulatory organisation fulfils an overall assessment of the effectiveness of licensee performance during construction. However at the moment there is no specific regulation or guide on performing such an assessment.

**2.2 Can your comprehensive reviews lead to changes to inspection priorities and inspection plans, establish a possible need for regulatory organisation response to performance issues, and lead to a change in the inspection programme?**

Yes, definitely it can. Results of previous inspections as well as other relevant information are considered in course of confirmation of upcoming inspection frequency and thematic areas.

***Part 3: Enforcement***

**3.1 Does the regulatory organisation take action against a licensee in response to identified findings or violations of regulations? If so, describe the process by which the regulatory organisation determines the appropriate action to take against the licensee.**

Yes, the regulatory organisation is authorised to have recourse to enforcement in case of detected violations. If violations to the requirements of legislation, regulations in the field of atomic energy use, licence terms and conditions are identified, an official of the regulatory organisation shall bring the offenders to responsibility in accordance with the procedure established by the Code of Administrative Offences of the Russian Federation. Moreover, a question on suspension or revocation of the construction licence can be raised.



## RESPONSE ON BEHALF OF UNITED KINGDOM

United Kingdom context: Note that a nuclear site licence has been granted for the construction of two EPR at Hinkley Point in Somerset. However, nuclear-related construction has not yet commenced (September 2015). Consequently, the United Kingdom response to the survey is based on established regulatory approaches and experience gained from interacting with the licensee in its development to date. ONR will continue to review the suitability of its approaches, and adapt them where necessary, throughout the construction phase.

### *Part 1: On-site inspection of new reactor construction*

**1.1 Provide a description on the general process for the on-site inspection of nuclear reactors that are under construction. For example, describe the authority to conduct inspections; presence of inspectors on site; preparation for inspections; the notification of inspection hold points and if so, how are hold points fixed (in a licence, separate from the licence, in general regulation?); inspection outputs; training of inspectors; follow-up of inspections; and the target inspection time per installation each year and/or over the course of facility construction.**

The authority to conduct inspections comes from The Energy Act 2013, which sets out the inspector's powers to access sites to conduct such inspections. ONR nominates an inspector with general duties under the nuclear site licence to inspect general compliance against the standard nuclear site licence conditions. An inspector is typically programmed to spend around four days per month on site. However actual inspection on site is dependent upon, and governed by, the licensee's construction activities. In addition to the nominated site inspector, specialist inspectors will attend site to conduct inspections relevant to their discipline.

The ONR inspection plan for a construction site is informed by the construction intervention strategy, comprising four cornerstone areas of licence compliance, organisational capability, design and safety case and security. Individual inspectors use this strategy to develop topic specific strategies and plans for inspection in their particular discipline under each of the cornerstone areas.

Under a licensee's arrangements for compliance with the nuclear site licence, the licensee divides the project into stages separated by "hold points". ONR inspectors judge the suitability of this hold point list. Under the licence, ONR has the option to exercise power to permission progress beyond a hold point. ONR's intention to permission a hold point is notified by issue of a licence instrument (i.e. a "Specification"); and a further licence instrument (i.e. a "consent" is then required before the licensee can progress beyond the hold point). In addition, the licensee may state in its own arrangements that it will not proceed beyond a certain stage without the "agreement" of ONR. ONR makes considerable use of such "derived powers".

Outputs of inspections are intervention reports completed by the inspectors. These outputs identify any issues which are categorised according to their significance, assigned target completion dates and tracked to completion. Issues may be elevated within ONR for resolution at senior levels where they are significant.

Inspectors are usually recruited from the nuclear industry according to their knowledge and experience within their discipline. However, experienced people from other parts of the high hazard sector may also be drawn upon. Training within ONR focuses on regulation i.e. inspection, assessment and enforcement – in other words, developing technically qualified people into nuclear safety regulatory organisations. In addition, Inspectors are encouraged to maintain their expertise through continued professional development within their specialised discipline.

The major difference between inspection of new reactor construction and inspection of operating installations is around ONR's focus on the licensee's continued development of its competence and capability to act as an intelligent customer for the construction and associated activities i.e. procurement.

ONR has not yet commenced oversight of construction activities for the first of the new wave of power stations to be built, hence validated figures on total ONR inspection time are not available. However, there is a dedicated site inspector and a resource of around 20 full time inspectors plus technical support contract is currently anticipated during the early phase of construction, including continued detailed design assessment (see scope of work in next section).

### **1.2 Have you developed objectives for your new reactor construction inspection/oversight programme? If so, what are the stated objectives?**

The construction intervention strategy includes the objectives of ONR's interventions. These objectives are:

- To secure ONR's regulation of the construction and installation by a licensee.
- To implement a programme of interventions or multi-discipline team inspections aimed at gathering evidence to form a judgement on the capability of the licensee organisation and the effectiveness of its management arrangements:
  - to comply with relevant safety and security legislation;
  - to produce a safety case that will support the licensee's request for ONR's permission to start safety related construction;
  - to ensure the continued evolution of a safety report that supports the licensee's construction and installation programme;
  - to ensure that the design of safety related SSCs is compliant with the extant safety case;
  - to control procurement and manufacture activities; and,
  - to control construction and installation.

### **1.3 How do you determine which activities to inspect? Are pre-licensing inspections carried out? If so, what items/subjects are inspected? What items/subjects are inspected post-licensing?**

The choice of activities to inspect depends on a number of factors, such as:

- the impact of the activity on nuclear safety;
- the complexity and novelty of the activity;
- regulatory operational experience;
- the competence and capability of the licensee/contractor;
- a result of ONR's assessment of a safety case;
- consideration of factors affecting future phases of the plant's lifecycle i.e. commissioning, operations, etc.;
- radiological implications.

With regard to pre- versus post-licensing inspection: during the pre-licensing inspections ONR seeks assurance that the prospective licensee will be in control of decisions that have the potential to affect safety at the point of licensing. For these reasons, ONR focuses on organisational capability. This includes the development, and demonstration, of the licensee's readiness to maintain control and oversight of site construction activities. However, there is limited site activity before licensing, and those activities that might be carried out, such as ground clearance, and not subject to detailed regulatory scrutiny because of the low potential safety impact. Post-licensing, as noted above, ONR's inspection programme develops to match the anticipated growth in site-based activities, the continued development of the detailed design and the management of key safety-related assessments, procurement and installation.

**1.4 Do you evaluate the safety culture at construction sites? If so, how is this evaluation conducted?**

ONR regards a positive safety culture as the outcome of effective leadership and management for safety. The organisational capability cornerstone includes consideration of those licensee attributes that together give an indication of the licensee's organisational and safety culture. In addition to the organisational capability cornerstone, inspectors within other cornerstone work streams are also required to consider the organisational capability aspects of their inspections.

ONR places considerable emphasis on seeking assurance that the licensee takes safety culture seriously, from the top of the organisation down, and that it monitors continually its culture, including that of its contractors. It is worth noting that ONR is currently developing a "leadership and management for safety review process" which includes aspects of safety culture, and which is being rolled out across all licensees.

**1.5 How are inspection findings processed? For instance, how is the significance of an inspection finding determined, how are licensees notified of the finding, are licensees required to respond to the regulatory organisation with a plan to address the findings, and are additional inspections conducted to ensure the findings have been adequately addressed?**

Inspection findings are reported in the inspection intervention report as issues. These issues are categorised by ONR as either 1–4. The category is dependent upon the significance of the issue. ONR's governance processes consider and endorse the categorisation of the issues and maintain oversight of the progress and closure via monthly meetings.

For issues designated as levels 1–3, the licensee is formally notified by a letter from ONR. Issues of level 4 are tracked by the inspector who raised the issue and discussed with the licensee at monthly intervals as part of the normal project progress activities.

Where issues are identified ONR expects the licensee to show how they are to be addressed in a timely manner. Depending on the significance of the issue, close regulatory interaction may be maintained to ensure licensee focus and understanding. Progress in resolving higher level issues are monitored by senior level regulatory organisation-licensee meetings.

**1.6 Is construction experience evaluated and incorporated into the reactor construction inspection programme?**

ONR is an active participant in the MDEP and WGRNR working groups and sub-groups. ONR also actively seeks learning from other sources. It further expects to monitor the licensee's use of learning from its own and others' experience in order to form views on their use of this information and to help guide ONR's inspection intervention strategies and plans.

**1.7 Describe any differences with regard to inspections performed at large research reactors that are under construction.**

Not applicable for the United Kingdom.

***Part 2: Assessment of licensee performance during new reactor construction***

**2.1 Do you conduct an overall assessment of the effectiveness of licensee performance during construction? If so, describe how the overall assessment of licensee performance is conducted including frequency, communication of results to the licensee and public, and the regulatory organisation response to licensee performance issues?**

ONR gather wide-ranging information about licensee performance. Amongst other things, this includes factors such as delivery of “right first time” safety submissions, resolution of issues and “relationship” indicators which might provide early warnings of problems between the licensee and the regulatory organisation. It is anticipated reviewing indicators to ensure that they are suitable for the licensee’s stage of progress through construction.

A licensee’s performance and its capability to undertake construction of the installation is a significant consideration of ONR’s decision to permission construction activities. As such, this will be reported in the cornerstone assessment reports and overall assessment report for permissioning of each regulated hold point. The licensee is formally communicated the decision by the issue (or not) of the licence instrument i.e. the consent. ONR places its report supporting the decision on its webpage.

**2.2 Can your comprehensive reviews lead to changes to inspection priorities and inspection plans, establish a possible need for regulatory organisation response to performance issues, and lead to a change in the inspection programme?**

The scope and frequency of inspection is continually informed by intelligence gained through interactions with the licensee at all levels. ONR’s governance processes are involved in these activities.

***Part 3: Enforcement***

**3.1 Does the regulatory organisation take action against a licensee in response to identified findings or violations of regulations? If so, describe the process by which the regulatory organisation determines the appropriate action to take against the licensee.**

ONR does take action against a licensee in response to identified findings or violations. Such action is always proportionate, targeted, transparent and consistent.

For serious violations or non-compliance with the licence or breaches of legislation ONR will use its enforcement management model to determine the appropriate action to take. Such actions include

- Formal communication by letter to the licensee;
- Powers under the nuclear site licence, i.e. withhold a consent or direct to stop construction;
- Under The Energy Act or Health and Safety at Work Act, issue of notices i.e. prohibition or improvement notices;
- Prosecution under the relevant legislation.

## RESPONSE ON BEHALF OF UNITED STATES

- 1.1 Provide a description on the general process for the on-site inspection of nuclear reactors that are under construction. For example, describe the authority to conduct inspections, presence of inspectors on site, preparation for inspections, notification of inspection hold points, inspection outputs, training of inspectors, follow-up of inspections, and the target inspection time per installation each year and/or over the course of facility construction. Also, describe any differences with regard to inspections performed at operating installations.**

### *Part 1: On-site inspection of new reactor construction*

There are currently (September 2015) five reactor units at three sites that are under construction in the United States. Four of these units are Westinghouse AP1000 units that were recently licensed (2012). These units were licensed under a one-step licensing process where a construction permit and operating licence, with conditions, were issued at once. One unit began construction in the 1980s. Construction on this unit was suspended for many years and was recommenced several years ago. This unit was licensed under a two-step licensing process, where a construction permit was issued for constructing the unit, and an operating licence must be applied for after construction has been completed. The answers to this survey are based on the one-step licensing process.

The Atomic Energy Act of 1954, as amended, is the fundamental United States law on both the civilian and the military uses of nuclear materials. The Act requires that civilian uses of nuclear materials and facilities be licensed, and it empowers the NRC to establish by rule or order, and to enforce, such standards to govern these uses as the Commission may deem necessary or desirable in order to protect health and safety of the public. The Energy Reorganization Act of 1974 established the Nuclear Regulatory Commission (NRC). NRC's regulations impose requirements that licensees must meet to obtain or retain a licence to construct a nuclear facility.

For new reactor facilities, the NRC reviews applications submitted by prospective licensees, and (when appropriate) issues standard design certifications, early site permits, limited work authorisations, construction permits, operating licences and combined licences (authorises the licensee to construct and (with specified conditions) operate a nuclear power plant). After issuing a combined licence for a new reactor, in accordance with the provisions of Title 10, Part 52, of the Code of Federal Regulations ([10 CFR Part 52](#)), the NRC performs the following oversight activities:

- Implement the construction reactor oversight process as described in Inspection Manual Chapter 2506, "Construction Reactor Oversight Process General Guidance and Basis Document."
- Conduct construction inspections to ensure that the as-built facility conforms to the conditions of the combined licence, and verify that the appropriate corrective actions have been implemented.

The construction reactor oversight process was modeled after the NRC's reactor oversight process that is implemented at all operating reactors. Therefore, the inspection, assessment and enforcement approach for new reactor construction is very similar to the approach implemented at operating reactors. However, unlike the operating reactor oversight process, which focuses on monitoring and evaluating the

performance of operating nuclear power plants, regulatory oversight for new reactors under construction focuses on the construction of reactor facilities between licensing and initial operation. As part of the construction reactor oversight process, the NRC implements a stringent construction inspection programme during the period between licensing and initial operation. The construction inspection programme is primarily implemented by the NRC Region II Office in Atlanta, Georgia, USA. Region II dispatches as many as five resident construction inspectors to a new reactor site during the pre-operational phase of construction to oversee the day-to-day activities of the licensee and its contractors, and may supplement this inspection staff with additional personnel from Region II and other regional offices, and headquarters technical staff, as needed, to ensure that the as-built facility conforms to the conditions of the combined licence. All inspectors are formally certified through a training programme that is described in [Inspection Manual Chapter 1252](#), “Construction Inspector Training and Qualification Program”.

A combined licence enables the licensee to construct a plant and operate it once construction is complete if certain standards identified in the combined licence are satisfied. These standards are called Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC). The introduction of ITAAC into the new reactor licensing process under 10 CFR Part 52 created a design-specific pre-approved set of performance standards that the licensee must meet to the NRC's satisfaction. The NRC's on-site construction inspectors devote significant time and resources to verify the licensee's completion of the ITAAC. Under [Inspection Manual Chapter 2503](#), “Construction Inspection Program: Inspections of Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) Related Work”, the NRC uses these direct inspections and other methods to confirm that the licensee has met these performance standards, as set forth in the combined licence, before allowing the licensee to begin loading fuel for initial plant start-up and operation.

The NRC's on-site inspectors also review the adequacy of the development and implementation of licensee programmes that support construction of a plant (e.g. quality assurance program, corrective action program, preoperational test program, etc.) and the development of operational programs (e.g. radiation protection program, emergency preparedness program, in-service testing program, etc.) that must be implemented at various milestones listed in the combined licence. The programmes inspected are listed in [Inspection Manual Chapter 2504](#), “Construction Inspection Program - Inspection of Construction and Operational Programs”.

The time provided for NRC inspectors to prepare for their inspections is approximately equal to the time allotted for the inspection itself. During inspection preparations, inspectors will review previous inspection reports and findings, combined licence conditions, relevant sections in the unit's final safety analysis report, and any additional relevant information that will contribute to an effective inspection. Numerous inspection procedures have been developed to guide the inspectors during their inspections. These inspection procedures are listed in Inspection Manual Chapters 2503 and 2504. Once the inspection is complete, a publicly available inspection report containing a scope of activities inspected and associated inspection findings that were identified during the inspection is issued to the licensee. Guidance for inspection report writing is contained in [Inspection Manual Chapter 0613](#), “Power Reactor Construction Inspection Reports”. If there are findings identified during the inspection, inspectors will follow-up by reviewing the licensee's corrective actions during a subsequent inspection.

The NRC does not employ the use of inspection hold points. However, close communication is maintained with the licensee to ensure that the NRC is aware of significant construction activities so that desired inspections can be planned and accomplished. The on-site contingent of resident inspectors is also key to ensuring inspection planners are aware of planned construction activities.

The total direct inspection time estimated for a new reactor unit under construction, not including preparation, documentation or travel time, is 35 000 hours per unit over the entire course of construction.

This estimate will be re-evaluated based on the actual inspection time expended on the 4 units that are currently under construction pursuant to combined licences in the United States.

## **1.2 Have you developed objectives for your new reactor construction inspection/oversight programme? If so, what are the stated objectives?**

Inspection Manual Chapter 2506 describes the Construction Reactor Oversight Process (CROP) for commercial nuclear power plants under construction and contains the objectives of the NRC's inspection/oversight programme.

The objectives of the construction inspection programme are to:

- Determine whether or not appropriate quality controls are implemented in the development of applications that will be or have been submitted to the NRC; and
- Provide reasonable assurance that the facility has been constructed and will operate in conformity with the licence, the provisions of the Act, and the Commission's rules and regulations.

As part of the overall construction inspection programme, the NRC developed a baseline inspection programme, which is to be completed at all reactors under construction prior to the Commission's affirmative 10 CFR Part 52.103(g) decision. It requires inspections of licensee performance in the six cornerstones of safety. The overall objectives of the baseline inspection programme are to:

- Provide a sufficient basis to support the finding, in accordance with 10 CFR Part 52.103(g), that the acceptance criteria in a combined licence have been met; and
- Develop confidence in the licensee's programmatic controls. Thus, the baseline inspection programme consists of ITAAC inspections and construction and operational programme inspections.

## **1.3 How do you determine which activities to inspect?**

The baseline inspection programme is to be completed at all reactors under construction prior to the Commission's affirmative 10 CFR Part 52.103(g) decision. The baseline inspection programme consists of ITAAC inspections and construction and operational programme inspections.

As part of the baseline inspection programme, a broad range of ITAAC-related activities are inspected. The ITAAC inspection philosophy recognises that several ITAAC are closely related, thereby providing the NRC with the opportunity to evaluate a group of ITAAC (an ITAAC family) based upon an inspection of some representative ITAAC within the family. In order to facilitate the inspection of representative ITAAC within a family to confirm adequate licensee control and completion of the ITAAC, a high level inspection planning tool, identified as the ITAAC Matrix, was developed. Such an inspection approach allows for the efficient use of NRC inspection resources not only for the ITAAC inspections, but also for the routine evaluation of the construction processes that result in the ITAAC products and completion.

Recognising that the construction inspection programme cannot reasonably inspect all licensee construction activities associated with completing each ITAAC, an ITAAC prioritisation methodology was needed. The concept was to develop a selection process that could work with the ITAAC Matrix to rank the ITAAC of any particular design. This rank would be based upon the value that NRC inspection provides to the assurance that the completed ITAAC could be accepted without need for additional confirmation. The ITAAC prioritisation methodology objective is to optimise NRC inspection resources, while providing reasonable assurance that a significant flaw in the completion of the ITAAC by the licensee will not go undetected.

The first step in prioritisation involves rank-ordering the ITAAC based upon certain defined attributes that make one ITAAC more or less important to inspect than the others. Attributes are considered to be some of the representative characteristics of any particular ITAAC. The following five attributes were selected for ranking consideration: complexity or difficulty of activity, construction and testing/training experience, difficulty of verifying by other means, safety significance, and licensee (or applicant) oversight attention. The attributes are weighted according to their impact on the overall objective. Then, each ITAAC is rated for each attribute by use of expert panels. The output of this process has been used to target for inspection those ITAAC that had a numerical ranking at or above a selected value. These ITAAC are referred to as targeted ITAAC.

An additional ITAAC inspection area concerns Design Acceptance Criteria (DAC), which are a subset of the ITAAC for a given design. The DAC are design details that were not provided at the time of design control document (DCD) submittal, with the understanding that these design details would be available during construction and verified as part of the ITAAC to demonstrate that the system design and as-built configuration conformed to the licensing basis.

The baseline inspection programme includes inspection of activities and SSCs associated with the following ITAAC:

- Targeted ITAAC listed in the DCD of the certified design being constructed;
- If there are no targeted ITAAC in a family, at least one ITAAC from that family will be selected for inspection;
- DAC ITAAC;
- Emergency Preparedness ITAAC;
- Security ITAAC;
- Targeted Site Specific ITAAC (the Site Specific Targeted ITAAC are selected by a separate panel after the COL is issued).

While the ITAAC will be the focus when selecting which activities to inspect, the NRC staff will inspect more than just ITAAC-related work. Licensees are required by regulation to develop and implement construction programmes. In the first years of a project, the licensee's construction programmes will be inspected. The staff's verification that the licensee has properly implemented required construction is directly related to the NRC's use of sampling during inspections and is the foundation of the assumption that the specific construction activities inspected by NRC are representative of similar activities that did not receive direct NRC inspection.

As the project progresses, the NRC will inspect the development and implementation of construction programmes and operational programmes. These programmes are listed in IMC 2504, "Construction Inspection Program - Inspection of Construction and Operational Programs". The scope and content of the operational programmes will have been reviewed by the technical staff during the COL application review process and approved when the COL was issued. The COL will contain milestones by which operational programmes must be developed and implemented. The approved operational programmes must be developed and implemented prior to the milestones listed in the COL and these will be licence conditions.

NRC Region II has responsibility for developing an inspection plan for each unit under construction. This process is accomplished through the development and maintenance of a baseline inspection programme schedule. The baseline inspection programme schedule contains entries for all targeted ITAAC inspections, and the required construction and operational programme inspections. The baseline inspection programme schedule is updated as necessary to align with the construction activities ongoing at the site.

As part of the inspection planning process, NRC Region II determines the number of SSCs planned to be inspected for a given ITAAC. The planned number of SSCs to be inspected for each ITAAC is documented in a smart plan for the ITAAC. The number of SSCs planned for inspection can be increased or decreased based on inspection programme results. The number of SSCs to be inspected will be reviewed and adjusted as part of the annual performance review.

#### **1.4 Do you evaluate the safety culture at construction sites? If so, how is this evaluation conducted?**

The NRC has issued a safety culture policy statement to set forth the Commission's expectation that individuals and organisations establish and maintain a positive safety culture commensurate with the safety and security significance of their activities and the nature and complexity of their organisations and functions.

As part of the construction reactor oversight process, performance is monitored in three broad strategic performance areas: construction reactor safety; safeguards programmes; and operational readiness. To measure construction performance, the construction reactor oversight process focuses on six specific cornerstones within the strategic performance areas: design/engineering; procurement/fabrication; construction/installation; inspection/testing; operational programmes; and security programmes for construction inspection and operations.

In addition to the cornerstones, the construction reactor oversight process features three cross-cutting areas. Cross-cutting areas contain fundamental performance attributes that extend across all of the CROP cornerstones of safety. These cross-cutting areas are named Human Performance (H), Problem Identification and Resolution (P), and Safety Conscious Work Environment (S). Within the cross-cutting areas are cross-cutting aspects, which are aspects of performance related to that cross-cutting area and can be a causal factor of a finding. The NRC assigns cross-cutting aspects to inspection findings in accordance with Section 08.03c and Appendix B of Inspection Manual Chapter 0613. The NRC reviews cross-cutting aspects for cross-cutting themes and potential substantive cross-cutting issues in accordance with [Inspection Manual Chapter 2505](#), "Periodic Assessment of Construction Inspection Program Results", to provide licensees the opportunity to address performance issues before they result in more significant safety concerns. Although the presence of cross-cutting aspects or the assignment of a substantive cross-cutting issue may be indicative of a potentially degraded safety culture, the NRC draws conclusions about safety culture based on the results of licensee and NRC safety culture assessments conducted by qualified staff, not based on the presence of cross-cutting aspects or substantive cross-cutting issues. Through the process of assigning cross-cutting aspects, the NRC routinely reviews issues important to safety culture during inspections.

The NRC can ask a licensee to perform an independent safety culture assessment for the following situations: (1) a conclusion is reached that the licensee did not adequately evaluate the contribution of a safety culture component to the performance issue, or (2) a licensee has not adequately addressed a repetitive substantive cross-cutting issue (SCCI), which may be indicative of underlying organisational issues with safety culture implications. Following a request for a licensee to perform an independent safety culture assessment, the NRC conducts an independent safety culture assessment follow-up inspection to review the results and effectiveness of the licensee's safety culture assessment.

In cases where there is significant performance degradation, the NRC conducts an independent safety culture assessment to assess the licensee's safety culture.

**1.5 How are inspection findings processed? For instance, how is the significance of an inspection finding determined, how are licensees notified of the finding, are licensee's required to respond to the regulatory organisation with a plan to address the findings, and are additional inspections conducted to ensure the findings have been adequately addressed?**

Inspection findings are processed in accordance with Inspection Manual Chapter 0613, "Power Reactor Construction Inspection Reports". Inspectors evaluate issues of concern that are identified during their inspections by first determining if there was a performance deficiency on the part of the licensee (violation of regulatory requirements or failure to meet a standard to which the licensee is committed to). If the performance deficiency is determined to be of more than minor significance, it is called a finding. The significance of inspection findings is determined in accordance with the construction significance determination process (SDP) described in Inspection Manual Chapter 2519, "Construction Significance Determination Process". The significance of inspection findings, as characterised by the SDP, is represented by a colour scheme (i.e. green, white, yellow, red).

All findings are documented in an NRC inspection report that is issued to the licensee and is available to the public. Once a licensee's corrective action programme has been determined to be adequately developed and implemented, licensees are not normally required to respond to the finding. However, licensees are required to enter the findings into their corrective action programme and must correct the deficiency. NRC inspectors routinely follow-up on identified findings during subsequent inspections.

**1.6 Is construction experience evaluated and incorporated into the reactor construction inspection programme?**

Yes, Management Directive (MD) 8.7, "Reactor Operating Experience Program", sets forth the policy of the US Nuclear Regulatory Commission for an effectively co-ordinated programme to systematically review operating experience (OpE), assess its significance, provide timely and effective communication to stakeholders and apply OpE insights to regulatory decisions and programmes affecting nuclear reactors. The construction experience (ConE) Program is an integral component of the Reactor OpE Program that focuses on collecting, screening, and evaluating information, and insights applicable to new nuclear reactor design, construction, and pre-operational testing.

The functional elements of the Reactor OpE Program and its process involve identifying safety issues, assessing their significance, taking actions to address the issues, and communicating this information to internal and external stakeholders throughout the OpE process. The actions, or application of OpE insights from OpE evaluations, could involve further communication to internal and external stakeholders, taking regulatory action, and/or influencing agency programmes.

***Part 2: Assessment of licensee performance during new reactor construction***

**2.1 Do you conduct an overall assessment of the effectiveness of licensee performance during construction? If so, describe how the overall assessment of licensee performance is conducted including frequency, communication of results to the licensee and public, and the regulatory organisation response to licensee performance issues?**

The NRC's construction assessment programme is implemented at each plant that is under construction to allow for the NRC to arrive at objective conclusions about a licensee's effectiveness in assuring construction quality, provide for predictable responses to performance issues, and to clearly communicate performance assessment results to the public. In implementing the construction assessment programme, the NRC evaluates the inspection history of selected construction activities and programmes, enforcement history, allegations, and safety culture to arrive at an integrated assessment of licensee performance. The NRC determines the appropriate agency response to performance issues using the guidance provided in the

construction action matrix. Follow-up agency actions, as applicable, are conducted to ensure that the corrective actions designed to address performance weaknesses were effective.

The construction assessment programme consists of a review system that provides for continuous, quarterly, mid-cycle and end-of-cycle (annual) reviews of licensee performance data (inspection results). The system is designed so that the continuous and quarterly reviews are informal reviews of performance data and are not resource intensive. The mid-cycle and end-of-cycle reviews are more formal and include licensee performance review meetings. The communication of assessment results involves quarterly updates of assessment data, semi-annual inspection planning letters, and semi-annual assessment reports. A public meeting with the licensee is held near the licensee's facility after the conclusion of the annual assessment cycle. Annual assessment letters will be made publicly available prior to the public meetings and the annual Commission meeting.

The construction actions matrix identifies the range of NRC and licensee actions and the appropriate level of communication for different levels of licensee performance. The construction action matrix describes a graded approach in addressing performance issues and was developed with the philosophy that, within a certain level of safety performance (i.e. the licensee response band), licensees would address their performance issues without additional NRC engagement beyond the baseline inspection programme. For plants that have safety-significant finding(s), the NRC will perform additional inspections beyond the baseline programme and initiate other actions commensurate with the safety significance of the issues. The colour of construction inspection findings is used as the input to the construction assessment programme's construction action matrix. Each finding is also evaluated to determine if the primary cause of the finding can be associated with one of the cross-cutting aspects. During the assessment of licensee performance, the NRC determines if a construction substantive cross-cutting issue exists.

**2.2 Can your comprehensive reviews lead to changes to inspection priorities and inspection plans, establish a possible need for regulatory organisation response to performance issues, and lead to a change in the inspection programme?**

Yes, however, agency action beyond the baseline inspection programme will normally occur only if assessment input thresholds are exceeded. The construction actions matrix identifies the range of NRC and licensee actions and the appropriate level of communication for different levels of licensee performance. NRC actions can range from conducting only the baseline inspection programme up to the issuance of an Order to modify, suspend or revoke licensed activities.

***Part 3: Enforcement***

**3.1 Does the regulatory organisation take action against a licensee in response to identified findings or violations of regulations? If so, describe the process by which the regulatory organisation determines the appropriate action to take against the licensee.**

The NRC enforcement policy governs the processes and procedures for the initiation and review of violations of NRC requirements and the NRC enforcement manual contains implementation guidance. The NRC enforcement policy supports the NRC's mission to ensure adequate protection of public health and safety, promote the common defence and security, and protect the environment. Adequate protection is presumptively assured by compliance with NRC requirements. Compliance with NRC requirements, including regulations, technical specifications, licence conditions, and orders, provides reasonable assurance to the NRC and the public that safety and security are being maintained. The application of the enforcement policy ensures that associated enforcement actions properly reflect the safety or security significance of such violations.

The NRC's enforcement process has the following basic steps:

- first, violations must be identified;
- next, the NRC must assess the severity or significance of the violation;
- finally, the NRC must disposition the violation.

Throughout the process, an organisation or individual subject to an NRC enforcement action has multiple opportunities to provide input.

The assessment, disposition and subsequent NRC action related to inspection findings identified at power reactors under construction are determined by the construction reactor oversight process, as described in NRC Inspection Manual Chapter 2506. Inspection findings identified through the construction reactor oversight process are assessed for safety significance using the construction SDP described in IMC 2519. The SDP uses risk insights, where possible, to assist the NRC staff in determining the safety or security significance of inspection findings identified within the construction reactor oversight process. Inspection findings processed through the SDP, including associated violations, are documented in inspection reports and are assigned one of the following colours, depending on their safety significance:

- red – inspection findings with high safety or security significance;
- yellow – inspection findings with substantial safety or security significance;
- white – inspection findings with low-to-moderate safety or security significance;
- green – inspection findings with very low safety or security significance.

Most violations associated with construction reactor oversight process inspection findings are not normally assigned severity levels, nor are they normally subject to civil penalties, although civil penalties are considered for any violation that involves actual consequences. Some aspects of inspection findings and their associated violations at power reactors under construction cannot be addressed only through the construction assessment program. These findings are severity levels and can be considered for civil penalties. Typically, these findings involve actual or potential consequences, willful violations of NRC requirements, or impact the regulatory process (i.e. failure to make required notifications to the NRC for construction deficiencies).