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Regulatory Oversight of the Commissioning Phase for New Nuclear Reactors

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COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

Regulatory Oversight of the Commissioning Phase for New Nuclear Reactors

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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 sound 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 analyses in areas such as energy and the sustainable development of low-carbon economies.

Specific areas of competence of the NEA include the safety and regulation of nuclear activities, radioactive waste management and decommissioning, 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.

COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES (CNRA)

The Committee on Nuclear Regulatory Activities (CNRA) is responsible for NEA programmes and activities concerning the regulation, licensing and inspection of nuclear installations with regard to both technical and human aspects of nuclear safety. The Committee constitutes a forum for the effective exchange of safety-relevant information and experience among regulatory organisations. To the extent appropriate, the Committee reviews 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 reviews regulatory aspects of current safety management strategies and safety management practices and operating experiences at nuclear facilities including, as appropriate, consideration of the interface between safety and security with a view to disseminating lessons learnt. In accordance with the *NEA Strategic Plan for 2017-2022*, the Committee promotes 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 promotes transparency of nuclear safety work and open public communication. In accordance with the NEA Strategic Plan, the Committee oversees work to promote the development of effective and efficient regulation.

The Committee focuses on safety issues and corresponding regulatory aspects for existing and new power reactors and other nuclear installations, and the regulatory implications of new designs and new technologies of power reactors and other types of nuclear installations consistent with the interests of the members. Furthermore it examines any other matters referred to it by the Steering Committee for Nuclear Energy. The work of the Committee is collaborative with and supportive of, as appropriate, that of other international organisations for co-operation among regulators and consider, upon request, issues raised by these organisations. The Committee organises its own activities. It may sponsor specialist meetings, senior-level task groups and working groups to further its objectives.

In implementing its programme, the Committee establishes 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 also co-operates with the Committee on Radiological Protection and Public Health, the Radioactive Waste Management Committee, and other NEA committees and activities on matters of common interest.

FOREWORD

The Committee on Nuclear Regulatory Activities (CNRA) of the 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)". Therefore the WGRNR constitutes a forum of experts on the licensing of new and advanced commercial nuclear power reactors seeking to facilitate a co-operative approach to identifying key new regulatory issues, and to promote a common resolution.

The Multinational Design Evaluation Programme (MDEP) was established in 2006 as a multinational initiative to develop innovative approaches to leverage the resource and knowledge of the national regulatory authorities that are currently or will be tasked with the review of new nuclear reactor designs. The nuclear regulatory authorities participate in MDEP, which includes design specific working groups (DSWGs) and issue specific working groups (ISWG). The NEA facilitates MDEP activities by technical secretariat services. The MDEP Policy Group (PG) and the Steering Technical Committee Group (STC) oversee the programme.

The WGRNR is the main point of contact between the Multinational Design Evaluation Programme (MDEP) and the CNRA, and aims to co-ordinate its work with that of the MDEP in such a way that it utilises its outputs and does not duplicate its efforts. It also extends the results of MDEP to other CNRA members. At its first meeting in 2014 (31st Meeting), the CNRA recognised the generic aspects of regulatory oversight of the commissioning phase for new reactors as a new task for the WGRNR. Accordingly, WGRNR has covered generic commissioning activities and MDEP DSWGs have addressed commissioning activities specific to a design. This was formally agreed on by the CNRA and MDEP chairs.

In this context, the WGRNR organised a joint workshop with the MDEP on the regulatory oversight of the commissioning phase for new reactors. The workshop was an opportunity to bring together experts from nuclear regulatory organisations on commissioning activities. Its main purpose was to foster broad international co-operation and to share commendable practices and recent experience related to the commissioning of new reactors. The workshop focused on generic aspects of the topics, including regulatory priorities and practices, the oversight and regulation of commissioning tests and activities, and commissioning issues which are not design specific. Information obtained as a result of this workshop should increase understanding of key regulatory issues of commissioning phase of new reactors, and promote a method to address them.

This report, prepared by Dr Seung Hoon Ahn (KINS, Korea), is based on discussions and input provided by the members of the Workshop Organising Committee and Session Chairpersons/Rapporteurs listed hereafter.

- Mr Seung Hoon Ahn, Korean Institute of Nuclear Safety, Korea
- Mr Young Joon Choi, NEA Secretariat
- Mr Yeon-Ki Chung, Korean Institute of Nuclear Safety, Korea
- Mr Steven Downey, Nuclear Regulatory Commission, United States
- Ms Kerri Kavanagh, Nuclear Regulatory Commission, United States
- Ms Aurélie Lorin, NEA Secretariat
- Mr Janne Nevalainen, Säteilyturvakeskus, Finland
- Mr Craig Reiersen, Office for Nuclear Regulation, United Kingdom
- Ms Anne-Cécile Rigail, Autorité de Sûreté Nucléaire, France
- Ms Minna Tuomainen, Säteilyturvakeskus, Finland
- Mr Sweng-Woong Woo, Korean Institute of Nuclear Safety, Korea

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LIST OF ABBREVIATIONS AND ACRONYMS

ANVS	Autoriteit Nucleaire Veiligheid en Stralingsbescherming (Netherlands)
ABWR	Advanced boiling water reactor
AP1000	Advanced passive pressurised water reactor 1000
APR1400	Advanced pressurised reactor 1400
ASN	Autorité de Sûreté Nucléaire (France)
CNRA	Committee on Nuclear Regulatory Activities
CNSC	Canadian Nuclear Safety Commission
CFT	Cold functional test
ConEx	Construction experience database
CT	Commissioning tests
DSWG	Design Specific Working Group
EPR	European pressurised reactor or evolutionary pressurised reactor
FANR	Federal Authority for Nuclear Regulation (United Arab Emirates)
FOAK	First of a kind
FPOT	First plant only test
FSAR	Final safety analysis report
GOR	General operating rule
GRS	Gesellschaft für Anlagen-und Reaktorsicherheit gGmbH (Germany)
HAEA	Hungarian Atomic Energy Authority
HP	Hold point
IAEA	International Atomic Energy Agency
KHNP	Korea Hydro and Nuclear Power
KINS	Korea Institute of Nuclear Safety
MDEP	Multinational Design Evaluation Programme
NEA	Nuclear Energy Agency
NNSA	National Nuclear Safety Administration (China)
NRA	Nuclear Regulation Authority (Japan)
NRO	Nuclear regulatory organisation
NRC	Nuclear Regulatory Commission (United States)
NSSC	Nuclear Safety and Security Commission (Korea)
OECD	Organisation for Economic Co-operation and Development
ONR	Office for Nuclear Regulation (United Kingdom)
OpE	Operating experience
OSART	Operational safety review team

PAA	Panástwowa Agencja Atomistyki (Poland)
PSAR	Preliminary safety analysis report
QA	Quality assurance
RB	Regulatory body
ROSTEC	Rostec Corporation (Russia)
SAR	Safety analysis report
SEC-NRS	Scientific and Engineering Centre for Nuclear and Radiation Safety (Russia)
SNSA	Slovenian Nuclear Safety Administration
SSCs	Structures, systems, and components
STUK	Säteilyturvakeskus (Finland)
TESG	Technical expert sub-group
TSO	Technical support organisation
UDT	Urzad Dozoru Technicznego (Poland)
UJD	Úrad Jadrového Dozoru (Slovak Republic)
VOSAFETY	Federal State Unitary Enterprise VO “Safety” (Russia)
VVER	Vodo-Vodyanoi Energetichesky Reactor (water-water energy reactor)
WGRNR	Working Group on the Regulation of New Reactors (NEA)
WP	Witness point
YVL	Ydinturvallisuusohjeet (Finland)

EXECUTIVE SUMMARY

The fundamental objective of all national nuclear safety regulatory bodies is to ensure that within their countries, activities related to the peaceful use of nuclear energy are carried out in a safe manner. While the prime responsibility for the safety of a nuclear installation remains with the licensee or plant operator, the regulatory body itself has an important responsibility in assuring that the licensee meets its prime goal of safety of nuclear installations.

The commissioning of a new reactor facility is an essential phase in terms of the safety of the subsequent power operation as it demonstrates that the facility being constructed meets the design requirements and the safety requirements as specified in the safety analysis report (SAR) and in the license conditions. Also, during the commissioning it should be verified that the structure, functions and duties of the licensee's organisation, such as the number and competence of operating personnel, are sufficient to ensure the safe operation of the facility. From this viewpoint, a regulatory body has to ensure its regulatory oversight at the commissioning phase of a new reactor is effective enough to assure that the licensee meets the safety goals.

The Working Group on the Regulation of New Reactors (WGRNR), as the main point of contact between the Multinational Design Evaluation Programme (MDEP) and the Committee on Nuclear Regulatory Activities (CNRA), organised a joint workshop with the MDEP on the regulatory oversight of the commissioning phase for new reactors. Its main purpose was to foster broad international co-operation and to share commendable practices and recent experience related to the commissioning of new reactors.

The workshop focused on generic aspects of the topics, including regulatory priorities and practices, the oversight and regulation of commissioning tests and activities, and commissioning issues which are not design specific. Information obtained as a result of this workshop should improve the understanding of key regulatory issues for the commissioning phase of new reactors, and promote methods to address them. To accomplish these objectives, the organising committee divided regulatory activities for commissioning into three topics, commissioning management, commissioning oversight and organisational issues, with the following eleven issues:

A. Commissioning management:
    1. application of commissioning experience and operating experience;
    2. selection of tests and acceptance of tests results;
    3. configuration management reflecting design change.
B. Commissioning oversight:
    1. regulatory hold points and witness points;
    2. bases for inspection;
    3. tests sampling criteria;

4. dealing with unexpected test results or occurrences.

C. Organisational issues:

1. inspection for licensee organisational readiness;
2. oversight of safety culture during commissioning stage;
3. oversight of maintenance and preservation of equipment;
4. deployment of regulatory resource.

A set of pre-workshop questions was developed for each issue and the participants provided their responses before the workshop. All the countries' responses were compiled in a template designed to summarise the points of special interest. These points were transferred to the chairs of the three parallel sessions for the workshop.

Using the countries' responses accumulated, discussions were made in each group to be in charge of each issue. There was a general consensus that regulatory oversight on commissioning should focus on safety, but detailed approaches were somewhat different among countries. Many lessons learnt and commendable practices were drawn for the given issues, while open questions for which the group couldn't come to a consensus were suggested for panel discussions.

In the closing session, the participants identified open issues and recommendations for future work. The issues were categorised in three topics: open issues for WGRNR; open issues for MDEP; and key messages to be conveyed to industry.

For WGRNR, the six open issues in the commissioning task are:

- criteria for selection of tests to be witnessed by the regulator;
- how to articulate technical review and quality assurance (QA) review of configuration management, preliminary safety analysis report (PSAR) vs. revision of PSAR, and PSAR vs. final safety analysis report (FSAR);
- how to assess the results of commissioning activities;
- for dealing with non-conformances (commissioning acceptance criteria missed), how to ensure that the licensee takes the appropriate preventive actions in order to ensure that commissioning lessons learnt are incorporated in a timely manner;
- identification of additional skills/experience needed for regulatory oversight of commissioning;
- time in the licensing process to discuss hold points and witness points with the applicant.

There are also three open issues within other tasks: to enhance construction experience database (ConEx) sharing experience (QA vs. timely sharing), testing of passive safety systems under design basis accident, and assessment of organisational readiness.

For MDEP, two open issues are:

- to develop the library for quick sharing of commissioning experience and for design specific working group (DSWG); and
- to enhance exchanges of information between regulator and licensee on ongoing commissioning issues.

Key messages to be disseminated to the industry are as follows:

- open, honest and regular communication with regulators is crucial (commissioning tests planning to be shared but also early communication of potential issues);
- good configuration control, reflected in PSAR and/or FSAR, is essential to support the commissioning oversight;
- regulators need accurate justification for crediting first plant only tests (FPOT) and access to testing information (e.g. procedures, results);
- it needs to be ensured that there are processes and procedures in place to manage unexpected occurrence during commissioning; and
- particular attention should be given to the handover between construction, commissioning and operation phases.

INTRODUCTION

The fundamental objective of all nuclear safety regulatory bodies is to ensure that within their countries, activities related to the peaceful use of nuclear energy are carried out in a safe manner. While the prime responsibility for the safety of a nuclear installation remains with the licensee or plant operator, the regulatory body itself has an important responsibility in assuring that the licensee meets its prime goal of safety of nuclear installations.

The commissioning of a new reactor facility is an essential phase in terms of the safety of the subsequent power operation by demonstrating that the facility constructed meets the design requirements and the safety requirements as specified in the safety analysis report (SAR) and in the license conditions. Also, during the commissioning it should be verified that the structure, functions and duties of the licensee's organisation, such as the number and competence of operating personnel, are sufficient to ensure the safe operation of the facility. The commissioning should be considered as a progressive transition from construction to operation, and involves participation of various stakeholders, designers, construction group, license holder, regulators, manufacturers, commissioning and operating teams. The commissioning process includes activities for the following purposes:

- to verify that structures, systems and components (SSCs) fulfil the design and safety objectives through the corresponding acceptance criteria;
- to collect baseline data for equipment and systems for future reference;
- to validate those operating procedures and surveillance procedures for which the commissioning tests provide representative activities and conditions, and to validate by trial use, to the extent practicable, that the facility's operating procedures, surveillance procedures and emergency procedures are adequate;
- to familiarise the operating, maintenance and technical staff of the nuclear power plant with the operation of the plant.

Recognising the changing and diverse situations during the commissioning phase of a new reactor, the regulatory body has to ensure its oversight is effective enough to assure that the licensee meets the safety goals.

At its 31st Meeting in 2014 the Committee on Nuclear Regulatory Activities (CNRA) recognised the generic aspects of regulatory oversight of the commissioning phase for new reactors as a new task for the Nuclear Energy Agency (NEA) Working Group on the Regulation of New Reactor (WGRNR). To implement the task, the WGRNR has covered generic commissioning activities. On 14-15 March 2016, the WGRNR held a joint workshop with Multinational Design Evaluation Programme (MDEP) on Regulatory Oversight of the Commissioning Phase for New reactors, in collaboration with the Korea Institute of Nuclear Safety (KINS). The main purpose of this workshop was to foster broad international co-operation and to share commendable practices and recent experience related to the commissioning of new reactors.

The workshop focused on generic aspects of the topics, including regulatory priorities and practices, the oversight and regulation of commissioning tests and activities, and commissioning issues which are not design specific. After WGRNR and MDEP members' long time review and debate of several candidate issues, 11 issues were selected:

1. Application of commissioning experience and operating experience
2. Selection of tests and acceptance of tests results
3. Configuration management reflecting design change
4. Regulatory hold points and witness points
5. Bases for inspection
6. Tests sampling criteria
7. Dealing with unexpected test results or occurrences
8. Inspection for licensee organisational readiness
9. Oversight of safety culture during commissioning stage
10. Oversight of maintenance and preservation of equipment
11. Deployment of regulatory resource

The first three issues are related to the management of the design specific commissioning issues, one important element of the commissioning plan, the next four deal with the practical cases to be encountered during regulatory oversight of the commissioning tests, and the last four are organisational capability issues, not design specific but crucial to assure safety of the facility during the commissioning and for future power operation. For this workshop they are grouped with the titles of commission management, commissioning oversight and organisational issue, respectively, and discussed in three respective groups split into three parallel sessions. The regulatory bodies from 15 countries participated in the workshop, including the members of the WGRNR and the MDEP DSWGs for European pressurised reactor (EPR), advanced pressurised reactor 1400 (APR1400), advanced passive pressurised water reactor 1000 (AP1000), advanced boiling water reactor (ABWR) and Vodo-Vodyanoi Energetichesky Reactor (VVER).

This report describes the lessons learnt and commendable practices obtained from discussions in each group, with the open questions and challenges discussed again in the closing session. The open issues and recommendations for future work, based on the closing session discussions and summarised by the organising committee, are also included.

1. COMMISSIONING MANAGEMENT

1.1 Application of commissioning experience and operating experience

For the topic of application of commissioning experience and operating experience, the following pre-workshop questions were presented:

a) Do you use commissioning experience from other reactors and/or operating experience to enhance the oversight of the commissioning phase for a new reactor? If so, describe the experience and how the oversight of commissioning has been enhanced.

b) When multiple units share the same licensing documents, do issues raised during the commissioning period of the first unit have any impact on the licensing documents of the subsequent units?

Upon reviewing the responses to the pre-workshop questions, the following points of special interest were identified.

- All use previous experience to improve regulation, with some specifically revising current inspection procedures and practices.
- Most stated that construction/commissioning/operating experience (OpE) is communicated internally and internationally.
- Some regulators maintain OpE databases for the licensees to use.
- Most countries have established processes where regulatory issues raised during the commissioning period of the first unit are applied to subsequent units (including licensing document changes).
- Two countries apply licensing to each unit individually even if same design.

The most outstanding point in the discussion was that most countries try to use previous experiences to enhance regulatory oversight of commissioning activities, while many countries have significant timespan between the last commissioning and new reactor construction. In this regard, use of construction experience database (ConEx) and information exchange in Multinational Design Evaluation Programme (MDEP) design specific working group (DSWG) meeting are commendable practices for sharing the commissioning experiences. However, ConEx information is gathered after all causal effect and corrective actions have been completed, and MDEP DSWGs meet every six months. The problem of slow information sharing is mostly attributed to report generation with translation of documents and root-cause analysis requiring much time and resources. To find a way to timely share commissioning experiences between regulators was regarded as a challenge. Another challenge is to review testing of passive systems introduced to the advanced reactor design for safety enhancement. In particular it was questioned how we can demonstrate capability of the structure, system and components (SSCs) under accident conditions.

1.2 Selection of tests and acceptance of tests results

For the topic of application of selection of tests and acceptance of tests results, the following pre-workshop questions were presented:

a) How do you check that the commissioning tests proposed by the licensee are adequate?

b) What is your position on crediting factory or qualification tests without performing new as-installed tests during commissioning? How do you deal with unsatisfied factory test results not solved before expedition on-site?

c) Do you allow a new reactor to take credit for first plant only tests (FPOT) performed at other units of the same or similar reactor design?

   – If so, which tests can be omitted and why? If not, describe your organisation's position on FPOT.

   – Are you aware of the draft MDEP European pressurised reactor Working Group (EPRWG) common position[1] addressing FPOT? Please, feel free to provide any comment.

   – How do you manage conflicts in the process of decision making that may occur about whether a certain test can be omitted or not?

   – What is your procedure for crediting the results of FPOT that has been performed under another regulatory supervision?

d) What are requirements set for tests that have never been performed before (i.e. first of a kind – FOAK)? How do you check the results of tests and their representativeness? Does the supervision of these tests differ from other tests? What are the requirements for passive safety systems testing during commissioning? How do you check the adequacy of analysis and experiment to support the passive safety systems capability?

Upon reviewing the responses to the pre-workshop questions, it was identified that the approaches for test selection vary by countries.

- Most regulators review the commissioning tests (CT) for adequacy focused around safety functions and acceptance criteria.
- In one country, the regulator determines the CT.
- Most countries would allow crediting factory testing for CT with regulator review and approval, and for some inspection of test, two stated CT had to be at site.
- All regulators require failed factory tests to be retested and three countries stated it can be retested on-site with reason).
- Most regulators have greater focus on FOAK testing.
- Some regulators use independent review/research/testing for passive system analysis.

1. MDEP DSWG developed a draft version of common position on FPOT, to define FPOT concept selected as one of common topics in a number of workshops, In the paper, FOAK is defined as a test for a new feature of the design or a new concept applied to the design, which has never been performed before (e. g. during factory acceptance tests), and FPOT is a FOAK test that is performed only on the very first unit of a specific design to be commissioned.

During the discussion it was identified that not all the countries recognise FOAK and FPOT terminology.

For some countries, it is not in their regulatory frame works. Others allow crediting of FPOT on a case by case basis, based on MDEP EPR WG common position paper, but with additional regulatory review. Discussions were made on FOAK and FPOT definitions and why FPOT is conducted. Next, the preconditions for crediting FPOT (Appendix 1 of MDEP common position paper) were discussed for the following items:

- licensee responsibilities;
- justification and demonstrating the validity of FPOT;
- data sharing;
- testing and testing programme.

Based on the group discussion, the following lessons learnt and commendable practices were identified:

1) Adequate documentation and justification need to be provided to regulator to credit FPOT. Draft MDEP WG Common Position on FPOT, Attachment 1[2] covers needed documentation and justifications.
2) In some cases, commercial aspects hinder regulators from carrying out their review and assessment.

1.3 Configuration management reflecting design change

For the topic of application of configuration management reflecting design change, the following pre-workshop questions were presented:

a) How do you check design change has been reflected in the licensing documents? [i.e. preliminary safety analysis report (PSAR) vs. final safety analysis report (FSAR), test procedures, operating procedures, etc.]
b) How do you check tests are still valid when design changes are implemented during construction?
c) When and for which document do you require regulatory approval?

Upon reviewing the responses to the pre-workshop questions, the following points of special interest were identified.

- Most inspect or specify process for design/configuration control, all require notification and approval by regulator of important or safety significant design changes.
- All required notification of the regulator of changes to documents submitted as part of the licensing process.
- Most inspect that the test procedure/acceptance criteria was changed as required by the design change.

2. In common position on FPOT, Attachment 1 provides a list of preconditions for crediting FPOT for licensee's responsibilities, justification and demonstration of the validity of the FPOT, data sharing, testing and testing programme, etc.

- Some countries implied that the regulator could direct the licensee to perform specific design changes.
- One country has rigorous required change submittal.

During the group discussion, cases that deficiency of modified design and improper implementation caused events were introduced. The lesson learnt is that design modifications should be controlled in a timely manner such that all of the design changes affecting to commissioning tests are implemented appropriately as designed and should be incorporated into the all the relevant documentations. As a commendable practice, some countries have requirement for licensee to submit configuration management plan describing configuration items and baseline freezing procedures as well as change management.

1.4 Open questions and challenges for commissioning management

There were two challenges for commissioning management to bring to WGRNR or other groups:

a) How are commissioning experiences shared among the regulators in a timely manner? Report generation with translation of documents and root-cause analysis requires much time and resources.

b) How can we demonstrate capability of the passive system SSCs under accident conditions?

2. COMMISSIONING OVERSIGHT

2.1 Regulatory hold points and witness points

For the topic of regulatory hold points (HPs) and witness points (WPs), the following pre-workshop questions were presented:

a) Do you impose mandatory hold points or witness points during commissioning?

b) Do you set criteria for the acceptance of HPs or WPs (i.e. prescriptive regulatory requirement)? If so, to what extent do you involve the licensee before you impose the criteria for the acceptance of hold points or witness points?

Upon reviewing the responses to the pre-workshop questions, the following points of special interest were identified.

- One key question about mandatory HPs: safety prime responsibility of licensee versus assessment milestones for regulator.
- Most common HPs: fuel loading, approach to critical, low and high power tests.
- For some countries: hold points are more flexible and may be defined in relation to the next stage of the licensee's overall commissioning programme. Most common criteria to define witness points: importance for safety, complexity of equipment/system, first-of-a-kind (FOAK) test, next stage of licensee's overall commissioning programme.
- Acceptance criteria: mostly fixed by licensee (safety test criteria) and assessed by regulator.

In order to facilitate discussion among the participants, the following questions were posed during the group session:

- Determining HPs and WPs:
  - What are reasonable criteria to determine appropriate HPs?
  - What can be considered as a "good amount" of HPs?
  - How do you consider some graded approach to HPs and WPs?
  - How do you consider risk-informed HPs and WPs?
  - How is the licensee involved in determining HPs and WPs?
  - How to formulate and capture HPs?
- Preparation for HPs and WPs:
  - How do you ensure to be ready (regulator and licensee) for HPs (time frame, documents submitted, checkpoints defined)?
  - How do you ensure to cover all predefined HP/WPs according to licensee's schedule and regulator's means?

- Processing HPs and WPS:
  - What do you do if HPs are missed or results are not acceptable?

To draw the lessons learnt and commendable practice, the key points in the discussion were that communication with the licensee was important, particularly in determining HPs/WPs and ensuring that the regulator and licensee were ready for HPs/WPs. The other key points that were discussed were the flexibility of the regulator to assign additional HPs/WPs and to ensure safety even if there are no HPs/WPs. Reasonable criteria for determining HPs include the verification that the plant was built as licensed, judgement of the inspection team, and the results of previous tests (particularly when non-conformances were found). Reasonable criteria for determining WPs could be risk or safety significance of the component, using WPs as a tool to assess licensee capability, and determining WPs based on issues identified in similar plants.

Some other lessons learnt that were identified during the discussion are as follows:

- Reasonable amount of HPs/WPs:
  - Overall, the participants agreed that there should not be too many hold points. Two commendable approaches to ensure that there are not too many hold points were identified. The first commendable practice was for the regulatory to focus on key steps in the commissioning process. The second commendable practice was for the regulator to choose a sample of HPs/WPs from a set of HPs/WPs identified by the licensee.

- Graded approach to selecting HPs/WPs:
  - The participants agreed that there are benefits to using a graded approach to selecting HPs/WPs. Some commendable practices identified during the discussion were to select HPs/WPs, based on safety or risk significance and to select HPs/WPs in order to assess the licensee's capability. In addition, for countries that set mandatory HPs/WPs by regulation, it was agreed that the flexibility to set additional HPs/WPs was beneficial.

- Licensee involvement:
  - The participants agreed that communication with the licensee is important, but HPs/WPs should be defined by the regulator. To assist the regulator in identifying the appropriate HPs/WPs, it would be beneficial for the licensee to submit its commissioning plan, selected HPs/WPs, and/or test results to the regulatory body. Witness points may also be assigned by the regulator as a means to assess licensee capability.

- Commendable practices for formulating and capturing HPs/WPs:
  - regulations or guidance documents identify HPs/WPs;
  - license conditions can set HPs/WPs;
  - permission to proceed to next step of commissioning may be formal or informal approval;
  - flexibility to fix additional WPs/HPs.
- Commendable practices to ensure that all predefined HPs/WPs are covered:
  - Good communication about the planning allows the regular body to organise its resources to witness the selected points.

- Licensee provides results of tests prior to moving to the next phase.
- Regulator requires HPs/WPs cannot be passed without approval.
- Operating license issuance is tied to completion of HPs/WPs.

2.2 Bases for inspection

For the topic of bases for inspection, the following pre-workshop questions were presented:

a) What are the regulatory bases for inspection?

b) Is there any specific requirement regarding multi-units sites commissioning?

Upon reviewing the responses, it was noted that there are a wide range of regulatory basis documents applicable to commissioning and that the applicable documents depended on the phase. First, for siting, construction, and fabrication phases, the applicable regulatory documents included the preliminary safety analysis report (PSAR), construction application, codes and standards, and associated regulations. For the commissioning phase, the applicable regulatory documents included the PSAR, final safety analysis report FSAR, general operating rule (GOR), detailed design documentation, the commissioning programme, the license application, commissioning reports, and associated regulations. For the operating phase, the applicable regulatory documents included the FSAR, GOR, license authorisation, and associated regulations. Finally, for the decommissioning phase, the applicable regulatory documents included the decommissioning plan and associated regulations.

Regarding multi-unit sites, most countries have no specific criteria for commissioning activity itself, but regulatory concern on hazards of adjacent units resulting from construction and commissioning activities.

Under this topic, the follow-up questions, shown below, focused on managing differences between the PSAR and FSAR:

- How do you manage the differences due to design changes between PSAR and FSAR?
- How do you manage the differences due to the design changes between the submitted FSAR and the most recent version of FSAR?

Reviews and inspections were introduced as the next discussion. Questions in this area focused on the responsibilities of reviewers and inspectors and how they are managed by the regulatory bodies. This discussion was followed by one about the importance of regulatory requirements and the various countries consider important to verify that the established facilities met the regulatory requirements.

Under the scope of the licensee's activities, the questions were: how do you consider the scope of the licensee's activities to inspect? And are there any experiences with inspections in the pre-licensing phase? Pre-licensing was introduced to be defined as prior to the receipt of a construction permit. If so, what challenges were there?

Lessons learnt and commendable practices identified during the discussion are as follows.

- Practices for managing the differences between the PSAR and FSAR reports:
  - One approach was to review the design changes as part of the assessment of the FSAR and prior to the issuance of the operating licence. In the PSAR stage, prior to the issuance of the FSAR, there may be some design changes that happened during that period, but those changes aren't reviewed as they happened. They are reviewed once the FSAR is submitted

and everything is verified prior to receiving final approval to operate from the regulatory body.

  - The other approach was that some regulators would request the PSAR be revised when the design changes occur. The PSAR revisions are reviewed as they come in.

- Managing the differences between the submitted FSAR and the most recent version of FSAR:
  - First approach was discussed that resident inspectors would have access to the most recent FSARs on-site and would be able to review those design changes as they come in.
  - Another approach would be for the regulations to require periodic updates to the FSAR.
- Split of review and inspection responsibilities:
  - Some countries had different staff members to perform review and inspection, while other countries had inspectors to play both functions.
  - It would be great to focus sampling on safety or risk significance. Licensee QA programme for implementation is also important.
- Scope of licensee activities to be inspected depends on the mandate of the regulator:
  - Some regulators are mandated for both nuclear and non-nuclear activities.
  - In both cases, inspection activities are driven by licensee activities.
- Pre-construction phase inspections:
  - Primarily focused on quality assurance (applicant or vendor).
  - Challenges:
    - keeping up with design changes;
    - applicants/vendors capability to implement QA programmes.

2.3 Test sampling criteria

For the topic of tests sampling criteria, the following pre-workshop questions were presented:

a) What are your criteria to sample licensee's tests to be inspected?
   - various and numerous.

b) What is the basis to establish above criteria?
   - safety significance of structures, systems and components (SSCs);
   - regulations;
   - commissioning tests (CTs) licensee documents;
   - licensee quality assurance programme;
   - PSAR/FSAR;
   - feedback from commissioning activities and operating experience.

c) How do you classify the tested systems?
   - graded approach based on criteria;

- regulator following the licensee safety classification vs. pre-established list by the regulator.

Upon reviewing the responses to the pre-workshop questions, the following points of special interest were identified:

- The test sampling criteria are various and numerous depending on the country.
- Take account of findings during CTs documentation assessment
- Use probabilistic tools in order to identify items with high safety/risk significance.
- Guide/Manual dedicated or included to pre-operational testing Inspection of Nuclear Reactor Facilities → inspection on most of the inspection items and possibility to add inspection function of additional parameters, as novelty and current issues.
- Expectation to inspect all FOAK tests and any tests specified in the license.

In order to facilitate discussion among the participants, the following questions were posed during the group session:

- How do regulators take licensee's schedule into account to build an efficient inspection programme on CTs?
- Criteria to sample inspections:
  - How to determine the number of sampling and the frequency of sampling?
  - How to take account of the risk and the expected/realised performance of the SSCs?
  - What kind of graded approach?
- Compilation of criteria by a regulatory body (RB) versus compilation of criteria by an applicant:
  - Are there experiences with both approaches?
  - If criteria are set by an applicant, how are these assessed by the RB? Are there sampling criteria?
  - What percentage of commissioning tests does each regulator observe?

Based on the group discussion, the following lessons learnt and commendable practices were identified:

- Considering the licensee's schedule in building the CTs inspection programme.
  - The participants agreed that communication with the licensee is important when developing a commissioning test inspection programme. Commendable practices identified to facilitate communication with the licensee include periodic meetings, having resident inspectors on-site with knowledge of licensee schedules, and having the licensee submit information to the regulator on upcoming tests, hold points, and witness points.
- How to determine test sampling criteria (number and frequency).
  - During this discussion, the participants agreed that regulators having the flexibility to adjust the sample are important. There were also three commendable practices in developing test sampling criteria identified during the discussion. The first commendable practice was to develop the criteria on a design-specific or situation-specific basis. In either case (design-specific or situation specific), the criteria could be developed based on the safety or risk

significance of the system, operating experience, the complexity and uniqueness of the test, or the entity performing the test and their capability. Other commendable practices included developing the test criteria based on regulatory guidance or based on the judgement of the inspectors.

- Considering the intelligent customer or licensee in establishing sampling criteria:
  - flexibility is important;
  - regulatory body may choose to align with sampling criteria of the licensee/subcontractor or to look at other areas not sampled by the licensee/subcontractor.
- Percentage of CTs observed:
  - no fixed percentage, but commonly mentioned ranges: 25-45% or 80-100%;
  - percentage observed depends on the phase of commissioning.

2.4 Dealing with unexpected test results or occurrences

For the topic of dealing with unexpected test results or occurrences, the following pre-workshop questions were presented. Also included below are the responses:

a) How do you check that licensee's processes are adequately established to deal with the situation of unexpected test results or occurrences?
   - licensee's identification and reporting to the RB;
   - review of licensee documents;
   - inspection;
   - licensee's QA programme defined and implemented.

b) How do you determine that licensee's implementation and follow-up corrective action are adequate in the case of the unexpected tests results or occurrences?
   - inspection by the RB;
   - licensee reports corrective action.

Upon reviewing the countries' responses to the pre-workshop questions, the following points of special interest were identified:

- Licensee's process for dealing with unexpected test results or occurrences should be defined and its implementation should be assessed (inspections) before and during commissioning phase.
- Reporting all non-conformances early to regulator body seems absolutely necessary before submitting final result of tests.
- A strong link needs to exist between on-field and designer staffs (licensee)/on-field inspector and assessment staff (regulatory body) to deal with non-conformances (licensee and RB).

In order to facilitate discussion among the participants, the following questions were posed during the group session:

- Before commissioning, how do other countries incite licensee to deal with deviations in a timely manner despite there is no immediate safety issue?
- In overall CTs programme, are detailed pre-requisites fixed for each phase? How to deal with deviations not yet solved concerning these pre-requisites?
- If unexpected inspection results or occurrences (including findings, non-conformities, etc.) are identified, how far does the RB investigate and follow up such issues or occurrences? What actions does the RB take towards the licensee?
  - Non-conformity control (how far, how to require).
  - Corrective measures (how far, how to require).
  - Actions to prevent similar event (how far, how to require).

Based on the group discussion, the following lessons learnt and commendable practices were identified:

- Key points:
  - Regardless of the authority of the inspector, dealing with non-conformances and unexpected test results should be a cornerstone of the licensee's responsibilities.
  - QA management is important to ensure that unexpected test results, deviations, and occurrences are not repeated.
- Commendable practices for dealing with unexpected test results, occurrences, and deviations:
  - Retest may be required.
  - Equipment may be returned to manufacturer.
  - Acceptance criteria may be modified with approval from regulator.
  - Tests may be postponed to the next phase provided that a justification is given and approved by the regulator.
- Commendable practices for dealing with unexpected inspection results and occurrences:
  - Licensee is typically expected or required to perform corrective actions and report to the regulatory body.
  - Regulatory body may follow up on corrective action.
  - Additional analysis may be warranted depending on the safety significance of the issue.
  - It may be necessary for the licensee to receive regulatory approval prior to proceeding to the next stage of commissioning.

2.5 Open questions and challenges for commissioning oversight

There was a list of questions for commissioning oversight which the group couldn't come to a consensus on, and to be brought to WGRNR or other groups. The questions included:

1) How early in the licensing process should hold points and witness points be discussed with the applicant?
2) Does the regulator have the flexibility to deal with a test result that does not meet the acceptance criteria?

3) For agencies with only a nuclear mandate, are there opportunities to work with other agencies on commissioning?
4) What are commendable practices for ensuring that the SAR is updated as the design changes?
5) How do you consider non-technical concerns (i.e. training, capability of the licensee, etc.) in determining witness points?
6) How do you assess the results of commissioning activities?
7) What are commendable practices to review justifications to proceed after an acceptance criterion has not been met?
8) How do we ensure that the licensee takes the appropriate preventive actions in order to ensure that commissioning lessons learnt are incorporated in a timely manner?

3. ORGANISATIONAL ISSUES

3.1 Inspection for licensee organisational readiness

For the topic of inspection for licensee organisational readiness, the following pre-workshop questions were presented:

a) How do you verify the organisational readiness of the licensee and its contractor organisations to commence commissioning? This may include areas such as competence, resources, management and supervision, decision making, etc.

b) How do you confirm that interfaces between the licensee and other key organisations (manufacturer, vendor/designer, major contractors, etc.) are clear, robust and effective?

Upon reviewing the responses, the following points of special interest were identified:

- All countries agree on the major elements, such as organisation, process, people, that constitute organisational readiness, even if different approaches are used for assessment.
- Regulatory engagement is primarily through the licensee, not directly with contractors.
- Regulator's role is to focus on licensee's performance and methodology for achieving required result, not to double check everything.

In particular it was noted that most regulators do document reviews and inspections but there are no common approach and success criteria to evaluate the impact of organisational aspects. In order to facilitate discussion among the participants, two aspects were majorly discussed as follows:

- For organisational readiness, all countries look at aspects of organisational readiness, but range of topic areas addressed and approach to gathering information varies. Why?
- For interfaces between licensee and other stakeholders, some do not and focus on licensee control.
  - What areas should be covered in organisational readiness assessments?
  - How should regulatory assessments of licensee readiness be carried out, and which specialists are usually involved?
  - Most regulators do document reviews and inspections, but can we draw out learning from experience on what went well and what did not go well?

Based on the group discussion, the following lessons learnt and commendable practices were identified:

1) Benefits of encouraging robust licensee's internal regulator/assurance function are evident.
2) It is important that the licensee is "intelligent customer".

3) If organisational readiness is not planned well in advance, it may lead to problems later on (for examples, poor handover to operation).
4) Third party readiness reviews (e.g. operational safety review team – OSART) give valuable feedback.
5) Start of commissioning is a major shift in responsibilities and activities to be performed; process for management of organisational change should be applied.

3.2 Oversight of safety culture during commissioning stage

For the topic of oversight of safety culture during commissioning stage, the following pre-workshop questions were presented:

a) How do you confirm that the safety culture of the licensee and its contractors is appropriate to commence and conduct commissioning?
b) How do you check that events and near misses are reported openly by the licensee and its contractors, and that learning is acted upon?

Upon reviewing the responses, it was noted that all countries recognise the significance of safety culture, and a regulatory approach to safety culture during commissioning is similar to operating sites but focus differs. In particular different countries have very different approaches to regulatory engagement on safety culture: targeted assessments, observation during "normal business", focus on management systems and limited engagement. Also, all expect near miss/event reporting but the issue was how effective regulators are in ensuring that learning is acted on by licensee.

- What is special about commissioning that warrants a particular focus on safety culture?
- What aspects of licensee safety culture should the regulator focus on during preparation for commissioning?
- What lessons have been learnt from safety culture assessments and interactions during commissioning stages?

To draw the lessons learnt and commendable practices, some examples were discussed as challenges to threaten safety culture during commissioning. First, start of nuclear commissioning means step increase in risk of accident leading to radiological release while pressure (on licensee and on regulator) due to time schedule or commercial reasons, also personal pressure on personnel to complete their tasks. Second, at the beginning of commissioning there are probably organisational changes and/or new organisations and personnel. There was another first-of-a-kind (FOAK) testing needs questioning attitude. Some other lessons learnt that were identified during the discussion are as follows:

- Start work on safety culture early.
- Regulator needs to understand safety culture and resource to engage licensee.
- Indications of poor safety culture should be acted upon (before something happens).
- Some countries felt they could do more structured safety culture engagement.
- Having passive safety features does not lessen the importance of good safety culture.

3.3 Oversight of maintenance and preservation of equipment

For the topic of oversight of maintenance and preservation of equipment, the following pre-workshop questions were presented:

a) How do you ensure the commissioning activities do not adversely impact the facility (e.g. settings)?

b) How do you ensure that the licensee, equipment installer and equipment supplier are aware of, and account for, environmental and other conditions that newly installed equipment may be exposed to prior to commissioning and operations (e.g. potential for heat, condensation, dust, impact, etc.)? How do you ensure that responsibilities for maintaining installed equipment prior to commissioning are clearly defined? When does the clock start for maintenance and periodic testing?

Upon reviewing the responses, the following points of special interest were identified:

- Some regulators engage early to ensure licensee makes provisions for protection of equipment during commissioning.
- Most expect licensees have procedural arrangements to protect already installed equipment.
- Some have found problems with licensee control and preservation of equipment conditions.
- Most regulators expect licensee to take responsibility for equipment from, at latest, start of cold functional test (CFT).
- "Start clock" for periodic maintenance can vary – generally cold functional test (plus "routine" maintenance work earlier).

To facilitate the discussion, the following questions were posed during the group session:

- How do regulators satisfy themselves that there is a smooth handover of responsibility for equipment from installer to licensee?
  - What learning is there on oversight of handover? What went well and less well?
- What steps do regulators expect the licensee to take to ensure that arrangements for maintenance and preservation of equipment during commissioning are effective?
  - What regulatory scrutiny of the licensee's maintenance and equipment preservation takes place?
  - Have there been problems? What learning is there on how to avoid them?

Based on the group discussion, the following lessons learnt and commendable practices were identified:

- Interface between construction and operation can be problematic if the two teams do not agree on the completeness of the installation work. Schedule pressure may cause the constructions team to handover equipment which is not ready for testing or operation.
- If handover from construction to commissioning is made while there are still open issues, attention must be paid to who has responsibility of closing the issues.
  - Long preservation time due to delays is a source of problems.
  - Role of on-site inspectors is essential in oversight of maintenance and preservation.
  - Some evidence of regulator itself not being joined up where responsibility transfers from one group to another.

- Commendable practices:
  - Licensee has robust criteria and arrangements for handover from construction to operations.
  - Licensee ensures that responsibility for preserving installed equipment is clearly defined and supported by robust arrangements.
  - Regulator ensures that their responsibilities and processes are clearly defined (e.g. when responsibility for oversight transfers from one section to another).

3.4 Deployment of regulatory resource

For the topic of deployment of regulatory resource, the following pre-workshop questions were presented:

1) How do you determine, prioritise and manage regulatory resource needs to oversee commissioning?
2) How do you ensure that regulatory oversight keeps pace with commissioning and does not unnecessarily impact on the licensee's schedule?

Upon reviewing the responses, it was identified that the regulators generally prioritise their commissioning activities on the basis of safety significance. Usually emphasis is placed on early access to licensee commissioning schedule and safety submissions such as to enable regulators to plan and to clarity for licensee on regulatory areas of interest. Of course for the inspection of the commissioning tests the approaches can differ, including direct witnessing of selected tests and oversight of licensee arrangements and results. So a good communication between regulator and licensee is always key. The following considerations were raised during the group session:

- How do you decide what level of regulatory resource is assigned to oversight of commissioning activities?
  - What informs your resource deployment planning?
- What amount of regulatory resource (full time staff numbers) is actually deployed to commissioning work?
  - Learning from those who have commenced commissioning.
- How does the regulator prepare for, and deal with, unplanned licensee schedule or commissioning test changes?
  - Do you plan for such circumstances: if so what assumptions are made?
  - What interaction takes place with licensee to ensure plans align?
  - Is the regulator flexible and adaptable to schedule changes?

Based on the group discussion, the following lessons learnt and commendable practices were identified:

- Large variations (6 months – 10 years) in how far into the future regulators plan their strategic bids for resource (top-down).
- Most regulators plan their tactical oversight tasks based on licensee's testing programme (bottom-up) – regular dialogue on schedule is a good practice as helps regulators to plan.

- In practice regulators recognise need to flex resource deployment as schedule vulnerable to change – requires prioritisation.
- For oversight of commissioning, use of external support is very limited.
- Oversight of commissioning on-site takes approximately 2-10 inspectors.
- Skills needed by regulator change as enter commissioning – plan for recruitment and development.

3.5 Open questions and challenges for organisational issues

There were two challenges for organisational capability to be brought to the Working Group on the Regulation of New Reactors (WGRNR) or other groups:

1) How to evaluate their impact of requirements for organisational aspects?
2) What are the success criteria? Traditionally regulators' focus has been on engineering, not on organisational aspects, and this is a challenge for the regulators.

4. CONCLUSION AND ISSUES FOR FURTHER WORK

In the group discussion of this workshop, the key lessons learnt and commendable practices are summarised as follows.

Commissioning management

1) For application of commissioning experience and operating experience:
   - Use of construction experience database (ConEx) and information exchange in Multinational Design Evaluation Programme (MDEP) design specific working group (DSWG) meeting provide a means to share the commissioning experiences, however, it is needed to find how to timely share commissioning experiences between regulators.
   - For the passive systems and components with scarce operating experience, their functional capability needs to be demonstrated under accident conditions.
2) For selection of tests and acceptance of test results, adequate documentation and justification need to be provided for regulator, so first plant only tests (FPOT) can be credited, as seen in the "MDEP WG Common Position on First Plant Only Tests".
3) For configuration management reflecting design change:
   - Design modifications should be controlled in a timely manner so that all of the design changes affecting to commissioning tests can be implemented appropriately as designed.
   - Licensee should submit the configuration management plan, describing configuration items and baseline freezing procedures as well as change management.

Commissioning oversight

1) For regulatory hold points (HPs) and witness points (WPs):
   - Communication with the licensee is important in determining HPs and WPs which should be defined by the regulators. The regulator can be assisted by the licensee who submits its commissioning plan, selected HPs and WPs, test results, etc.
   - Flexibility is important in assigning HPs and WPs, with reasonable criteria of the following considerations:
     - For HPs, verification that the plant was built as licensed, judgement of the inspection team, and the results of previous tests.
     - For WPs, risk or safety significance of the component, assessment of licensee capability, and issues identified in similar plants.
2) For bases for inspection:
   - Maintenance of safety analysis report is important although different practices exist in managing the differences between the PSAR and FSAR, and the differences between the submitted FSAR and the most recent version of FSAR.

- Focus should be on safety or risk significance, in addition, the licensee quality assurance (QA) programme for implementation, regardless of whether the functions of the regulatory review and inspection split or not.
- In pre-construction phase, inspections primarily focus on quality assurance, while there are challenges in keeping up with design changes and in verifying applicants' and vendors' capabilities to implement QA programmes.

3) For test sampling criteria:
   - Communication with the licensee is important, in developing a test inspection programme. Periodic meeting with the licensee, resident inspectors on-site, and the licensee's submittal of upcoming tests, hold points and witness points can facilitate the communication.
   - Flexibility is important in adjusting the sampling number and frequency for inspection. In particular, the intelligent licensee can help the regulator align with sampling criteria of the licensee/subcontractor, or to look at other areas not sampled by the licensee/subcontractor.
4) For dealing with unexpected test results or occurrences:
   - Dealing with non-conformances and unexpected test results should be a cornerstone of the licensee's responsibilities.
   - QA management is important to ensure that unexpected test results, deviations, and occurrences are not repeated.
   - For unexpected inspection results and occurrences, the safety significance of the issue can warrant additional analysis or require regulatory approval prior to proceeding to the next stage of commissioning.

Organisational issues

1) For inspection for licensee organisational readiness:
   - Robust licensee's internal regulation and assurance function should be encouraged to identify and resolve some internal challenge issues.
   - Organisational readiness should be planned well in advance to avoid any problems during commissioning stage.
   - Process for management of organisational change should be applied because start of commissioning is a major shift in responsibilities and activities to be performed.
2) For oversight of safety culture during commissioning stage:
   - Work on safety culture should start early and indications of poor safety culture should be acted upon before something happens.
   - Regulator needs to understand safety culture and resource to engage licensee.
3) Oversight of maintenance and preservation of equipment:
   - Licensee should ensure that responsibility for preserving installed equipment is clearly defined and supported by robust arrangements.
   - Regulator should ensure that their responsibilities and processes are clearly defined, when responsibility for oversight transfers from one section to another.

4) For deployment of regulatory resource:

   - Regular dialogue on schedule with the licensee is a good practice, because regulators are to plan their tactical oversight tasks based on licensee's testing programme.
   - It is needed to flex deployment of the regulatory resources, taken into account the schedule vulnerable to change and prioritisation of the tasks.

Based on the panel discussions about open questions and challenges suggested in three groups, the participants drew open issues and recommendations for future work. The issues were categorised as three topics: open issues for Working Group on the Regulation of New Reactor (WGRNR); opened issues for MDEP; and key messages to industry. Detailed issues and messages elaborated are as follows:

1) Open issues for WGRNR:

   Commissioning task:

   - Criteria for selection of tests to be witnessed by the regulator (safety significance, organisational capability, etc.).
   - How do you articulate technical review and QA review (configuration management, PSAR vs. rev. of PSAR or PSAR vs. FSAR)?
   - How do you assess the results of commissioning activities?
   - Dealing with non-conformances (commissioning acceptance criteria missed) – How do we ensure that the licensee takes the appropriate preventive actions in order to ensure that commissioning lessons learnt are incorporated in a timely manner?
   - Identification of additional skills/experience needed for regulatory oversight of commissioning.
   - How early in the licensing process should hold points and witness points be discussed with the applicant?

   Within other tasks:

   - Enhance ConEx sharing experience (QA vs. timely sharing).
   - Testing of passive safety systems under design basis accident.
   - Assessment of organisational readiness: ongoing task.

2) Open issues for MDEP:

   - Develop the library for quick sharing of commissioning experience.
   - Design specific working group (DSWG): enhance exchange of information between regulator and licensee on ongoing commissioning issues.

3) Key messages to the industry:

   - Open, honest and regular communication with regulators is crucial (commissioning tests planning to be shared but also early communication of potential issues).
   - Good configuration control, reflected in PSAR and/or FSAR, is essential to support the commissioning oversight.
   - Regulators need accurate justification for crediting FPOTs and access to testing information (e.g. procedures, results).

- It needs to be ensured that there are processes and procedures in place to manage unexpected occurrence during commissioning.
- Particular attention should be given to the handover between construction, commissioning and operation phases.

APPENDIX A. POSITION PAPERS

The Position Papers are provided covering the following topic area and questions. These are the collated responses from the countries/organisations that replied to the following questions for each topic:

1. Commissioning management

1.1 Application of commissioning and operating experience

1.1.1 Do you use commissioning experience from other reactors and/or operating experience to enhance the oversight of the commissioning phase for a new reactor? If so, describe the experience and how the oversight of commissioning has been enhanced.

1.1.2 When multiple units share the same licensing documents, do issues raised during the commissioning period of the first unit have any impact on the licensing documents of the subsequent units?

1.2 Selection of tests and acceptance criteria

1.2.1 How do you check that the commissioning tests proposed by the licensee are adequate?

1.2.2 What is your position on crediting factory or qualification tests without performing new as-installed tests during commissioning? How do you deal with unsatisfied factory test results not solved before expedition on site?

1.2.3 Do you allow a new reactor to take credit for First Plant Only Tests (FPOT) performed at other units of the same or similar reactor design? If so, which tests can be omitted and why? If not, describe your organisation's position on FPOT.

1.2.4 What are requirements set for tests that have never been performed before (i.e. first-of-a-kind – FOAK)? How do you check the results of tests and their representativeness? Does the supervision of these tests differ from other tests? What are the requirements for passive safety systems testing during commissioning? How do you check the adequacy of analysis and experiment to support the passive safety systems capability?

1.3 Configuration management reflecting design change

1.3.1 How do you check design change has been reflected in the licencing documents i.e. Preliminary Safety Analysis Report (PSAR) vs. Final Safety Analysis Report (FSAR), test procedures, operating procedures, etc.?

1.3.2 How do you check tests are still valid when design changes are implemented during construction?

1.3.3 When and for which document do you require regulatory approval?

2. Commissioning oversight

2.1 Regulatory hold points and witness points

2.1.1 Do you impose mandatory hold points or witness points during commissioning?

2.1.2 Do you set criteria for the acceptance of HPs or WPs? If so, to what extent do you involve the licensee before you impose the criteria for the acceptance of hold points or witness points?

2.2 Bases for inspection

2.2.1 What are the regulatory bases for inspection?

2.2.2 Is there any specific requirement regarding multi-units sites commissioning?

2.3 Test sampling criteria

2.3.1 What are your criteria to sample licensee's tests to be inspected?

2.3.2 What is the basis to establish above criteria?

2.3.3 How do you classify the tested systems?

2.4 Dealing with unexpected test results or occurrences

2.4.1 How do you check that licensee's processes are adequately established to deal with the situation of unexpected test results or occurrences?

2.4.2 How do you determine that licensee's implementation and follow-up corrective action are adequate in the case of the unexpected tests results or occurrences?

3. Organisational issues

3.1 Inspection for licensee organisational readiness

3.1.1 How do you verify the organisational readiness of the licensee and its contractor organisations to commence commissioning?

3.1.2 How do you confirm that interfaces between the licensee and other key organisations are clear, robust and effective?

3.2 Oversight of safety culture during commissioning stage

3.2.1 How do you confirm that the safety culture of the licensee and its contractors is appropriate to commence and conduct commissioning?

3.2.2 How do you check that events and near misses are reported openly by the licensee and its contractors, and that learning is acted upon?

3.3 Oversight of maintenance and preservation of equipment

3.3.1 How do you ensure the commissioning activities do not adversely impact the facility?

3.3.2 How do you ensure that the licensee, equipment installer and equipment supplier are aware of, and account for, environmental and other conditions that newly installed equipment may be exposed to prior to commissioning and? How do you ensure that responsibilities for maintaining installed equipment prior to

commissioning are clearly defined? When does the clock start for maintenance and periodic testing?

3.4 Deployment of regulatory resource

3.4.1 How do you determine, prioritise and manage regulatory resource needs to oversee commissioning?

3.4.2 How do you ensure that regulatory oversight keeps pace with commissioning and does not unnecessarily impact on the licensee's schedule?

WORKSHOP ON REGULATORY OVERSIGHT OF THE COMMISSIONING PHASE FOR NEW REACTORS

Korea, 14-16 March 2016

GROUP 1 – Commissioning management

1.A Application of commissioning experience and operating experience

Answers	Learning
CANADA	
Canada is not commissioning any new reactors at the moment. However, experiences from two completed refurbished stations are being used for an additional two refurbishing projects. This experience can also be used to enhance the oversight of commissioning phase for new reactor. Examples of enhancements to regulatory oversight include: • prior to start of project, ensuring that adequate training to those conducting commissioning activities is provided; • ensuring there's enough staff to conduct inspections at site; • having a balanced approach in performing documentation review, field inspections and interviews of licensee staff. Another aspect is to perform licensee inspections to ensure that commissioning procedures are approved prior to use. In addition, the regulator should verify that a systematic process is in place for modifications of commissioning procedures, test plans, etc. When multiple units share the same licensing documents, regulatory issues raised for the first unit will be applied for future units to ensure that our regulatory positions are consistent. These issues are typically documented in our licence conditions handbook (which clarifies the licence conditions).	**General Learning on how other regulators deal with the topics.**
CHINA	
China Regulator always attaches great importance to experience feedback of construction, installation, commissioning and operation. According to the rules and regulations, operating unit must timely report operation event and construction incidents of nuclear power plant, and carry out analysis works to find out root cause; Technical support unit of NNSA -Nuclear and Radiation Safety Center has specially set up an Experience Feedback Department to collect and analyse operation and construction incidents nationwide, at the same time, and to tightly follow up operation incidents that occurred internationally; NNSA has organised national nuclear power plant experience feedback platform to collect and arrange operation and construction incidents of nuclear power plant, which will open to regulator staff and owner units; In order to do well in commissioning and operating experience feedback, NNSA reports typical incidents in nuclear power plants to operating units on a regular basis, at the same time, organizes experience feedback communication meeting of national nuclear power plant annually, summarising good practices and lessons learned based on experience feedback of nuclear power plant in current stage.	**What is the good practice in APR1400 inspection experience feedback?**

FINLAND	
• *Do you use commissioning experience from other reactors and/or operating experience to enhance the oversight of the commissioning phase for a new reactor? If so, describe the experience and how the oversight of commissioning has been enhanced.* STUK have used it's commissioning experience from Loviisa NPPs 1970's and Olkiluoto NPPs 1980's and large plant upgrades, modifications and modernisation projects during 1990's and 2000's to develop its regulatory guidance and practices. STUK have had a designated YVL-guide for commissioning and recently it has been integrated to the regulatory guide for Construction (YVL A.5, 2014). • *When multiple units share the same licensing documents, do issues raised during the commissioning period of the first unit have any impact on the licensing documents of the subsequent units?* STUK: Yes, issues are solved and licensing documentation (mainly FSAR) shall be updated by the licensee and approved by STUK.	
FRANCE	
• *Do you use commissioning experience from other reactors and/or operating experience to enhance the oversight of the commissioning phase for a new reactor? If so, describe the experience and how the oversight of commissioning has been enhanced.* **ASN feedback** The last oversight of CTs by ASN was in 1997 for a reactor built at Civaux. ASN developed an oversight plan of Flamanville 3 (FLA3) CTs. To elaborate this plan, the synthesis of inspections performed at Civaux between 1987 and 1997 was consulted and one inspector, working at that time, was interviewed. The feedback allowed to identify special points where particular care had to be taken. **NPP operator (EDF) feedback** **Feedback of CTs from commissioning of EDF NPPs and other EPRs (Finland, China…)** The objective of the requirement n° [INB 167-1-3] of ASN's resolution N°2013-DC-0347 (see Annex 1) is to take into account feedback from other CTs (performed previously on French reactors and performed currently in EPR in Finland and China). EDF sent in 2013 the first version of the document with an identification of good practices and significant deviations for the different CTs phases: preparation of the documentation, performing of CTs and results analysis. EDF detailed its organisation for the different phases of the CTs in FLA3 to implement these good practices and avoid such deviations. The update versions sent 2014 and 2015 with Taishan and OL3 feedbacks have a focus on the performing phase. **Feedback of specific deviations discovered during operation of EDF NPPs (they are all water pressurise reactors)** During an inspection, ASN asked EDF to investigate deviations which occurred during EDF NPPs operation and were (partially) due to a lack of commissioning tests or of tests after a design change. EDF sent a table to describe the deviations, the causes and its analysis of the possible repetition for FLA3. FLA3 CTs programme takes into account feedback except in one case	**Recommendation: as there is an important timespan between the last commissioning of a nuclear reactor in France and the commissioning of the EPR reactor in Flamanville (FLA3), having access to regulatory archives and reviewing past practices according to current regulations and current challenges is necessary. Benefiting from recent experience in commissioning oversight (i.e. from regulators which are currently overseeing plant undergoing commissioning), sharing experience between regulators that oversee the commissioning of similar plants are topics to be discussed. Handling of proprietary information and quick information on significant outcome of CT may be discussed.**

where there is a change of the operational procedure for the concerned system. Globally, the two EDF feedback documents are taken into account: • by IRSN staff when they analyse system commissioning test programmes; and • by ASN inspectors to prepare inspections in EDF engineering services on preparation of CTs documentation. • *When multiple units share the same licensing documents, do issues raised during the commissioning period of the first unit have any impact on the licensing documents of the subsequent units?* Not applicable to current situation in France.	
JAPAN	
(1) Application of commissioning experience Japan has ABWR commissioning experiences in Kashiwazaki-Kariwa Units 6/7, Hamaoka Unit 5 and Shika Unit 2. There was a failure case found in Hamaoka Unit 5 during its first periodic inspection and reflected to another NPP, Shika Unit 2, just after the start of its commercial operation. It was the failure of the turbine blade base. **(2) Sharing the same licensing documents** As licencing application of Construction Plans for installation of nuclear power reactor facilities is done unit by unit, even if the design is same as previous NPP, each unit licencing is applied individually.	**Commissioning period (from fuel loading to commercial operation start) would be about one year in the experiences. During commissioning, inspections would be conducted to check for the licensee's operational safety activities and the performance of facilities.** - **What are the matters to be focus confirmation in the tests or inspections?**
KOREA	
Answer 1.A.(1) The regulatory basis for the use of the operating experiences is the Article 10 (construction permit) and Article 11 (standards for permit) of the Nuclear Safety Act (NSA), which prescribe the mandatory submittal of description of the technical capability necessary for construction of a nuclear power plant (NPP). As such, it is stipulated that the construction and operating experiences from other reactors including the regulatory body's findings to the existing plant, occurred events from NPPs, and unsatisfactory commissioning test results, needs to be reflected through an establishment and implementation of a formal framework. Regulatory body is operating the DIOS (Dissemination of Incident & Operating Experience System), the events database from reactors either under construction or operation, and the CATS (Corrective Action Tracking System) to check whether the corrective actions are being implemented and to confirm that the operating experiences are rightly reflected upon for recurrence prevention. Such systems above are utilised in reviews and commissioning inspection stage to determine the validity of relevant content. In particular, those are mainly utilised during the site walk-down to confirm the validity of technical competence for operation. **Answer 1.A.(2)** Two units could share many of the licensing submittal documents such as Preliminary Safety Analysis Report (PSAR) or Final Safety Analysis Report (FSAR) in accordance with the Enforcement Degree of the NSA. In the review process of first unit, the validity of such documents is thoroughly reviewed while the review process of the second unit focuses on the difference from the	**Domestic experience (1.A.(1))** **The experiences from the design, construction, and commissioning of domestic NPPs were reflected upon the design, construction, and commissioning of the Shin-Kori units 3 and 4. Especially, it is confirmed that during the review and Pre-operational inspection stage, the experiences from the Shin-Kori units 1, 2 and Shin-Wolsong units 1, 2 (e.g. the regulatory findings, and design changes, and measures to prevent recurrence of the events) were well reflected upon. For instance, reflecting the case of Shin-Kori unit 2, management has been enhanced by taking measures to improve the quality management of the manufacturer-entrusted inspection agency. As for the facility, lessons from the**

first unit. If licensing document is changed due to issues raised during the commissioning period, the regulatory body reviews it in the licensing process of the first unit. After relevant document is approved and revised, regulatory body conducts the pre-operational inspection to confirm the actual actions taken to the second unit in compliance with revised document.	**failures in Shin-Kori unit 1, the turbine control circuit has readjusted the acceleration rate set point and the interlock function of condensate polishing plant has been improved.** **In particular, regarding the follow-up measures from the spray event from the Shin-Kori unit 1 (Sep. 19, 2010), it was confirmed that relevant actions were appropriately taken including:** o **1) enhanced procedure to secure the manpower in accordance with the commissioning process;** o **2) utilizing human error prevention methods for commissioning plants and enhanced training system;** o **3) enhanced operation for commissioning by reaffirming the validity of procedure compared to the existing plant;** o **4) improved inoperable signal control circuit of Plant Control System (PCS) Hand Switch; and** **5) improved bypass logic circuit for Thermal Overload Relay.** **Major operating experience reflected from other reactors [Refer to Annex 1.A.(1)]** o **Shin-Kori unit 1: Reactor coolant spray event (Sep. 17, 2010).** o **Shin-Kori unit 1: Turbine and reactor shutdown due to the exceeding of turbine acceleration rate (Nov.17, 2010).** o **Shin-Wolsong unit 1: Reactor shutdown due to the failure of the electronic card of the plant control system (March 27, 2012).** **<u>Items to be discussed during the group session</u> (1.A.(1))** **Introduction of the status on**

	Analysis data and reflection of commissioning experience of Korean standard NPP:
NETHERLANDS	
The Netherlands does not have any recent experience with new builds. Therefore there is no recent experience with respect to the oversight on the commissioning phase. However, ANVS is preparing itself for the reviewing phase of new applications (mainly aimed at a new research reactor project). A Technical Review Plan (further mentioned under 1B) is compiled that will be used as guidance document for the reviewer, but can also be used by the applicant. ANVS is also working on the necessary hold points and witness points that should be used with respect to the new build activities. At the moment it is foreseen that two licenses will be issued for the new research reactor; i.e. a construction license and an operating license. The Dutch Regulatory Body (ANVS) is working on an oversight strategy for new build activities. International experience is taken into account. A selection of Regulatory Bodies was asked to provide some of their experiences with respect to now build activities. The input of this questionnaire will be used by ANVS in order to compose its supervision strategy.	**1. Are there differences between a NPP and a research reactor with respect to the compilation of the supervision approach for the commissioning phase?** **2. If so, what are the experiences?**
RUSSIA	
Regulation of NPP safety at the stage of a NPP unit commissioning is carried out with the account of the existing Rostechnadzor's experience in safety regulation of the previously commissioned units. Evaluation of how a Licensee accounts the available Russian and foreign experience in NPP units commissioning shall be performed by Rostechnadzor in frames of a safety case review (in the course of the review of a Safety Analysis Report (SAR) submitted by a Licensee, in particular Chapter 14 "Commissioning"). In accordance with the effective regulatory documents in the field of atomic energy use, licensing and oversight by a regulatory body shall be carried out for each unit of a NPP individually. In case of detection of any problems in the course of a NPP unit commissioning (due to non-conformance of the design documentation), they are to be eliminated until transfer to the next commissioning stage of a NPP unit. This shall also be referred to the problems related to mutual influence of units constructed on the same site.	
SLOVAK REPUBLIC	
• Do you use commissioning experience from other reactors and/or operating experience to enhance the oversight of the commissioning phase for a new reactor? If so, describe the experience and how the oversight of commissioning has been enhanced. • When multiple units share the same licensing documents, do issues raised during the commissioning period of the first unit have any impact on the licensing documents of the subsequent units? In Slovak Republic there are 4 reactors (identical type WWER - 213) in operation since EBO 1984/1985 and EMO12 1998/2000, what is good assumption for enhance the oversight of the commissioning phase for next two	

similar units. The difference is in the commissioning approach. In the past there was a General supplier, who organised and coordinated all contractors, but now General supplier does not exist and these activities are covered by licensee itself. We have to take into consideration the fact, that it is more than 15 years, when the last reactor was put into operation, therefore the knowledge management had to be implemented by the licensee, but also it was a challenge for regulatory body. The commissioning activity will be led by Control and Coordination Committee of the Commissioning – the highest managing body of non-active tests and commissioning. It consists of licensee representatives, heads of working groups for commissioning and appointed contractors´ representatives. Scientific and Technical Commissioning Support Team - a group of experts for scientific and technical support to commissioning nominated by Research institute of Nuclear Power Plants and approved by the management of licensee will provide independent support to the Commissioning unit during the commissioning. Through specialised and expert activities it will perform supervision over the fulfillment of requirements for ensuring nuclear safety in the course of commissioning. It will perform supervision over the scientific and technical levels of commissioning programmes, supervision over the incorporation of nuclear safety requirements into the commissioning programmes and checks the course and results of the commissioning. During commissioning will be permanently available on site also a group of experts from designer of the Project. The Regulator will use the consortium of external technical support organisations for Non active testing (NaT) and commissioning from Czech Republic, with commissioning experience from reactors WWER. When multiple units share the same licensing documents all issues raised during the commissioning of the first unit have impact on the licensing documents of the next unit, because all experiences and new knowledge have to be considered and incorporated. In our case there is a proposal to issue one Authorisation for the operation for both units, nevertheless second unit will be commissioned at least 12 months later, because also one construction permission was issued. In the Authorisation for the operation there will be conditions, which have to be fulfilled for commissioning of 2nd unit. The one of steps our commissioning licensing is permission for handling with Nuclear Material (NM) in Nuclear Facility with required documents: Plan for handling and transport NM and Radioactive waste (RW), plan for Physical protection. The next steps are Commissioning permission and Permission for temporary using civil with required documents: Limits and conditions for safe operation, List of classified equipment, programmes of testing classified equipment specified by the Authority, Commissioning programme of a nuclear installation broken down to phases, Programme of operational controls of classified equipment, Quality management system documentation and requirements for quality of a nuclear installation, Operating regulations specified by the Authority, On-site emergency plan, Pre-operational safety report, Probabilistic safety assessment of operation for shutdown reactor and for low power levels, as well as for the full reactor power for nuclear installations with nuclear reactor, Physical protection plan, including the contract with the Police Corps, as well as the description of the method of implementing aviation operations at the premises or in the vicinity of a nuclear installation, Plan for radioactive waste management, spent nuclear fuel management including their shipment, Conceptual decommissioning plan for the nuclear installation, Document supporting the secured financial coverage for liability for nuclear damage, except the repository, System of training for	

the employees, Training programmes for licensed employees, Training programmes for professionally competent employees, Documents on meeting the qualification requirements for licensed employees and professionally competent employees, Documents on readiness of the nuclear installation for commissioning, for the trial operation, report on evaluation of the commissioning of the nuclear installation and of permanent operation, report on evaluation of the trial operation, Off-site emergency plans for the regions in the emergency planning zone, Demarcation of boundaries of the nuclear installation, Demarcation of the size of the emergency planning zone for the nuclear installation.	
UNITED ARAB EMIRATES	
1. In the United Arab Emirates (UAE), lessons learned from commissioning experience and operating experience, is incorporated into the arrangements for the Barakah NPP project in a number of ways. (a) The Licensee is required by Regulations (REG-14 Article 5 Para 8) to apply lessons learned from commissioning experience at the reference Facility and other similar Facilities to address safety issues. (b) The Licensee's operating experience programme, which is overseen by the Regulator, incorporates the screening, and learning of lessons where relevant, of both internal and international (WANO and INPO) events. (c) Commissioning experience and operating experience gained during the commissioning of Shin-Kori 3/4 (the reference APR-1400 units for Barakah NPP) is provided to the UAE Licensee and Regulator and any relevant learning lessons are incorporated into the commissioning programme. (d) Commissioning experience from the UAE Licensee is required to be reported to the Regulator and is evaluated within the Regulatory operating experience programme to ensure that root causes have been effectively identified and appropriate corrective actions have been put in place. (e) The UAE Regulator, FANR, has an operating experience programme (CP.7 Construction and Operating Experience Procedure) which is in accordance with international standards including IAEA SSR-2/2 and NS-G-2.11. This programme includes the review of international experience from the NEA/IAEA International Reporting System (IRS), which includes a limited number of commissioning events and the NEA ConEx database which includes a greater number of commissioning related events. All these events are reviewed by the Regulatory screening process to identify and implement any lessons for the Regulatory process or for the Licensee. (f) To supplement the above processes, specific monitoring of information related to the construction and commissioning activities at Olkiluoto and Flamanville are reviewed by FANR to identify any issues which may be relevant to FANR or Barakah NPP.	**How can the timescales for sharing commissioning event experience be shortened? The international event reporting systems (IRS, ConEx) can take months/years for an event to be reported. By this time the particular commissioning activity related to the event may have already finished on another NPP being commissioned, hence the opportunity to learn may be missed.**
UNITED KINGDOM	
• Do you use commissioning experience from other reactors and/or operating experience to enhance the oversight of the commissioning phase for a new reactor? If so, describe the experience and how the oversight of commissioning has been enhanced There is limited NPP commissioning experience within the ONR; the last NPP to be commissioned in the United Kingdom was Sizewell B which entered	**Provision of temporary services to support commissioning activities?** **Preservation of installed plant prior to commissioning?**

commercial operation in 1995. However lessons learnt reports from industry have been reviewed to identify what went well and what could be improved. IAEA Safety Guide SSG-28 reflects experience from the commissioning of Sizewell B; this guide is used to inform ONR's approach to the regulation of commissioning activities. A limited number of other nuclear facilities have been commissioned in the United Kingdom in more recent years and new plant has been commissioned on the existing fleet of operating reactors. ONR periodically reviews its internal assessment principles and assessment guides (which both address oversight of commissioning activities) to capture any relevant learning from the United Kingdom and internationally. The recent update to the assessment principles saw the inclusion of the requirement to test as far as reasonably practicable equipment provided to mitigate severe accidents. The ONR commissioning assessment guide has recently been reviewed against SSG-28. • When multiple units share the same licensing documents, do issues raised during the commissioning period of the first unit have any impact on the licensing documents of the subsequent units? ONR require the licensee for a multiple unit NPP to have appropriate arrangements for reporting incidents and issues arising during the commissioning of earlier units and that appropriate corrective action is taken to avoid a similar incident or issue affecting the following unit. ONR looks to the corrective actions to include all reasonably practicable measures to modify the plant design, safety case documentation, commissioning and operating procedures for subsequent units.	
UNITED STATES	
• Do you use commissioning experience from other reactors and/or operating experience to enhance the oversight of the commissioning phase for a new reactor? If so, describe the experience and how the oversight of commissioning has been enhanced. The collection and review of operating experience is a continuous process. The NRC has a group dedicated to reviewing operating experience (OpE) with technical subgroups to evaluate issues for actions by the NRC, our licensees or suppliers. The NRC also has a construction operating experience group that specifically looks at construction experience. Information and lessons learned gathered by these two groups is incorporated into the NRC's oversight process. The NRC periodically reviews NRC procedures and Regulation Guidance to see if they need to be updated. As an example Regulatory Guide (RG) 1.68, "Initial Test Programs (ITPs) for Water-Cooled Nuclear Power Plants", was updated in 2013 based on operating experience and to address new reactor designs. The NRC procedures for inspecting the initial test program, inspection procedure (IP) 70367 "Part 52, Inspection of Preoperational Test Program," IP 70702 "Part 52, Inspection of Preoperational Test Performance", and IP 72401 "Part 52, Inspection of the Startup Test Program" were revised in 2014. IP 72304, "Startup Testing for the AP1000: Test Procedure Review, Test Witnessing, and Test Results Evaluation", is under revision. Use of operating and construction experience improved the IPs in two ways. First, the NRC found that repeating technical detail from the Final Safety Analysis Report (FSAR) in procedures could lead to problems for the NRC inspectors as FSARs changed. As a result, the IPs have been modified to reference the source of technical information (e.g., FSAR) so the most current information is provided to the inspectors. Second, the NRC	**Do you have dedicated commissioning inspectors and how do you train them?**

included more focus on test, pre-job briefings, communication, command and control. In addition, the NRC has developed a presentation for training of the inspectors for commissioning based on prior commissioning and operating experience. Links for the references are as follows: RG 1.68 http://pbadupws.nrc.gov/docs/ML1305/ML13051A027.pdf IP 70367 http://pbadupws.nrc.gov/docs/ML1325/ML13253A101.pdf IP 70702 http://pbadupws.nrc.gov/docs/ML1329/ML13294A482.pdf IP 72401 http://pbadupws.nrc.gov/docs/ML1409/ML14099A269.pdf IP 72304 http://pbadupws.nrc.gov/docs/ML0536/ML053620357.pdf • When multiple units share the same licensing documents, do issues raised during the commissioning period of the first unit have any impact on the licensing documents of the subsequent units? In most cases, changes in the licensing documents will require changes to all the units that share the same licensing documents. Specifically for the 4 AP1000 units under construction in the United States changes have been submitted together or nearly at the same time for all the units. The response to Question 1C explains more about the design and configuration control requirements. Where an issue is raised during the commissioning phase NRC inspectors and management share operating experience through direct communication, electronic media, and meetings.	

1.B Selection of tests and acceptance of tests results

Answers	Learning
CANADA	
CNSC requires commissioning tests to be performed for each reactor, irrespective of the availability of similar or identical tests from other units or tests that have been done elsewhere. The applicant may submit their proposal to omit certain tests; however, they must submit a request for acceptance (by submitting additional information) to justify that tests done elsewhere are adequate. CNSC staff will make a determination whether certain tests can be omitted or not. Should there be disagreements between CNSC and the licensee, there is a protocol in place to resolve difference of opinions between our staff and the licensee's. The amount of oversight will be based on the technology, the amount of modular construction and documented in a project-specific plan. CNSC will ensure that the licensee has established clear acceptance criteria for tests results. We will also have research funding in place to allow a third party to evaluate the submitted results. For passive safety systems testing, the licensee will need to demonstrate that there is: • adequate testing during the manufacturing stage; • sample testing from those components received from the manufacturer. Again, CNSC will have research funding in place to verify the results of the passive safety systems capability if needed.	

CHINA	
Selection of tests: Based on six selective principles, that is, uniqueness, importance of safety, complexity, related tests to three shields, test balances and risks, with the combination of commissioning experiences of CPR1000 units, we score the commissioning tests of AP1000 and EPR, 79 and 79 tests are selected for AP1000 and EPR respectively. Corresponding inspection procedures are compiled for each selective test. For EPR, there are 5 EPR FPOT and 13 TAISHAN Unit 1 FPOT. Now all procedures for FPOT have been compiled. Corresponding commissioning inspection procedures have been compiled. **Acceptance of test results:** Operation unit must firstly compile commissioning programme and commissioning quality assurance program. The commissioning programme has been defined all commissioning tests and acceptance criteria (incl. safety criteria and operation criteria) for each test item based on requirements from NNSA. These two documents must be fully inspected and reviewed by NNSA before beginning of CFT, which including review on the rationality of test setting, the adequacy of acceptance criteria, the satisfactory of inspection requirements and the like. All test results will be accepted by regulator after satisfying acceptance criteria of approved commissioning program. Furthermore, For those major items like test results of FPOT and EPR important tests, they shall be reviewed and admitted by NNSA after complete site inspection and witness. For the major commissioning tests, NNSA will set up general technical expert mechanism. General technical expert, inspector, technical supporting personnel, total five or six people composes of an inspection group to joint finish site inspection. To guarantee inspection efficiency, NNSA coordinates with operational units to submit test schedules and evaluation materials one month prior to start of tests, and re-check report one week before start of tests. Tests can only be performed upon review of site inspector and confirmation of prerequisites. NNSA carries out inspection according to commissioning inspection procedure/control point inspection procedure and review again on test results.	**How much tests have been selected as inspect items in APR1400? What are the selection criteria? What is the differentia of inspection between unit 1/2 and unit 3/4 in Shin Kori?**
FINLAND	
• *How do you check that the commissioning tests proposed by the licensee are adequate?* STUK: Overall commissioning plan and all the commissioning testing programmes are submitted to STUK, and for safety classified systems STUK approval is needed before start of the test. In the review of the commissioning testing programs, STUK focuses on the coverage and acceptance criteria of safety functions. STUK also inspects licensee's procedures for preparing/evaluating the commissioning testing programs. • *What is your position on crediting factory or qualification tests without performing new as-installed tests during commissioning? How do you deal with unsatisfied factory test results not solved before expedition on site?* STUK: Site commissioning activities shall concentrate on tests, that cannot be carried out in factories or during qualification (e.g. system commissioning, testing safety functions and performance test in final configuration. STUK shall oversee (case by case) and approve factory or qualification tests. In case	**Regulatory approach for FOAKs?** **Definition of FOAK in different member countries? How FOAKs elsewhere can be credited?**

of a failed factory test, the priority is to retest, but in some cases the tests can be carried out at site. • *Do you allow a new reactor to take credit for first plant only tests (FPOT) performed at other units of the same or similar reactor design?* STUK: YES, STUK's regulatory guidance do not deny crediting FPOTs. • *If so, which tests can be omitted and why? If not, describe your organisation's position on FPOT.* STUK: Approvals of FPOT testing shall be done case by case. STUK shall evaluate that the same level of safety is ensured in FPOT as Site testing. • Are you aware of the draft MDEP EPRWG Common Position addressing FPOT (see Attachment 6)? Please, feel free to provide any comment. • STUK: Yes, STUK is aware of MDEP EPRWG Common Position – STUK participated in drafting the document. • How do you manage conflicts in the process of decision making that may occur about whether a certain test can be omitted or not? • STUK: It is Licensee's responsibility to make its safety case and justify in the commissioning plan and commissioning programmes which test can be omitted. STUK shall give its regulatory position based on its review. • What is your procedure for crediting the results of FPOT that has been performed under another regulatory supervision? STUK's regulatory position is based on MDEP EPRWG Common Position addressing FPOT • *What are requirements set for tests that have never been performed before (i.e. First-Of-A-Kind –FOAK)? How do you check the results of tests and their representativeness? Does the supervision of these tests differ from other tests? What are the requirements for passive safety systems testing during commissioning? How do you check the adequacy of analysis and experiment to support the passive safety systems capability?* STUK: No specific requirements in the regulatory guidance for FOAK tests. Supervision depends on the safety significance of the FOAK. If a FOAK test demonstrates a feature/function important to safety, STUK will witness the tests, and may ask the licensee for some further justification for the adequacy and representativeness of testing. Case-by-case evaluation. No specific requirements for passive systems concerning commissioning.	
FRANCE	
• *How do you check that there are enough commissioning tests defined by the licensee? What is your position on crediting factory or qualification tests without performing new tests during commissioning tests?* The licence condition [INB 167-A] (in Annex 1) specify the necessity to have a test, control or other mean for checking compliance for each equipment with requirements in the licensing basis, included the PSAR, the FSAR and the environmental impact assessment. This licence condition define the CTs tests carried out within the perimeter of FLA3 once systems important to safety have been built or installed on site. In addition of CTs programs, ASN requested, with the licence condition [INB 167-E], a document describing the complementarity of CTs with tests and controls performed earlier, in order to meet the objectives set by requirement [INB167-A]. **<u>Technical assessment of the licensee's documentation</u>** <u>For systems important to safety</u>	**Learning: At the beginning, inspections revealed that the licensee wasn't in compliance with the requirement [INB 167-E] as input data was not fully capturing claims presented in the licensing basis. The licensee now elaborates Analysis Notes (NAS) of CTs Sufficiency. It uses as input data the list of functional requirements for systems. Developing these notes allowed EDF to identify the need for additional CTs.** **Challenge: The assessment of**

EDF has four main kinds of documents for commissioning tests : • CTs programmes with a general description of all the tests for one system (principle, criteria, CT sequence of operational procedures…). • Operational procedures which describe all steps for each sequence of CTs programmes. • "Typical guide" which are operational procedures for equipment like pumps or valves: these guides allows to have less voluminous CT documentation and to implement the same kind of tests for same kind of equipment. • Analysis Notes of CTs Sufficiency (NAS) elaborate by the licensee to be compliant with the requirement [INB 167-E]. The aim of these notes is to check the systematic existence of a control or a test for each requirement of the PSAR, the FSAR and the environmental impact assessment. To assess sufficiency of the CT for a system important to safety, it is checked for each FSAR requirements that a CTs exist, its configuration and if a transposition is needed, whether it is correct. If there is no CTs, ASN checks if there is another test or control or another justification and whether it is satisfactory in relation to safety analysis. If the test strategy is based on several partial tests performed either on factory or on site, all the partial tests put together must be equivalent to an overall test. NAS allows for crediting factory or qualification tests, thus avoiding performing tests during commissioning tests. In fact, some accidental conditions can't be reproduced during CT. In this case, there is a transposition from appropriate measurements obtained during CT and the same measurements obtained during factory or qualification test. There is a column in the NAS to indicate the transposition and it is detailed in the system CTs programmes. ASN requested IRSN to assess the CT programmes. To assess sufficiency of the commissioning tests, a sample of system CTs programmes and typical guides have been selected. The criteria to make the selection were: • Nature of fluid conveyed (water, steam, air, electricity), • Organisation responsible for elaborating CT documentation (vendors, contractors, licensee departments…), • Systems very significant from a safety point of view or with design significantly different from the one of operating reactors in France. Based on these criteria, a batch of system CTs programme to be assessed has been agreed between ASN and its TSO (IRSN). This selection represents roughly 25% of licensee CT documents for systems important to safety. IRSN is formalising its assessments in specific opinions sent to ASN. In addition, IRSN produced also a general opinion on cross-cutting issues. <u>For systems classified for environmental protection</u> ASN inspected EDF engineering services on the preparation of the GWPS CTs programme to check its sufficiency. GWPS was chosen because EPR design has major differences compared to the NPPs currently in operation in France. The general approach is the same as the one on systems important to safety, whereas the reference document is environmental impact assessment instead of (P)SAR. **<u>Inspections</u>** During inspections the documents which describe EDF organisation to prepare CTs documentation are reviewed, to check consistency with	**EDF CTs documents showed lack of completeness of NAS for requirements for passive systems checked by calculation (and not by tests).** **In addition, there is ongoing discussions with the licensee when the safety function is only credited by a qualification test. ASN and IRSN consider they are one part of the demonstration whereas the licensee wants to separate the CT and qualification process:** **- The licensee doesn't want to list qualification tests in the NAS because all information is in the qualification documents;** **- ASN considers the NAS as a global overview of the verifications needed and each test useful to check requirements in the licensing basis, included (P)SAR and environmental impact assessment has to be listed.** **Question: Does the other regulators ask for a document listing all the checks for all safety requirements in order to be sure that there is no lack? If not, what kind of documents do they check?**

regulatory requirements and EDF commitments, and their correct implementation is assessed on some specific cases. • *How do you deal with unsatisfied factory test results not solved before expedition on site?* EDF has a tracking system compiling issues not yet resolved when an equipment is shipped to FLA3. There are two processes: – The deviation is solved after expedition on site but before CTs, thanks to laboratory/factory test(s) or additional study. – If the deviation is not solved before the CTs, the first questions addressed by EDF are whether the planned CT can be performed as planned, can be partially performed as planned, has to be postponed (cannot be performed as planned) or whether an additional test or modified test is to be developed and scheduled so that CTs exhaustiveness and representativeness is not affected. Such analyse is done by the licensee, ASN will assess this process based on specific examples. • *Do you allow a new reactor to take credit for first plant only tests (FPOT) performed at other units of the same or similar reactor design?* In accordance with his implication in the redaction of the EPRWG common position addressing FPOT, in principle, ASN acknowledges the possibility of crediting commissioning tests performed in another country as part of FLA3 CT program. The requirement [INB 167-B] provides for this possibility: to justify the sufficiency of the commissioning tests, EDF can take into account tests performed on other reactors of the same type. ➢ *If so, which tests can be omitted and why? If not, describe your organisation's position on FPOT.* Tests which could be omitted as a result of crediting FPOT are tests for which possible differences in design, manufacture and installation of the tested component or system, in the environmental and operating conditions and practices, or the codes and standards applied, do not affect the validity of the FPOT results for FLA3. ➢ *Are you aware of the draft MDEP EPRWG Common Position addressing FPOT (see Attachment 6)? Please, feel free to provide any comment.* Yes, France took part in the development of this position. ➢ *How do you manage conflicts in the process of decision making that may occur about whether a certain test can be omitted or not?* Should this occur, the investigation will focus on whether there are significant doubts on the representativeness of the FPOT for FLA3 and whether performing the test at FLA3 would have major drawbacks, especially from a safety point of view. ➢ *What is your procedure for crediting the results of FPOT that has been performed under another regulatory supervision?* In case this possibility is contemplated by the licensee, ASN has specific requirements concerning the corresponding tests: – EDF's choice of crediting a test performed in another country has to be explicitly documented in the commissioning test programme and must be technically justified in a document that can be assessed by ASN an IRSN. The representativeness of the tests performed in another country and its validity for Flamanville 3 has to be proved. This demonstration has to take	

into account the differences (system design, component manufacturer, operating conditions…), if any, between the plant where the tests took place and FLA3. – As for any other Flamanville 3 commissioning tests, the requirements of ASN resolution n° 2013-DC-0347 must be fulfilled, especially the prerequisites to the tests, the management of deviations and the appraisal of uncertainties. EDF organisation has to include the organisation for these specific tests. – The preparation of the tests and the tests themselves have to be considered as "activities important for protection" accordingly to the French order of 7 February 2012. In practice, this means that they should be developed and performed under quality assurance provisions, by competent personnel and that tests have to be monitored by EDF staff. – The results of the tests must be available for EDF and for ASN. It is EDF responsibility to conclude on the acceptability of the FPOT result for FLA3. – MDEP Common Position on FPOT is used as a guideline for the licensee submission to request crediting FPOT. To check this point, there is firstly an assessment of CTs documents for the specific test and the demonstration of the similarity between the plant where the tests took place and FLA3, as well as quality assurance provisions implemented for the FPOT. An inspection during the FPOT is foreseen to check that the FPOT is performed as described in the documents. ASN has to be informed of the provisional schedule of the test. Finally, FPOT results have to be found acceptable and it should be confirmed that any deviation in the FPOT does not compromise test transposability to FLA3. • *How do you check the results of tests that have never been performed before (i.e. First-Of-A-Kind – FOAK) and their representativeness? How do you balance oversight of off-site manufacturing tests and on-site tests?* We check the results of tests that have never been performed before like the other CTs. • *What are the requirements for passive safety systems testing during commissioning? How do you check the adequacy of analysis and experiment to support the passive safety systems capability?* There is no special obligation during commissioning to do a test if there was a control or test or other evidence before CTs which demonstrate the capacity of the systems (passive included) capability to do his function. It could be a study, a factory/laboratory test report… For example for the core catcher, in the NAS, the checking for some requirements is a calculation note.	
JAPAN	
(1) Selection of commissioning inspections The methods of inspections are not proposed by the licensees, but they shall undergo inspections conducted by the NRA, based on the Reactor Regulation Act and the Commercial Reactors Ordinance. Before the inspections, they submit applications for the inspections to the NRA in advance. Though the basic items of inspections are established by the Commercial Reactors Ordinance, the NRA determines concrete inspection items and methods in the inspection procedures and inspects following these procedures after the licencing review process or hearings from the licensees about inspection contents.	**As for introducing of FPOT concept, there are some concerns as shown in the following:** - **Even if it is the same design as previous unit, how do you confirm that the equipment is completed as designed?** - **If there is any trouble or**

(2) Crediting factory or qualification inspections without performing new as-installed inspections In approval of the construction plans, the NRA reviews the compliance of procurement management methods with the NRA Ordinance on Quality Management System, in the stage of construction order, assemble and installation of components, and checks for the licensee's management is being carried out according to the approved construction plans through the inspections. Furthermore, in some of the inspections for SCCs (e.g. reactor, reactor cooling system equipment, steam turbine, auxiliary boiler, etc.), the NRA may witness the factory inspections and also inspects them on site. So, the NRA confirms that there is no large discrepancy between factory test data and on-site test data (e.g. operation and leakage inspection of SRVs). In addition, even if the NRA witnesses the inspections only on site, the NRA confirms the performance meets the one in the factory test and checks for the factory data and on-site data (e.g. pump operation performance inspection). As stated above, the NRA confirms the situation of procurement management validation as for assemble, install and acceptance of equipment. And also the NRA confirms the situation of non-conformance management. In addition, the NRA compares on-site data with the construction plan specification and factory data in an operation inspection of the equipment and so on, in order to confirm that the performance meets the required specification. If it does not meet the required specification, the inspection is suspended. **(3) FPOT (First plant only test)** Japan has never adopted FPOT for commercial nuclear power reactors, and does not make study for introduction of FPOT in ABWR inspections. The Reactor Regulation Act defines the regulatory inspections of nuclear power plants at various stages: construction (including commissioning), operation and decommissioning stages. That act sets forth obligations for the licensees to receive the regulatory inspections, and to comply with the NRA technical standards. The NRA ordinances provide details on regulatory inspections such as the scope of each inspection, time to receive inspections, items for inspections, procedures for applying to inspections, implementation manuals for inspections, issuance of inspection certificates, and so on. In the inspections of equipment during commissioning, the NRA conducts pre-service inspections in each NPP unit without any attention that the plant design is the same or not. And the NRA confirms that the construction work is based on the approved construction plans for the detailed design and that the NPP equipment meets the technical standards. Therefore, no inspection has been omitted for the same design NPP. **(4) FOAK (First-Of-A-Kind)** In the inspections during commissioning (i.e. when ready to start criticality operations or when completing all the approved construction), some of the differences between BWR and ABWR are shown below. - Time from full insertion to full out of Control Rod Drive system and single rod scrum time (measured position of scrum time: BWR 75% insertion, ABWR 60% and 100% insertion). - No. of pumps in the recirculation pump trip inspection (BWR 1 pump, ABWR 3 pumps powered by one bus bar).	**failure found in the equipment in which test or inspection was omitted, may a discussion about the pros and cons of FPOT be initiated?** - **Do you have public consensus on omission of test or inspection**

KOREA	
Answer 1.B.(1) During the review for the construction permit and operating license (OL), the initial test programme in accordance with the chapter 14 of PSAR and FSAR, proposed by the licensee, is reviewed. The Article 29 of the Enforcement Decree of the NSA and the Nuclear Safety and Security Commission (NSSC) Notice 2014-12 (Regulation on Pre-operational Inspection of Nuclear Reactor Facilities) prescribe the time and scope of the pre-operational inspection. The Regulatory Guide-KINS/RG-N18.00 (Initial Test) is also used as reference. The review is to determine whether the initial test programme of the licensee includes the test items important to check upon the essential safety functions. Upon the inspection requests in accordance with the NSSC Notice, the validity of the scope and contents of the requests is reviewed and reflected in the pre-operational inspection plan while the inspector reviews the licensee's test procedure in advance to see whether the test is conducted by an appropriate method. **Answer 1.B.(2)** Regulatory position upon this matter is that new as-installed functional or performance tests should be conducted even though the factory or qualification tests are performed by licensee or supplier. It is also the regulatory position that unsatisfied factory test results should be resolved before expedition on site. **Answer 1.B.(3)-1** There are no requirements on the FPOT but FPOT can be applied for the plants whose design is highly similar. For the FPOT to be credited, the test results on the first plant need to satisfy the acceptance criteria and have high credibility and the variables that might affect the test results of the subsequent units must be minimal. **Answer 1.B.(3)-2** We agree with the MDEP EPRWG FPOT Common Position except some part that we believe changes are necessary. • If all the prerequisites presented in Appendix 1 are fulfilled, FPOT may be credited. • Delete the part "a regulator may accept crediting FPOTs with the fulfillment of only part of the prerequisites" • For the FPOT to be credited, it should be similarity between the first unit and the subsequent units. • For the FPOT to be credited, the test results on the first plant need to satisfy the acceptance criteria and have high credibility and the variables that might affect the test results of the subsequent units must be minimal. • The repeatability of the test results should be guaranteed. **Answer 1.B.(3)-3** Difference in opinion whether a certain test can be omitted can primarily be managed through the process of discussion between specialists within the regulatory body. When the difference remains the same after such process, the regulatory stance can be decided through Technical Advisory Committee and Coordinating Committee and delivered to the licensee. In addition, such conflicts between licensee and regulatory body would be managed through the safety review process which includes RAIs, technical meeting with licensee, Coordinating Committee of regulatory body, and Technical Advisory Committee.	**Domestic experience (1.B.(2))** **Although it is the regulatory position that all factory or qualification test results should meet the criteria and specification before expedition on site, regulatory body has experience of some exceptions to approve that the unsatisfied or unresolved test results, which are not critical to the function or performance of systems and components, could be resolved after the expedition on site.** **A. Resolving unsatisfied software design within digital I&C systems after the expedition on site.** • **Prior to the expedition on site for the digital I&C systems of Shin-Hanul units 1 and 2, the regulatory body performed special audits during design and implementation phases of those systems. Through this special audits, the regulatory body issued action items to resolve dissatisfaction of software design within safety systems.** • **The principle is that such action items should be resolved before expedition on site. Though, the regulatory body approved the licensee's suggestion to resolve those before Cold Functional Test after expedition on site.** • **The regulatory body reviewed that the way of resolution was to change the software and it did not affect the hardware installation. Also the dissatisfaction of the software is not critical.**

Answer 1.B.(3)-4 There are no specific procedures or framework for crediting the results of FPOT that has been performed under another regulatory supervision. In case the regulatory body needs to credit the results of FPOT that has been performed under another regulatory supervision, regulatory position would be determined through the formal decision making process within the regulatory body. This process includes the Technical Advisory Committee and Coordinating Committee. **Answer 1.B.(4)-1** There is no particular requirement related to the FOAK test in the nuclear legal framework of Korea but according to the Article 4(Application for construction permit), Article 9 (Request for authorisation of standard designs), and Article 16(Application for Operating License, etc.) of the Enforcement Regulation of the NSA, it is prescribed that the contents related to the initial test should be submitted. In accordance with the law, in each phase of the reviews for the construction permit, standard designs, and operating license, the regulatory body confirms whether the licensee identified FOAK tests and reflected it into the Chapter 14 of PSAR and FSAR and relevant documents. The supervision of FOAK test is differentiated from other tests as it is selected as the priority inspection item. **Answer 1.B.(4)-2** Under the legal framework of the NSA, the requirements for passive safety systems are not explicitly provided yet. However, as the design requirements for the safety system, the Article 44(Reliability) of "Regulations on Technical Standards for Nuclear Reactor Facilities, etc" requires that systems and components that perform safety functions shall assure and maintain sufficiently high reliability and take into account the possibility of single failure, it can be generally applied to the passive safety system. The requirements prescribed in the Article 41(Testability, Monitorability, Inspectability, and Maintainability) can also be applied in general sense. If the licensee requests for exemption or relief of the application of single failure and the related tests in the design of passive safety system, the regulatory body will consider the international technical standards (USNRC SECY Paper, IAEA documents) as reference and will develop the specific standards, based on the domestic data to evaluate such request. Up until now, in domestic NPP design, Safety Injection Tanks with Fluidic Device and Passive Auxiliary Feedwater System have been reviewed based on the existing requirements. The same goes for the inspection of the performance tests of SIT/FD. Regarding the validity of the analysis and tests to verify the capability of the passive safety system, the regulatory body has confirmed the elements as follows in the stages including review for the standard design certification, review for the construction permit, and review for the OL**:** 1) Prototype Experiment; 2) Development of analysis technology and validation through the simulation of the test ; 3) Application and confirmation to the accident analysis; and 4) As an extent to practicable, confirmation of the actual capability through the pre-operational inspection. Such an approach, in general sense, can be applied to the evaluation of the passive safety system.	**With the review results of it, the regulatory body determined that such design dissatisfaction could be fixed through the software changes before Cold Functional Test phase after the expedition on site.** **Domestic experience (1.B.(4))** **A. IRWST Sparger Discharge and Thermal Mixing test [Refer to Annex 1.B.(4) A.]** **B. Verification test of safe shutdown capability against Common Cause Failures of safety I&C systems [Refer to Annex 1.B.(4)] B.]** **C. Table 1. FOAK tests at Shin-Kori Unit 3 [Refer to Annex 1.B.(4)] C.]** **1. Low Temperature/Low Pressure Initial Criticality** **2. Low Temperature/Low Pressure Low Power Physics Test (LPPT)** • **Shutdown Margin measurement** • **Critical Boron Concentration (CBC) measurement** • **Isothermal Temperature Coefficient (ITC) measurement** **3. NOT/NOP LPPT** • **Ejected Rod Worth Measurement** • **Dropped Rod Worth Measurement** **4. Xenon Oscillation Control Test** **5. Ejected CEA Test** **6. Dropped CEA Test** **7. IRWST In-Plant Test** **8. POSRV test** • **Set pressure test of spring loaded pilot valve** • **Main valve operation test with spring loaded**

	pilot valve **9. SIT Blowdown Test (K-factor evaluation)** **10. MCR MMIS Test** • **Tests for digitalised I&C Systems** • **Verification tests of safe shutdown capability against CCF of safety I&C systems** **11. Cavity Flooding Sys (CFS) Test** **12. External Reactor Vessel Cooling (ERVC) Test** **13. Emergency Containment Spray Backup System (ECSBS) Test**
NETHERLANDS	
There is no recent experience with the oversight on tests proposed by the licensee. Recently guidance (Dutch Safety Requirements; DSR) was developed with respect to new nuclear installations. This guidance includes amongst others the following: • With respect to tests it will be assessed if they comply with the start of art and technology (DSR 3.1(1)) • Qualified testing methods shall be implemented (DSR 3.1(2)) • Use of equipment that has been sufficiently tested (DSR 3.1 (2)) • Where a new design, feature or engineering practice is introduced it shall be ensured that the quality and reliability is commensurate with the safety significance as required in 3.1 (5). Before implementation of such a design, feature or engineering practice the transferability of (DSR 5(9)): a) results from precedent research and development programs, b) performance tests with specific acceptance criteria and c) examination of operational experience from similar applications d) on the expected conditions in a nuclear power plant shall be demonstrated. • For all items important to safety test codes shall be provided according to their safety relevance. The test codes shall individually define qualification tests, material tests, structural inspections, pressure tests, acceptance tests and functional tests as well as in-service inspections. Adherence to these instructions shall be monitored as part of a quality assurance programme. (DSR 6(4)) ANVS is working on a Technical Review Plan (TRP). This is an internal document which describes how the review should be performed. This TRP includes a part on testing and inspecting/monitoring and on commissioning. With respect to testing, test mock-ups, test procedures, test evaluation methods and test results shall be presented and discussed in light of acceptance criteria to be met. Additionally pre-operational tests planned for the commissioning phase shall be described in order to prove selected design features.	**1. How to select tests to be reviewed or to be witnessed?** 2. **Should selection be based on safety function, complexity or random?**

RUSSIA	
In pursuance of the requirements of the Federal Regulations and Rules in the Field of Atomic Energy Use, all systems and elements important to safety shall be subject to direct and complete check for compliance with the design characteristics in the course of a NPP unit commissioning. In case when conduct of a direct and complete check is impossible (to be substantiated), the conduct of a partial and indirect check is allowed. The certain scope of tests shall be justified in SAR Chapter 14. Based on SAR the Licensee shall ensure the development of NPP unit commissioning programme, test programmes for commissioning stages, as well as test programmes and procedures for systems and elements. The Regulatory body reposes trust in manufacturer tests, since it exercises control over the process (oversight over manufacturing of equipment important to safety). In pursuance of the requirements of the Federal Regulations and Rules in the Field of Atomic Energy Use, technical and organisational solutions adopted to ensure NPP safety shall be approbated by the previous experience, tests, researches, and experience in operation of prototypes. In order to confirm approbation a Licensee can refer in his SAR to the tests conducted abroad. But this does not exempt the Licensee from the necessity to conduct on-site tests to confirm functioning of systems in compliance with the design characteristics in frames of a NPP unit commissioning program.	
SLOVAK REPUBLIC	
Our specialist and the external science-technical support for Non active testing (NaT) and commissioning - Consortium of international TSO's should review selected programmes will perform the following activities: assesses completeness and technical level of the unit commissioning documentation from the nuclear safety observance viewpoint, compering all proposed commissioning tests with the commissioning tests other Units, assesses preparation, course and evaluation of selected functional capability tests of equipment and systems important from the nuclear safety viewpoint in the stage of non-active tests, checks the unit preparedness to commence individual commissioning stages as well as the unit preparedness to commence activities according to approved programmes in the stage of active tests preparation and execution, checks execution of the commissioning programmes, assess the testing and confirm the achieved results and check the Punch list items from nuclear safety point of view. The objective plant design validation are to confirm that selected equipment is capable to perform its design intended safety functions by testing in manufacturing and construction phase, and by commissioning tests in commissioning phase and also to verify adequacy of the plant design with respect to main performance requirements of the basic design during physical tests, power escalation tests and 144 hours trial run including power uprate. Design validation will be performed at the Level of components, systems and power plant. Validation of the component shall be performed by technological contractor during factory and site acceptance tests (FAT, SAT) confirming compliance of the component with requirements of Technical Documentation. Unsatisfied FAT results or Final inspection (FIR – supply release note) are automatically reason for deny the shipment. In spite of successful FAT the SAT all functional tests have to be performed and any test can be omitted. We do not credit factory. All tests during commissioning phase have to be performed. Our legal requirements define that all selected equipment must be qualified, the qualification method corresponds with their safety importance.	

No, we do not define the term First plant only test (FPOT) in our legal framework. We do not issue a license for the specific type of reactor, we require fulfil legal requirements for each nuclear facility with reactor. The design of a nuclear installation shall take account of the available results of research programmes. If an unverified design is introduced or unverified functions are introduced, research programmes or reviews of operational experience from similar applications shall be used to demonstrate the use of a sufficiently conservative approach to the provision of nuclear safety. New solutions shall be tested prior to commissioning and monitored during operation. The design of a nuclear installation shall take account of operational experience from similar nuclear installations. A test programme must be developed for each selected facility. If selected facilities are part of a technological system or compose an integrated system, the test programme must be developed for the integrated system or its part. Test programmes for selected facilities are developed so that they verify the activity and functions of the activated facility in prescribed operating states expected by the design and listed in an operating safety report. The licensee must perform commissioning according to startup programmes approved by the Authority so that each phase and sub-phase composes an integrated set of tests, and the next phase or sub phase cannot start until the preceding phase or sub-phase has been properly completed and the fulfilment of all success criteria specified in its programme has been evaluated and logged, which is one of the conditions for passing to the next commissioning phase or sub-phase. We are aware of the above mentioned draft. We follow the opinion that the possible crediting the FPOT should be discussed at the stage of design approval, before the project starts. The tests of passive safety systems are a part of Non active testing and commissioning programmes. For example the part of procedure of commissioning for emergency systems charging and cooling core P041 is dealing with emergency tanks (hydro accumulators) tests. There are tested relieves valves, the level lowering and set of discharging, the tightness of backflow valves. In the Procedure of commissioning for spray system and system JMP – depressurisation in hermetic space bar and localisation radioactive fading P043. There is the test water tipping on the floor of steam generators box. For checking the adequacy of analysis we use independent TSO.	
UNITED ARAB EMIRATES	
The Licensee is required by Regulations 6 Article 6 Item 7 and Item 10 to provides a description of the SSCs of the Nuclear Facility in line with their impotence to Nuclear Safety including a discussion of their safety objectives, design bases, safety classification, design and construction codes and the inspections, tests and analysis that provide reasonable assurance that the system will meet its design objectivities. Number of FANR Regulatory guidance indicate that a methodology consistent with the USNRC ITAAC would be sufficient to demonstrate the above. FANR regulatory guidance does not require the format of USNRC ITAAC or the administrative processes associated with USNRC design certification or one step licensing. FANR has written procedures (review instructions) for reviewing the entire scope of the PSAR. These review instructions identify FANR Regulations, FANR regulatory guides and other regulatory guidance that FANR applies to the review. Review instruction for chapter 14 describes selection of tests and acceptance criteria to evaluate the construction inspections and test plan CITP and the Initial Test Plan ITP. All safety-related SSC's (NSSS & BOP Safety class 1, 2, 3 as	

defined in PSAR Classification of Structures, Components, and Systems Chapter 3, Article 3.2) should be included in CITP table. All the tests necessary to demonstrate that the SSC's meets the design intent as stated in the Safety Analysis Report are included in CITP table.	
UNITED KINGDOM	
In advance of granting consent to (i) commence inactive commissioning, and (ii) bring nuclear fuel on site and commence active commissioning ONR requires the licensee to prepare a document(s) identifying for each safety system the commissioning tests necessary to demonstrate that it meets the design and safety requirements, as well as the criteria to be met by the tests. ONR will assess the document(s) to determine whether the proposed tests are sufficient to support the assumptions made in the safety case. This assessment will inform its decision to grant consent to commence inactive and active commissioning. ONR recognises that it is appropriate for licensee's to take credit for certain aspects of factory and qualification testing. However, ONR will expect the licensee's on site commission tests to be sufficient to demonstrate the satisfactory operation/performance of installed equipment in the various plant configurations that it is required to operate in. Such testing should start with individual equipment tests progressing to system testing and then integrated system testing. Where it is not possible to fully test installed equipment ONR will permit the licensee to take credit for certain aspects of factory or qualification tests if supported by a suitable justification that the results of such tests are valid, applicable and representative for the intended operating environment. ONR will expect the licensee to have adequate arrangements for addressing non-compliances arising during factory and qualification testing whether or not they are resolved before site installation. Such arrangements will include the management of modifications to the equipment/system design and any changes to the associated safety justification. The arrangements are required to give ONR the option to specify that the licensee seek its permission to implement any modification to the design and/or safety justification. a) ONR is not averse to licensee's taking credit for FPOTs, however each test will be considered on an individual basis. ONR will look to the licensee: • to assess the vendor's proposal and decide whether it is appropriate to use the FPOT data; and • to verify and validate all FPOT data used to demonstrate the safety of a United Kingdom. ONR is in early discussions with the United Kingdom licensee for Hinkley Point C to understand which FPOTs they may want to take credit for. ONR contributed to the EPRWG Common Position on FPOT. The approach that ONR will adopt in accessing a licensee's justification for crediting FPOTs is as outlined in the United Kingdom contribution to the EPRWG Common Position paper which is largely reflected in the final draft of the paper. b) ONR will determine the extent to which it has oversight of a given commissioning test depending upon: • the importance of the equipment to nuclear safety; • the complexity of the equipment/ test;	**Regulatory oversight of factory and qualification tests?** **Implementation/oversight of FPOTs to minimise regulatory risk on later EPR NNP?**

• the novelty of the equipment/ test ; • the potential consequences should the test be inadvertently conceived/ executed, and • relevant operating experience. This will be no different for FOAK tests, however due to their nature it is likely that they will be selected for closer scrutiny.	
UNITED STATES	
• *How do you check that the commissioning tests proposed by the licensee are adequate?* The NRC reviews the applicants initial test program (e.g., commissioning tests) as part of the licensing process. The NRC guidance for review of the applicant's initial test program (ITP) is provided in NUREG-0800, "US NRC Standard Review Plan," Section 14. The ITP addresses the applicant's plan for preoperational and initial startup testing. The test program consists of preoperational and initial startup tests, as described in Regulatory Guide (RG) 1.68. RG 1.68 includes references to other regulatory guidance for the ITP. Preoperational tests consist of those tests conducted following completion of construction and construction-related inspections and tests, but before fuel loading. Such tests demonstrate, to the extent practicable, the capability of structures, systems, and components (SSCs) to meet performance requirements and design criteria. Initial startup tests include those test activities scheduled to be performed during and following fuel load activities. Testing activities include fuel loading, pre-critical tests, initial criticality, low-power tests, and power ascension tests that confirm the design bases and demonstrate, to the extent practicable, that the plant will operate in accordance with its design and is capable of responding as designed to anticipated transients and postulated accidents. In addition to the tests described in RG 1.68, tests for new designs, including first of a kind (FOAK) tests, are submitted by the applicant and reviewed by the NRC during the licensing process. (NOTE applicants are required by RG 1.68 to consider OpE in their ITP.) The link to NUREG-0800 is www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0800/ • *What is your position on crediting factory or qualification tests without performing new as-installed tests during commissioning? How do you deal with unsatisfied factory test results not solved before expedition on site?* The NRC has not received any requests from applicants or licensees to credit factory or qualification tests for tests that are normally conducted as part of commissioning. As such, the NRC does not have a current position on this item. If such a request was made, the applicant/licensee would have to submit their basis for crediting factory or qualification tests versus using commissioning tests as part of the licensing review or license amendment. The NRC would need to review and approve this as part of the licensing process or license amendment process. For testing not completed before installation on site, the SSC cannot be considered operable until the required testing is completed and found acceptable. The licensee can install the SSCs at their risk. If the final testing requires changes	**How do you handle design features which have been used in other countries but you have never reviewed and have no regulatory experience with?**

to the FSAR, then that change would need to be implemented (as required by their process and regulation) prior to considering the SSC operable. • *Do you allow a new reactor to take credit for first plant only tests (FPOT) performed at other units of the same or similar reactor design?* Yes, the NRC may allow a new reactor to take credit for FPOT performed at other units of the same design. There are two ways for this to be accomplished depending on where in the licensing process the crediting reactor is, i.e., license review or license issued. 1) If the FPOT was completed before the completion of the licensing on the following unit, then as part of the licensing process the applicant can submit a change to their application to the NRC for review of the basis for not including the FPOT. 2) For licensed reactors, FPOT is in the FSAR and part of the license conditions. The licensee would be required to submit to the NRC for review, a FSAR change and a license amendment request to modify the FPOT requirements. • *If so, which tests can be omitted and why? If not, describe your organisation's position on FPOT.* All FPOT are important so the NRC has not predetermined what can be omitted. It is up to the applicant or licensee to submit the basis for not performing the FPOT. If the design is an approved design under 10 CFR Part 52 then once the change is approved by the NRC future designs could use the same change for their applications so long as they provided the basis. • *Are you aware of the draft MDEP EPRWG Common Position addressing FPOT (see Attachment 6)? Please, feel free to provide any comment.* The NRC has been involved with the development of the common position paper. The only NRC comment that was not incorporated in the final draft is the statement that, "In order to come up with this common position, the EPRWG has conducted a survey among its members on the preconditions which would be acceptable to the regulators for crediting FPOTs." The NRC comment is that "would" should be changed to "may". There are multiple factors involved in the acceptance of FPOT for one plant to another that the NRC would need to understand and find acceptable. • *How do you manage conflicts in the process of decision making that may occur about whether a certain test can be omitted or not?* The NRC licensing process allows the applicant or licensee to make a submittal for NRC review. The NRC staff would use its NUREG-0800 Standard Review Plan and existing regulatory guidance, i.e., RG 1.68, to make a decision on the acceptability of the applicant's/licensee's submittal for omitting a test. If conflicts arise regarding the acceptability of the proposed change, the NRC could handle via correspondence, teleconference, and/or public meetings with the applicant/licensee to discuss the submittal. The NRC has the final decision on the acceptability of omitting a test. • *What is your procedure for crediting the results of FPOT that has been performed under another regulatory supervision?* The NRC does not have a procedure for crediting the results of FPOT that have been performed under another regulatory supervision. By law, the NRC is	

required to conduct certain activities and provide the basis for reaching regulatory findings; as such, consideration of using the results of FPOT conducted outside of NRC jurisdiction would raise policy matters that would need to be resolved. • *What are requirements set for tests that have never been performed before (i.e. First-Of-A-Kind –FOAK)? How do you check the results of tests and their representativeness? Does the supervision of these tests differ from other tests? What are the requirements for passive safety systems testing during commissioning? How do you check the adequacy of analysis and experiment to support the passive safety systems capability?* The NRC reviews the applicants initial test program (e.g., commissioning tests) as part of the licensing process. The NRC guidance for review of the applicant's initial test program (ITP) is provided in NUREG-0800, Section 14. The ITP addresses the applicant's plan for preoperational and initial startup testing. The test program consists of preoperational and initial startup tests, as described in Regulatory Guide (RG) 1.68. RG 1.68 includes references to other regulatory guidance for the ITP. FOAK tests are proposed by the applicant and reviewed by the NRC. For new designs that were not specifically covered in RG 1.68 the applicant should consider if a FOAK test is needed. The NRC will also consider whether a FOAK is needed during its review. For example, during the review of the AP600 design, the NRC's Advisory Committee on Reactor Safeguards (ACRS) was involved in evaluating the proposed FOAK tests. The ACRS provides the NRC Commission with an independent expert technical advice. For technical matters introducing new or novel safety aspects, the NRC may conduct basic testing on design concepts to independently verify the concept. Passive systems must have a documented technical basis for NRC review. New concepts in passive systems may need prototype testing and/or FOAK tests to verify the designs. The NRC uses staff and independent experts as necessary to review these designs. The ACRS provides an independent technical review. For FOAK tests the NRC plans to inspect each test, and review the test results.	

1.C Configuration management reflecting design change

Answers	Learning
CANADA	
Licensees may make changes in design according to the provisions in their management system (which is developed in accordance with CSA N286-12, Management System Requirements for Nuclear Facilities). The CNSC ensures that applicant has a robust engineering change control and configuration management program. CNSC will perform inspections on configuration control programs/processes. Any configuration changes that will have an impact on the submitted design and licensing basis information will require notification to the CNSC. The licensee should describe in their change control process what is deemed to be a significant design change and must notify the CNSC of the change. To check that design change has been reflect in the test procedure, CNSC staff will perform document review to ensure that the licensee has followed their change control process in line with their management system processes and	

procedures. CNSC staff has developed an inspection guide to verify the licensee's configuration management process. In addition, there will be a notification process in place to identify when procedures, test acceptance criteria and other relevant information has been modified by the licensee. Based on previous lessons learned for refurbishment projects, there will be a notification process in place for identifying when certain procedures, test acceptance criteria and other relevant information has been modified by the licensee. CNSC will perform additional inspections if there are shared systems in the multi-unit stations.	
CHINA	
Configuration management of China nuclear power plant mainly includes: programme management, design requirements, information control, change control, evaluation and training etc., which are correlative. Configuration management of Taishan EPR project is process changing- based. In order to review, follow up and manage design change generated by EPR project, Taishan nuclear power plant developed design change management procedure and design change information management module, carrying out full track on technical review, approval of design change, modification of design documents and engineering implementation. Those important DCR, TCR will be reviewed and approved by NNSA, and the review results will be copied to regional office for following up.	
FINLAND	
• *How do you check design change has been reflected in the licencing documents (i.e. preliminary safety analysis report (PSAR) vs. final safety analysis report (FSAR), test procedures, operating procedures, etc.)?* STUK: The licensee must have procedures in place for configuration control and change management. STUK oversees that the procedures are followed. Licensee shall assess all design changes and how the design change will affect to the licensing documentation. STUK is informed about design changes (safety significant changes need approval from STUK, document updates due to minor changes are sent for information). STUK oversees the licensee's methods for e.g. keeping the operating procedures, training simulator etc up-to-date. These items are subject to inspections. • *How do you check tests are still valid when design changes are implemented during construction?* STUK: The licensee must have a procedure in place for configuration control and change management. STUK oversees that the procedures are followed and that they cover also impact of changes on testing. • *When and for which document do you require regulatory approval?* STUK: Safety significant changes need preapproval from STUK including corresponding commissioning procedures.	
FRANCE	
• *How do you check design change has been reflected in the licencing documents (i.e. preliminary safety analysis report (PSAR) vs. final safety analysis report (FSAR), test procedures, operating procedures, etc.)?* The licensee has documents to describe their process to ensure update of all documents impacted by a design change. EDF works with document	**Challenge: At site level, to implement a design change, several actors (electricians, mechanics…) are involved. While**

configuration. If there is a design change, EDF determines which documents are impacted and the design change is sent to the department/unit in charge of this document. If the document is really impacted, they list the changes needed and the documentation is changed for the next configuration for which the design change will be taken into account. The changes are sent to the site who is in charge of the implementation.

To check this process, ASN makes inspection on engineering services and on site to check, on some specific design changes, whether the licensee did implement its process and whether required updates were actually made.

- *How do you check tests are still valid when design changes are implemented during construction?*

If the test has not been performed, normally all the installation (or a part of the installation) switches to the targeted configuration at the same time and the engineering services did the work to assess the impact of the design changes on the CTs documentation and they did the changes if necessary. However, on site, it appears that, considering the feasibility of changes implementation (both from a technical and planning aspects), the implementation of some design changes was either anticipated or postponed.

Before the beginning of CTs, firstly, there is an "end of installation/assembly" report dedicated to each system, to describe the state of the system transferred to the commissioning team. At this stage, the aim is to know the initial state of the system before doing CT in compliance with the bullet point i of the requirement [INB167-2-3]. After, considering the anticipated or postponed design changes, the commissioning team assesses the impact(s) on the CTs documentation and modifies it if necessary. ASN checks this process during inspections. In addition, an IRSN representative will be present on site during overall CTs phase. Discussions on his exact missions are on-going.

If the test has already been performed, during the process described at the former question, the licensee has to analyse the impact of design changes on CTs documentation. The engineering services in charge of this documentation has to determine which additional or revised tests are to be performed and, when needed, modified sheets of CT procedures are included in the design change file. Licensee's staff on site will determine whether these modified sheets should result in additional/revised tests or whether tests already performed remained adequate. ASN checks this process during inspections.

- *When and for which document do you require regulatory approval?*

There are two steps where there is a regulatory "approval" :

- For the NPP creation authorisation: a PSAR and an environmental impact assessment are the two major documents submitted in the application. They are not formally approved although implicitly accepted if the authorisation is granted by the Government.
- For the commissioning/operation licence : the application include the SAR, the general operating rules (GOR) which includes document such as the Tec Spec and periodic testing programme, a study on the waste management, the internal emergency plan and the update of the environmental study assessment. These documents are not formally approved but are implicitly accepted if the license is granted by ASN. Prior to granting the licence, ASN may require the licensee to modify these documents to its satisfaction. Once the license has been granted, modifications to these documents also implies either notification or approval by ASN.

construction/installation is still on-going, It can be difficult to have a "homogeneous" state/configuration of the installation (cabling done in one configuration, measuring devices settled in another configuration): licensee should have reliable process to check the configuration of the whole system before implementing CT.

When commissioning team knows the actual configuration of the system (with anticipated and postponed design changes implemented), it can be difficult to assess impact of anticipated or postponed design changes on CTs documentation to be compliant with the actual state of the installation.

Question: do the other licensees have the same organisation? If yes, are there any documents required by the regulator to check if the anticipated or postponed design changes are correctly taken into account in CTs operating procedures? If yes, when does the regulator require their submission?

Challenge: For the design changes after circuit flushes CT operational procedures, the licensee will have to implement FME provisions. In fact, if the circuit is opened again, it is necessary to guarantee the systematic elimination of any foreign material. Our TSO (IRSN) suggests they include visual endoscopic inspections. The licensee is going to elaborate this doctrine.

Question: for FME, what are

○ To be sure of the state of the BNI at the commissioning, ASN makes inspection to check the licensee process to well implement the design changes and reach the final commissioning target.	**the measures taken by the other licensees? How do the other regulators check their implementation?**
JAPAN	
(1) Reflection in the licencing documents in the case of design change Matters of the basic design (i.e. plant type, thermal power, and location, structure and equipment of facility, etc.) are reflected in the reactor installation license. Matters of the detailed design and plan for construction are reflected in the construction plans. However, as for a change mandated by the Commercial Reactors Ordinance (e.g. repair of the facility) it is just notification of the construction plans. **(2) Inspection for design changes during construction** A change of the construction plan is applied, and its compliance with the technical standards is confirmed in this review. The construction work is confirmed to be obedient to the approved construction plan in the inspections. **(3) When and for which document do you require regulatory approval?** • Basic design: Permission of the reactor installation licence. • Before construction (detailed design, plan for construction work): Approval of the construction plans. ○ Before operation (before fuel loading) : Approval of the operational safety programs	· **What are the requirements or criteria to be considered as the same design?** · **How do you accept and choose representative reviews or inspections? What are the requirements or criteria for that?** - **Same manufacturer, construction timing, location, and others?** · **In the case that the licensee plans to modify construction plans (detailed design) after the RB's approval, the licensee shall again seek RB approval for the modifications. And the licensee is required to undergo the RB pre-service inspections for modified facilities.** - **Is there a reasonable and effective verification method, when design changes are implemented? In that case, how do you think about the scope of responsibility of the RB?**
KOREA	
<u>Answer 1.C.(1)</u> Design change during the construction phase of reactor facility is prescribed in the Article 5 (Application for change permit) and Article 6 (Report of changes in minor matters) of the Enforcement Regulation of the NSA. After receiving the design change application documents from utility, the regulatory body reviews the relevant content in PSAR and FSAR as well as the submitted documents to confirm the validity of the design change. Test procedure and operating procedure that ensue the design change should be conducted in accordance with the licensee procedure (management of design change) and the plant operator reflects the design change into the relevant test procedure and operating procedure. For the confirmation of the design change, the in situ walk-down such as pre-operational inspection, quality assurance inspection is being conducted.	**<u>Items to be discussed during the group session</u> (1.C)** **Computerised system and regulatory position of configuration management are on the way to be developed in Korea. Under this circumstance, followings are to be discussed.** • **Major items of design change control including pre-operational**

For your reference, the documents of the test procedure and operating procedure are utility controlled documents. **Answer 1.C.(2)** For the system which was changed its design after the pre-operational inspection during the construction, it should be checked whether such design change affects the performance and validity of the existing test results. If it does, pre-operational inspection is performed again for the system. **Answer 1.C.(3)** The documents that require the regulatory approval for the configuration management of the design change are the documents submitted for licensing application (e.g. PSAR, FSAR). If such design change affects the documents for licensing application and requires the permission, not the report of changes, appropriate permission should be obtained in advance. The cases that require the report of changes in minor matters provided in the Article 6 of the Enforcement Regulation of the NSA.	**inspection and quality assurance inspection** • **Methods to establish the design basis document for the plant under construction** • **In situ walk-down practice for "physical configuration"** **Domestic experience (1.C.(2))** **The validity evaluation of system performance test through the design change process of utility operator should be confirmed for the in situ design change during the system performance tests. There has been a non-conformance case (Performance of wash pump in the service water system found unsatisfactory*) due to omission of the evaluation of the affected equipment during the design change process.** *** Performance of wash pump in the service water system found unsatisfactory** **It was confirmed that the performance result of the wash system of the service water system was 95% of the acceptance criteria, which was lower than that of shop test. Later, it was found that the design was arbitrarily changed during the construction in the field. The orifice tap for flow measurement which was originally located as a flange tap was changed into a piping tap. As a result, the indication of the flow rate was lower than actual value. Orifice flow meter was improved to be able to convert the measured pressure into flow based on the piping tap installed in the field.**

NETHERLANDS	
There is no recent experience in the review of FSAR, PSAR and other relevant licensing documents. However, ANVS is preparing itself for the reviewing phase of new applications. Both PSAR and FSAR will be reviewed by the Regulatory Body. The Technical Review Plan (mentioned under 1B) is used a guidance document for the reviewer, but can also be used by the applicant. ANVS is also working on the necessary hold points and witness points that should be used with respect to the new build activities. At the moment it is foreseen that two licenses will be issued; i.e. a construction license (PSAR is the basis) and an operating license (FSAR is the basis). Changes in the configuration management shall amongst others be represented in these documents.	**1. What is the experience with the amount and the level of details of the documents on which regulatory approval is needed?**
RUSSIA	
Since, in pursuance of the requirements of the Federal Regulations and Rules in the Field of Atomic Energy Use, any and all non-conformances between SAR and NPP design are not allowed, and SAR is considered to be a license document, changes to which can be introduced through changes to the license terms and conditions only, then it is necessary to obtain an approval of the Regulatory body to introduce changes to a NPP design. When a Licensee is intended to introduce changes to the design, the Regulator shall carry out safety evaluation of the concerned power unit in the part of changes to be introduced. In case of positive result, the relevant change shall be introduced to the license terms and conditions (for construction or operation) of a power unit, and thereupon implementation of changes to the power unit is allowed. When changes are to be introduced to a NPP design at certain stages, the Licensee shall correct both the Preliminary Safety Analysis Report (PSAR) and Final Safety Analysis Report (FSAR) simultaneously due to specifics of the licensing process (at the stage of a NPP unit commissioning, starting from the moment of nuclear fuel delivery, a Licensee shall maintain two licenses: for construction (the actual PSAR is required) and for operation (FSAR). The Regulator shall exercise control over the process of introduction of changes to a NPP design (in particular, in the part of systems important to safety) by means of a licensing procedure. In order to introduce changes to the systems important to safety, the Licensee shall file an application for introduction of changes to the license terms and conditions, submitting the adequate substantiations to the Regulatory body. By the order of the Regulatory body safety review can be carried out for the mentioned substantiations. Based on the results of the review and inspections there shall follow a decision on introduction of changes to the license terms and conditions or on rejection of such changes. Upon introduction of changes to the design and approval of such changes by the Regulator (through introduction of changes to the license terms and conditions), the corrections are to be made to the relevant test programmes. All test programmes shall be corrected prior to commencement of tests.	
SLOVAK REPUBLIC	
According our legal requirements Section 9 Quality Management System Changes Control Significant Changes according to Section 2 item v) Atomic act (with impact on NS) shall be justified in advance, thoroughly planned and evaluated after their implementation. Changes are performed in accordance with	

principles and requirements applicable for the original equipment or documentation. Applying deviations from the original design requirements or implementation of new requirements shall be justified and their acceptability shall be documented by respective analyses. Authorisation applicant or authorisation holder submits along with the change: 1) analysis of the proposed change causes stating reasons of the change objective; 2) evaluation of change impacts on nuclear safety; 3) proposed measures aimed at preventing potential negative impacts of the new equipment on the existing one at its assembly, inspections, tests, maintenance and operation; 4) proposed measures aimed at preventing potential negative impacts of the change including its incorporation into the quality management system documentation or into the personnel technical training; 5) list of quality management system documents affected by the change and the changed quality management system documentation provided that it is subject to Authority's approval; 6) safety evaluation of the proposed change elaborated by an independent person via risk analysis method; 7) assessment of the proposed change by the person, who elaborated the original design res. by another qualified person. The licensee issued methodical guide, which is obligatory for all that participate in Mochovce completion process. This Procedure defines methods and duties for the management of all design changes, arising in connection with the design, manufacturing, construction, erection and commissioning. The Design Change Assessment shall contain the change reason with mark-ups on Basic Design Documents including a complete analysis of the change with the evaluation of the effects on other systems and their impact on activities in progress, technical features and safety analyses. These are provided by dedicated Technical Reports according to the requirements of Decree 431/2011, Section 9. During the Change assessment also all relevant tests procedures have to be fully analysed and if there is an impact identified the modification of test procedure is requested. Supplementary Documentation identifying additions or changes (additions and changes are all hereinafter referred to as "changes") with respect to the Basic Design in accordance with the provisions of § 68 of Civil Construction Law No. 50/1976 Coll. as specified in § 11 of Decree No. 453/2000 Coll. and Atomic Act No. 541/2004 Coll. as amended and supplemented by other acts . The Amendments are intended solely to be prepared for major changes (as defined in paragraph 5.2.1) and submitted to the relevant Authorities for their approval or notification. The Amendments therefore refer to changes affecting UJD (either for approval or notification of such changes) and other Authorities or Construction Permit. The Amendments will be developed so to cover affected parts of the Basic Design and will include identification of the principal documents of the Basic Design that are affected and have to be amended and the list of valid documents of the Basic Design (e.g. list of all Basic Design documents plus list of all Amendments; in this list for each Basic Design document shall also be reported if amended or not; in case it is amended the document code of all the Amendments involving that document shall be reported). The Amendment of Basic Design is not the re-issue of the Basic Design documents, instead it is an additional documentation consisting of a technical report where the change is described and may contain sketches and a list of modified equipment.	

The licensee may implement the modifications of nuclear installation only provided that a preceding approval or permission has been obtained from the Authority. One of the duties of licensee is to submit to the Authority any safety related modification for permission or approval, at least one month prior to its foreseen implementation.	
UNITED ARAB EMIRATES	
Based on the latest issued construction license for BNPP 3&4 license condition 3stipulates that: The Licensee shall obtain the written approval of the Authority prior to implementing modifications to any of the following which may result in significant Safety, Security or safeguards implications: FANR REG-16 article 13 states that licensee shall establish and implement a programme to manage modifications, the programme should cover SSCs, OLCs, procedures, documents, plans, computer programmes and the organisational structure of the Licensee. Modification control shall ensure the proper Design, Safety Assessment and review, control, implementation, and testing of all permanent and temporary modifications. The modifications should be limited to minimise the impact of the safety significance. Personnel shall be trained on the modifications before commissioning the modifications	
UNITED KINGDOM	
Conditions attached to the Nuclear Site License for a NPP include the requirement for the licensee to develop and implement arrangements for the control of modifications during the construction of the plant. These arrangements will be subject to close scrutiny by the ONR Site Inspector to ensure that they are both adequate and correctly implemented. The licensee is expected to maintain a process for managing changes to the safety case and operational documentation resulting from modifications to ensure that such changes are incorporated at the appropriate time. The licensee's arrangements for modifications (see a) above) are expected to include consideration of commissioning tests and the need to revisit any tests already completed. This will be subject to checking by the ONR Site Inspector and/ or specialist Inspectors as part of routine regulatory oversight. ONR requires licensees to categorise modifications depending on their significance to nuclear safety with the highest category submitted to ONR for assessment prior to implementation. The Licence Condition associated with commissioning requires that the licensee's arrangements shall ensure that no plant which may affect nuclear safety is operated (except for the purpose of commissioning) until a safety case is submitted to the ONR. The safety case shall include the safety implications of modifications made since commencement of the construction of the plant and those arising from the commissioning of the plant. The licensee shall not commence operation of the plant without the consent of ONR.	
UNITED STATES	
• *How do you check design change has been reflected in the licensing documents (i.e. preliminary safety analysis report (PSAR) vs. final safety analysis report (FSAR), test procedures, operating procedures, etc.)?* NRC requires in 10 CFR 50.34, or 10 CFR 52.79 (for plants licensed under Part 52),	**How do you handle the fast changing computer/ plc/software etc. technology?**

that the design, ITP, and test acceptance criteria all be part of the FSAR. The licensees are required to meet the requirements of the design or change them. The licensees are required to notify the NRC of changes to the FSAR, and some require prior NRC approval (described later). The NRC maintains construction site resident inspectors and monitors construction activities. The NRC performs inspections to verify the construction is in accordance with the licensed design. The NRC's inspection programs are sample-based inspection program. The inspection program uses a process to determine what construction activities need to be inspected (described in IMC 2506, "Construction Reactor Oversight Process General Guidance and Basis Document"). An expert panel of NRC staff with extensive nuclear construction and NRC inspection experience was convened to weight the four attributes that contributed to determining the value of inspecting related work (such as Safety Significance; Propensity for Making Errors; Construction and Testing Experience; and Opportunity to Verify by Other Means). The NRC has the freedom, access, and authority to inspect any construction related activities, including at manufacturer locations.

The link to 10 CFR regulations is www.nrc.gov/reading-rm/doc-collections/cfr/

The link to IMC 2506 is http://pbadupws.nrc.gov/docs/ML1505/ML15055A477.pdf

- *How do you check tests are still valid when design changes are implemented during construction?*

The licensee as part of their design change process is required to evaluate the effects of a design change. NQA-1 (all versions since 2000) (currently the NRC endorses NQA-1 2008 by RG 1.28, "Quality Assurance Program Criteria [Design and Construction]) states in part for design change control, "These measures shall include evaluation of effects of those changes on the overall design and on any analysis upon which the design is based. The evaluation shall include facility configurations that occur during operation, maintenance, test, surveillance, and inspection activities." The NRC maintains resident inspectors at both operating and under construction reactors. The inspectors are expected to monitor work activities, testing, and design changes to independent assess whether the licensee is meeting regulatory requirements.

The link to RG 1.28 is http://pbadupws.nrc.gov/docs/ML1001/ML100160003.pdf

- *When and for which document do you require regulatory approval?*

For reactors, the NRC has two licensing frameworks, 10 CFR Part 50 for construction permits (CP) and operating licenses (OL) and 10 CFR Part 52 for design certifications (DC) for standard designs and combined license (construction and operation – COL). A good description of these licensing processes is in NUREG/BR-0298, "Nuclear Power Plant Licensing Process." For plants that are going to be doing commissioning, they would have a COL or OL and a reviewed and approved environmental report and FSAR, (which includes the Technical Specifications and initial test program (i.e. commissioning tests)).

Changes to the OL or COL for the facility or to the Technical Specifications (not including Technical Specification basis) require NRC review and approval before implementation.

For plants licensed under Part 50, changes to the approved FSAR require the licensee to perform a review of each change to determine if the change requires NRC approval prior to implementation (10 CFR 50.59). In brief summary, 10 CFR 50.59 requires prior NRC approval if the change could; 1) cause more than a minimal increase in the frequency or consequences of an accident; 2) cause more than a minimal increase in the frequency or consequences of a malfunction of a structure, system or component (SSC) important to safety; or 3) cause a different type accident than previously evaluated. For plants licensed under Part 52, changes to the approved

FSAR require the licensee to perform a similar review to the 10 CFR 50.59 review (required in section VIII for each Part 52 Appendix – there is an Appendix for each new reactor design). In addition for plants licensed under Part 52, changes to certain information, designated as Tier 1 or Tier 2* in the FSAR, require NRC approval prior to implementation. For both Part 50 and 52 plants other changes to the FSAR are reported to the NRC at least annually. The link to the NRC website from which the combined licensed holders COLs and FSARs can be found is www.nrc.gov/reactors/new-reactors/col-holder.html Link to NUREG/BR-0298 is http://pbadupws.nrc.gov/docs/ML0421/ML042120007.pdf	

WORKSHOP ON REGULATORY OVERSIGHT OF THE COMMISSIONING PHASE FOR NEW REACTORS

Korea 14-16 March 2016

GROUP 2 – Commissioning oversight

2.A. Regulatory hold points and witness points

Answers	Learning
CANADA	
As per CNSC regulatory document REGDOC-2.3.1, *Construction and Commissioning Programs*, at a minimum, the regulatory hold points are: Phase A: prior to fuel load Phase B: prior to leaving reactor shutdown state Phase C: approach to critical and low power tests Phase D: high-power tests These regulatory hold points are considered risk significant to the CNSC. REGDOC-2.3.1 does not specify mandatory witness points. However, they will be determined based on the submitted application and the technology chosen; the witness points typically align with the major milestones of the project. The witness points will be detailed in the project plan and will be discussed with the licensee. For witness points, CNSC will begin with a baseline review of test results, which typically involves document review of SSC test results. CNSC will then select additional tests to witness based on: • The risk significance of the SSC (such as special safety systems, safety support systems). • Whether alternative design approaches have been taken to meet our regulatory requirements. • Issues that have been identified while reviewing the specific design of the SSC (such as novelty of design, adequacy of SSCs in meeting our requirements, etc.). • Unexpected results discovered from other similar tests. Safety issues that have been identified in the international community.	
CHINA	
Yes. The Commissioning Inspection Programme which is issued by NNSA is the basis. There are 7 hold points and 79 witness points based on Supervision and inspection Programme in Commissioning stage for TAISHAN Unit 1. • 7 hold points: cold functional test, hot functional test, first fuel loading, first initial criticality, initial synchronisation, 60% thermal power , 90% thermal power ; • 79 witness points: uniqueness, importance of safety, complexity, related tests to three shields, test balances and risks, with the combination of commissioning experiences of CPR1000 units;	**The regulatory hold points set in commissioning phase.**

• For each hold point, we have special Inspection Procedure, which include acceptance criteria. For each witness point, the acceptance criteria from System Safety Criteria.	
FINLAND	
• *Do you impose mandatory hold points or witness points during commissioning* ➢ *If so, what is the basis for selecting the hold points and witness points?* ➢ *If not, what is the basis for not imposing mandatory hold and witness points?* STUK: Major mandatory hold points • before fuel loading • before first criticality • before increasing power to new power level during nuclear testing Other hold points • commissioning inspections of all pressure equipment before start of commissioning tests • STUK can also set hold points on other technical areas based on graded approach. E.g. using safety classification. • *Do you set criteria for the acceptance of hold points or witness points (i.e. prescriptive regulatory requirement)? If so, to what extent do you involve the licensee before you impose the criteria for the acceptance of hold points or witness points?* STUK: Criteria are set in the regulatory guides. E.g. for first criticality the criteria are that STUK has approved a detailed description of the procedure for making the reactor critical and the results of preceding tests have been reported to STUK within the scope necessary to demonstrate fulfilment of the acceptance criteria.	
FRANCE	
• *Do you impose mandatory hold points or witness points during commissioning* Yes. ASN's current view is that only a few hold points will be set. Many witness points are set. ➢ *If so, what is the basis for selecting the hold points and witness points?* Hold points and witness points have to be considered differently: • A witness point (WP) should be set when the regulator needs to be informed on a specific CT: ○ for a potential on-site inspection during performing; ○ to request the assessment of the results of a specific CT. To define witness points, the regulator has therefore to consider the benefits of a field inspection against a (delayed) "office" assessment of the test's performance and results, or the regulator seeks to be informed as soon as the test is performed in order to assess its results in anticipation of an upcoming hold point. • A hold point (HP) should be set when the regulator needs to perform and conclude a review (documentation assessment or on-site inspection) of	**Question: it is difficult to have an exact date for the performing of a CT. What is the organisation of the other regulators with licensee to be ready to watch the WP/HP.**

pre-defined information (results of controls or CTs) prior to the implementation of a specific CT. To define a hold point, the safety significance of moving past the hold point has to be understood (test stage when tests results and the state of the reactor have to be questioned). Therefore, for hold points, the regulator has to define what it wants to control and proceed as early as possible in association with the licensee (paper files) and set up field control points.

- When the regulator sets a hold point, it is important to clarify the content of the licensee's submission and time for submission.

Hold-points for Flamanville 3 (FLA3) EPR reactor:

For FLA3, already defined hold-points are:

- **Inner Containment Pressure Test (See license-conditions [INB167-2-1]): a report should be sent by licensee 30 days before implementation. This report should include:**
  - A list of deviations encountered during erection and how they were handled. The goal is to show that the "as built" inner containment is ready for the test and that non-conformance reports (NCRs) not yet solved (if any) have no impact on CT's performance and result.
  - The method used to ensure that equipment inside inner containment won't be damaged by test conditions (especially already commissioned equipment).
  - A self-assessment by the licensee on the effectiveness of its organisation and processes (dedicated committees are established by EDF) to decide on whether moving to the **next step of overall CT program.**

For this hold-point, ASN plans to assess this report and to perform inspection before implementation and during implementation of this test. A final report should be provided by licensee one month after completion of the test and this report will also be assessed, to confirm the validity (and results) of the test.

- Fuel arrival on site (See Article 20-VI of French BNI procedures decree and license-condition [INB-167-50-1] defining this as "partial commissioning"): licensee should provide an application for such hold-points to ensure safety of fuel assemblies in pool or to ensure appropriate use of radioactive materials during commissioning tests (wastes and releases issues). Moreover, he has to submit a report to ASN 2 months before the date planned for partial commissioning giving :
  - a list of CTs still to be completed before partial commissioning;
  - a list of CTs already performed and their results including managements of NCRs;
  - a list of other controls still to be conducted before partial commissioning.

The licensee should submit every week additional results and information on management of NCRs when needed for CT or other controls performed and needed before authorising fuel arrival.

Finally, just before fuel arrival, when licensee considers all prerequisites are met, it submits its statement on acceptance of fuel arrival based on sufficiency, results and management of NCRs of commissioning activities and other controls. This statement should also take into account formal opinions provided by its dedicated committees for moving to the next step of overall CT program.

For such hold-point, ASN plans to assess the application and to perform on-site inspection before releasing HP to check status of installation, preparedness of future operating teams, progress of overall CT programme and the way licensee deals with non-conformances not yet solved.

- Fuel loading (See Article 20 of French BNI procedures decree and license-condition [INB-167-50-1]): licensee should provide an application for such hold-point to ensure safety of the overall plant. Moreover, he has to submit a report to ASN 2 months before the date planned for operating giving:
  - a list of CTs still to be completed before operating;
  - a list of CTs already performed and their results including managements of NCRs;
  - a list of other controls still to be conducted before operating.

The licensee should submit every week additional results and information on management of NCRs when needed for CT or other controls performed and needed before authorising fuel loading.

Finally, just before fuel loading, when licensee considers all prerequisites are met, it submits its statement on acceptance of fuel loading based on sufficiency, results and management of NCRs of commissioning activities and other controls. This statement should also take into account formal opinions provided by its dedicated committees for moving to the next step of overall CT program.

For such hold-point, ASN plans to assess the application and to perform on-site inspection before releasing HP to check status of installation, preparedness of future operating teams, progress of overall CT programme and the way licensee deals with non-conformances not yet solved.

If ASN authorises operation, new license –conditions (including new HPs for first criticality, power levels…) will be fixed.

Witness-points for Flamanville 3 (FLA3) EPR reactor:

Since the beginning of EPR construction, ASN sends each year a list of WPs to perform inspections (See license-conditions [INB 167-51.ii.]). Licensee should give notice to ASN at least two weeks before the planned date of each identified WP.

For FLA3, already defined witness-points for commissioning are:

- HVAC extreme tests (cold and hot season) for diesel and SBO buildings;
- Cleaning/Flushing of RPV;
- First In/Out Check of I&C;
- Preliminary CT of I&C/electrical cabinets, HVAC systems, CFWS/ECWS/CCWS;
- Cleaning and first start of a safety diesel/SBO.

New WPs will be fixed according to licensee schedule progress and taking into account findings during CT documentation assessment.

- *If not, what is the basis for not imposing mandatory hold and witness points?*

Not applicable.

- *Do you set criteria for the acceptance of hold points or witness points (i.e. prescriptive regulatory requirement)? If so, to what extent do you involve the licensee before you impose the criteria for the acceptance of hold points or witness points?*

For WPs, no criteria are defined because ASN just wants to know when the CT is implemented in order to be able to perform inspection or assess results as soon as possible.

For HPs, ASN has defined content of licensee submission and timeframe for submission to ASN. For HP related to one-site fuel arrival or fuel loading in the

vessel, the general criteria to be met are set in the regulations (see Article 20 of French BNI procedures decree). Usually, HPs are set to perform inspection or assessment prior to implementation of a defined CT. As ASN cannot foresee all issues that could appear in the submission or during inspection, no pre-defined criteria are generally set but aims are communicated to the licensee through content of submission or through inspection agenda.	
JAPAN	
(1) Hold points or witness points The Reactor Regulation Act requires licensees to undergo Pre-service Inspections and receive an NRA confirmation before the facilities being operations. The Commercial Reactors Ordinance specifies the required inspections according to the progress of construction process, and following inspections are conducted for commissioning: (Hold points in the Pre-service Inspections during commissioning) • <u>When ready to start criticality operations</u> - Regulatory inspections for the performance and function or of SCCs (i.e. reactors, cooling system for reactors, instrumentation and control systems, and generators) required for criticality operations. ➢ Inspection of fuel assembly configuration in the core, shutdown margin inspection, inspection of the control rod drive mechanism, first criticality confirmatory inspection, and others. • <u>When completing all the approved construction</u> - Regulatory inspections for the overall performance of facilities in power operations. ➢ Inspection of the control rod drive mechanism, RCIC, the recirculation pump trip system, load inspection, plant trip inspection, loss of external power supply inspection, generator load rejection inspection, and others. **(2) Criteria for the acceptance of hold points or witness points** Concerning the Pre-service Inspections, the Commercial Reactors Ordinance set forth the requirements for the inspection timing (construction process, so-called hold points), facilities and items. The NRA inspectors conduct the inspection, witnessing the licensee's test for the selected items and reviewing the records of the items, where the scope of inspection items is determined in advance, and the inspections are carried out on the days that the licensees want. After the Approval of Construction Plan, the licensee submits applications for the Pre-service Inspections to the NRA, and then the NRA makes out the inspection procedures (including the scope, items, methods, criteria, etc.) and conducts the inspections.	- **How do you consider the risk informed hold points or witness points?** - **How do you consider some graded approach to hold points or witness point?** - **When is the starting point for the resident inspections conducted by the resident inspectors (from siting, design or construction phases)? What is the intent of the resident inspection starting points?**
KOREA	
<u>Answer 2.A.(1)-1</u> **Regulatory hold points** The regulatory body does not use the hold points because the regulatory inspection should not be the reason to delay the test schedule of the licensee. The Nuclear Safety and Security Commission (NSSC) Notice 2014-27	**<u>Domestic experience</u>** **The inspection programme to verify systems and components important to safety of the plant**

(Regulation on Pre-operational Inspection of Nuclear Reactor Facilities) prescribes the time of inspections per main unit process in accordance with the Article 29 (Time, etc. of Pre-operational Inspection) of Enforcement Decree of Nuclear Safety Act (NSA). Initial fuel loading is the regulatory witness point, not the hold point. The initial criticality and re-criticality, as the Notice prescribes them as the items for witness inspection, are also the witnessing items. **Regulatory witness point** It is the basis for selecting the regulatory witnessing items, rather than the witness points themselves. The NSSC Notice 2014-27 (Regulation on Pre-operational Inspection of Nuclear Reactor Facilities) prescribes the time and inspection items, based on which the subjects and inspection items for each main unit process are selected and notified. **Answer 2.A.(1)-2** Inspectors are cautioned to be certain that licensees do not interpret requests for notification of expected tests as "hold points" for the tests. Licensees are not expected to delay conduct of a test until the inspector arrives. **Answer 2.A.(2)** There is no acceptance criteria set for the hold points or witness points. The regulatory witness points are set when certain points are considered to be important for the safety during major tests or the test procedure. In the process, the selecting standards from the inspection guideline and the regulatory experience can be used as a reference, but the final decision on the witness point is made by the regulation team (personnel) in charge of individual inspection items (or test items), after corresponding with the test engineer of the Licensee.	**are fully tested to demonstrate that they satisfy their design requirements. In the NSSC Notice 2014-27 (Regulation on Pre-operational Inspection of Nuclear Reactor Facilities), the witnessing items for pre-operational inspections (during construction and commissioning stage) are specified as follows:** **1. Foundation excavation, reinforcing bar installation, liner plate installation and fabrication, concrete placement, for structuring of reactor containment, etc.;** **2. Installation, welding, non-destructive test, and pressure test of components and piping of systems;** **3. Cold functional test, per each system, of various equipments and components such as pumps, motors, heat exchangers, valves, etc.;** **4. Cold hydrostatic tests and hot functional tests; and** **5. Initial fuel loading, hot functional test after the fuel loading, initial criticality test, low power reactor physics test and power ascension test.**
NETHERLANDS	
The ANVS is working on a strategy with respect to hold points and witness points. At the moment it is foreseen to fix at least hold point at the start of each new phase. Possible hold points are fuel loading and the start of nuclear tests. However, at the moment these hold points are not formalised. Next to this; hold points and witness points will be discussed with an applicant in pre-licensing meetings. The applicant will be asked to provide their strategy with respect to hold points and witness points. The Technical Review Plan gives guidance to the reviewer on the commissioning phase and the use of hold points. Elements that should be present in the commissioning programme are mentioned in the TRP. The TRP can be used both by Regulatory Body as well as the applicant.	1. What is regarded to be a good amount of hold points? 2. How is the licensee involved in determining the hold points and witness points? 3. Are there any differences between the hold points and witness points for a NPP compared to a research reactor? 4. How to formulate and capture the hold points?
RUSSIA	
Conditions for transfer from one stage to another shall be specified by the Regulator in the license terms and conditions for construction and operation	

of an NPP unit. Transfer to the next stage of works shall be allowed by the Regulator upon conduct of a check. Based on the NPP unit construction schedule submitted by a Licensee, the Regulator shall specify the control points for checks of implementation of works, and compiles the schedule of checks. The above-mentioned schedule shall be brought to the notice of a Licensee and Developer.	
SLOVAK REPUBLIC	
The hold points during commissioning are imposed by Slovak legislation, concretely in the Regulation No. 430/2011 Coll. Based on the legislative requirements the licensee has to split the commissioning into two phases: physical start-up and commissioning tests at different power levels. They has to be conducted in compliance with approved phase commissioning programme and approved individual physical and power commissioning test programmes. Approval is issued by regulatory body. Regarding acceptance criteria, these are set up by licensee and they are part of the physical commissioning and power commissioning programmes submitted to the regulatory body for approval. A permit holder may pass on to another sub-phase of power commissioning only once the results of tests from the previous phase have been evaluated, and success criteria for the given phase have been met and base on the agreement issued by regulatory body.	
UNITED ARAB EMIRATES	
FANR did not impose a mandatory hold points. FANR REG 16 Article 24 "The Licensee shall complete a review of the test results for each stage before Commissioning can continue to the next stage. Judgements shall be made on the basis of the review results on whether the succeeding stages will be modified as a consequence of the test results, or because some tests in the stage had not been undertaken, or some tests had been undertaken but had not been completed. The Licensee shall advise the Authority of the outcomes of its review before continuing to the next stage"	
UNITED KINGDOM	
a) Conditions attached to the Nuclear Site Licence require the licensee to divide commissioning into stages. Typically, a licensee identifies the start of each stage by defining a Hold Point, which is usually selected to represent a point in the commissioning programme where there is a significant step change in the nuclear safety risk. Where ONR so specifies, the licensee shall not commence nor thereafter proceed from one stage to the next of its commissioning, i.e. proceed passed a hold point, without the consent of ONR. In practice ONR uses these powers sparingly and selectively. Thus ONR specifies that a licensee seek ONR's consent to commence inactive commissioning, commence active commissioning (i.e. receipt of fuel onto site) and the first approach to criticality. However, ONR retains the option to permission any or all of the stages (i.e. Hold Points) in the commissioning programme. The decision to permission additional stages is informed by, amongst other considerations, the licensee's performance. Conditions attached to the Nuclear Site Licence also require the licensee to have adequate arrangements for commissioning any plant or process	

which may affect safety. The licensee will apply its arrangements to each stage of the commissioning and will identify any witness points required in the interest of nuclear safety. ONR will usually appoint a Site Inspector, and a programme of regulatory inspections will be introduced. The inspections will need to satisfy ONR that the arrangements for managing commissioning are fit for purpose and that witness points are providing the licensee with adequate oversight of critical commissioning tests and activities. Prior to consenting to the commencement of active commissioning, ONR will seek evidence that the licensee has resolved all the issues arising from its assessment of the pre-commissioning safety report, the technical specifications and the maintenance schedule. Before the start of active commissioning ONR will also require the licensee to conduct a satisfactory demonstration of its arrangements for responding to a radiation emergency. ONR will expect the licensee to compile a schedule of those tests which are considered to be of particular significance to nuclear safety. From this schedule ONR will select tests which are to be witnessed; along with any additions that may be of particular interest. The criteria for selecting tests to witness include: • the importance of the equipment to nuclear safety; • the complexity of the equipment/ test; • the novelty of the equipment/ test; • the potential consequences should the test be inadvertently conceived/ executed, and • relevant operating experience. b) ONR does not regulate by prescription and as such does not set the acceptance criteria for hold points and witness points. The ONR hold points generally consist of a sub-set of the licensee's own hold points for which the licensee will be expected to have robust management arrangements including the documentation of expectations for clearing the hold point and subsequent sign off that they have been met by both the licensee's management and internal regulator. The criteria should be broader than just the adequacy of the installed plant, covering other topics such as organisational capability. ONR will be interested in looking at the licensee's own review of the Hold Point when forming its own opinion as to whether consent can be granted to proceed. ONR will expect the licensee to define acceptance criteria for all commissioning tests in accordance with the safety case assumptions and will choose to sample accordingly. It is envisaged that the appropriateness of the acceptance criteria for those tests witnessed by ONR will receive greater scrutiny due to the increased interest in these particular tests.	
UNITED STATES	
• *Do you impose mandatory hold points or witness points during commissioning?* The NRC does not impose mandatory hold points or witness points. The NRC maintains NRC inspectors at each construction and operational site, and has the authority and access to witness any activity at the site (10 CFR 50.70). The NRC does not use hold points, however the licensee keeps the NRC informed of the schedule for testing (if the licensee does not want to keep the NRC informed the NRC increases oversight). Licensees are not	**What do you do if there is a regulatory hold point that is missed or the results are not acceptable?**

required to delay conduct of a test until the inspector arrives. The NRC inspectors ensure they are present to witness testing or other key activities in accordance with the NRC inspection plans and procedures. • *If so, what is the basis for selecting the hold points and witness points?* The NRC does not have hold points or witness points, but the NRC does have an inspection plan for the NRC inspectors. The NRC inspection plan establishes which testing the NRC wants the inspectors to inspect (witness). The NRC inspection plan requires the inspection of those construction tests deemed targeted by the expert panel (discussed in question 1 C). The NRC will also inspect all FOAK tests and any tests specified in the License (these are usually the same). In addition, the NRC may inspect other tests based on risk significance, uniqueness, or complexity, and selected during the NRC inspection planning process. • *If not, what is the basis for not imposing mandatory hold and witness points?* The NRC is an independent regulatory agency. As an independent regulator, the NRC does not sign off on a licensee procedure, so as to remain independent. The NRC has unfettered access to perform inspections and observe licensee performance (10 CFR 50.70). The NRC has not encountered difficulties in inspecting commissioning activities that we are interested in, and licensees are mindful of NRC interests in witnessing particular tests. The NRC has the authority to grant and revoke licenses to individuals and utilities/organizations to operate a nuclear plant. • *Do you set criteria for the acceptance of hold points or witness points (i.e. prescriptive regulatory requirement)? If so, to what extent do you involve the licensee before you impose the criteria for the acceptance of hold points or witness points?* The NRC does not have NRC hold or witness points. As part of the licensing process the applicant is to provide the acceptance criteria for the ITP in the FSAR (in accordance 10 CFR 50.34, or 10 CFR 52.79 – for plants licensed under Part 52). The NRC as part of its licensing review will evaluate the acceptance criteria.	

2.B. Bases for inspection

Answers	Learning
CANADA	
CNSC has 14 Safety and Control Areas (SCAs) such as management system, human performance management, operating performance, physical design, etc. In the generic inspection plan, CNSC will identify for each SCA the regulatory basis for carrying out the inspections. These includes the Nuclear Safety and Control Act, Regulations, licence, documents submitted in the licence application and, regulatory documents and codes and standards referenced in the	

licence. Examples of CNSC regulatory documents include: REGDOC-2.3.1, Conduct of Licensed Activities Construction and Commissioning Programs: REGDOC-2.3.3, Periodic Safety Review REGDOC-2.4.1, Deterministic Safety Analysis REGDOC-2.4.2, Periodic Safety Review Examples of codes and standards include: CSA N286, Management System Requirements for Nuclear Facilities CSA N290.15, Requirements for Safe Operating Envelope for NPPs	
CHINA	
"Commissioning Program" which is a necessary document for applying initial fuelling permit. The regulatory bases for inspection are PSAR\FSAR\Commissioning Program\System Safety Criteria\System Commissioning Program\Commissioning Procedure\System Design Manual and so on. There isn't any specific requirement regarding multi-units sites commissioning.	
FINLAND	
• *What are the regulatory bases for inspection (PSAR, FSAR, others)?* STUK: The most recent preapproved design documentation (PSAR, detailed design documents, commissioning programme, FSAR). • *Is there any specific requirement regarding multi-units sites commissioning?* STUK: No.	
FRANCE	
• *What are the regulatory bases for inspection (PSAR, FSAR, others)?* As submission of PSAR was done before detailed design, modifications are very numerous so that there are many updates in FSAR. Before submission of license application, PSAR is the base for inspection. After submission of license application, FSAR is also a base for inspection as assessment of license application is on-going (this FSAR take into account modifications of design implemented or to be implemented on-site). After license is granted, FSAR will be a basis for inspection (all modifications should have been implemented on-site). For commissioning activities, PSAR or FSAR can	**<u>Questions:</u>** **How do other regulators manage design change/modifications between PSAR and submitted FSAR?** **How do other regulators manage design change/modifications between submitted FSAR and operating licence?**

be used to check if their content is consistent with installation (are all equipment described in PSAR/FSAR settled and are the requirements for these equipment met? If not, licensee should explain why and this may imply an update of FSAR or commissioning procedures). For commissioning tests, GOR should also be a base for inspection (e.g. periodic tests, hazards management, core-test…). Regulatory requirements are also bases for inspection on commissioning: French regulatory requirements for commissioning activities are stated in general BNIs regulation (TSN Act, BNI procedure decree, order on general safety expectations…) and specific site authorisation and associated licence conditions (creation decree, license authorisation, license-conditions for construction and design – commissioning tests – Post-Fukushima issues). Early before starting commissioning, ASN engaged with licensee (from 2008) and performed inspections on the organisational readiness of the licensee and its contractor organisations to start commissioning (from 2011). Thus, ASN decided to establish license conditions specific for commissioning activities (See attached ASN decision 2013-DC-0347 -7th May 2013) to set specific requirements on these activities. • *Is there any specific requirement regarding multi-units sites commissioning?* Not applicable to current situation in France.	
JAPAN	
(1) Regulatory bases for inspection The Reactor Regulation Act defines the regulatory inspections of nuclear power plants at various stages, after the licensing at each stage of progress: construction (including commissioning), operation and decommissioning stages. That act sets forth obligations for the licensees to receive the regulatory inspections, and to comply with the NRA technical standards, during each stage from construction to decommissioning. The NRA ordinances provide details on regulatory inspections such as the scope of each inspection, time to receive inspections, items for inspections, procedures for applying to inspections, implementation manuals for inspections, issuance of inspection certificates, and so on. (Planned inspections of the facilities and operational safety activities during commissioning) • Pre-service Inspection - The NRA conducts the inspection to verify that construction work is being carried out	• **Does division of responsibilities between reviews and inspections become clear in your RB?** • **How do you consider the importance of verifying that the established facility conforms to the regulatory requirements?** • **How do you consider the scope of licensee's activities to inspect?**

according to the approved detailed design, "Construction Plan", and that the established facility conforms to "technical standards" • Operational Safety Inspection - The NRA reviews the compliance with "Operational Safety Program" prescribing the necessary operational safety measures of nuclear power reactor facilities. In commencing operation, the licensees must set forth Operational Safety Programmes and obtain the NRA approval. **(2) Specific requirement regarding multi-units sites commissioning** There is no specific requirement regarding multi-units sites commissioning. • Pre-service Inspection is carried out for each unit (unit by unit), not depending on the number of units. • Operational Safety Inspection is carried out for each site (site by site), not depending on the number of units. However, the number of the resident inspectors will depend on the number of units.	
KOREA	
Answer 2.B.(1) The licensing documents to be the regulatory basis for the inspection can be described as follows: As for the pre-operational inspection conducted after the construction permit (CP), the basis document for the regulatory inspection may differ based on whether the application documents for operating license (OL) are submitted or not. Before the submittal of such documents, regulatory basis for the commissioning oversight should be PSAR while after the submittal, basis should be FSAR. The document "Plan for Quality Assurance concerning Construction", one of the licensing application documents should also be the regulatory basis and applied until the approval of the OL regardless of the submittal of OL application documents. After the OL approval, the regulatory basis for inspection is FSAR and the "Quality Assurance Plan concerning Operation". **Answer 2.B.(2)** There is no specific requirement existed regarding the multi-units commissioning. All the requirements on commissioning test are applied to each and every unit in a same manner and importance no matter how many units are under commissioning stages simultaneously. However, for the equipment or systems shared by	

more than two units, the licensee should specify prerequisite conditions in the test procedure whether such commissioning test may affect other units on the site. The regulatory body reviews and inspects the validity of the procedure and the results according to the prerequisite conditions.	
NETHERLANDS	
Regulatory bases for inspection is the license. With respect to the new build of a research reactor two licenses are foreseen: - construction license; - operating license. A safety report, based on the PSAR/FSAR will be part of the license. It might be necessary to perform inspection prior to the licenses (e.g. with respect to long-lead items). In these cases specific arrangements with the applicant will be made.	**Are there any experiences with inspections in the pre-licensing phase? If so, what are the challenges?**
RUSSIA	
Both PSAR and FSAR constitute legitimate base for inspection by Regulatory Body as Nuclear and Radiation Safety Supervision Body. The legitimate basis for inspections in frames of the license for construction is PSAR, while the legitimate basis for inspections in frames of the license for operation is FSAR. In addition plant design documentation is used for inspection by Regulatory Body as State Construction Supervision Body. There are no specific requirements for multi-unit site commissioning.	
SLOVAK REPUBLIC	
The regulatory basis for inspections are FSAR, phase commissioning programme, physical commissioning and power commissioning programmes and all documentation submitted by licensee to the RB. Through this documentation the licensee declares that the all legislative requirements are fulfilled. As regards multi-units commissioning there are not set up any specific requirements regarding this. The requirements are impose in the permission for commissioning and they are an integral part of the permission. They resulted from design and technical specifications of the NPP.	
UNITED ARAB EMIRATES	
1. Review the applicable chapters of SAR, the applicable start –up Administrative Procedure(SAP), applicable CITP tables, FANR	

Regulations and facility licenses pertaining to the Commissioning Program 2. Review the licensee Commissioning Programme and the start-up schedule for commissioning activities in progress or already performed and select CITP test or relevant tests results to be reviewed by FANR (regulator) 3. Ensure that all tests listed in CITP tables III, IV and V have the tests result verified according to this instruction. 4. The applicable test procedures, Test results record sheet, test reports (when available) associated with the test(s) to be inspected. 5. Review previous inspection reports related to test results for follow up of observations and corrective action implementation	
UNITED KINGDOM	
a) During commissioning ONR will use the pre-commissioning safety report and commissioning test documentation as the basis for inspections. Prior to fuel on site ONR will also inspect the correct implementation of the technical specifications and maintenance schedule. b) ONR will expect licensees of multi-unit sites to give due consideration to the potential hazards arising from the adjacent units whether still under construction, commissioning or operating commercially. The respective safety cases should identify such hazards and the measures taken to protect and/ or mitigate.	
UNITED STATES	
• *What are the regulatory bases for inspection (PSAR, FSAR, others)?* The regulatory authority to inspect is in 10 CFR 50.70(b)(4) which states, "The licensee or construction permit holder shall afford any NRC resident inspector assigned to that site, or other NRC inspectors identified by the Regional Administrator as likely to inspect the facility, immediate unfettered access, equivalent to access provided regular plant employees, following proper identification and compliance with applicable access control measures for security, radiological protection and personal safety." The NRC inspects testing or other activities to ensure they are in accordance with the design basis (i.e. PSAR, FSAR) and regulatory requirements for Quality Assurance (10 CFR Part 50 Appendix B).	

• *Is there any specific requirement regarding multi-units sites commissioning?* 10 CFR 52.79(a)(31) requires the COL applicant to provide in its FSAR the following as part of its application: "For nuclear power plants to be operated on multi-unit sites, an evaluation of the potential hazards to the structures, systems, and components important to safety of operating units resulting from construction activities, as well as a description of the managerial and administrative controls to be used to provide assurance that the limiting conditions for operation are not exceeded as a result of construction activities at the multi-unit sites". The NRC will review this evaluation as part of the licensing process. In addition, 10 CFR 50.34(a)(11) has similar requirements for a CP and 10CFR 50.34(b)(6)(vii) has similar requirements for an OL. The NRC resident inspectors for the operating units will keep a close watch for the effect of construction/testing activities on operating units.	

2.C. Tests sampling criteria

Answers	Learning
CANADA	
During planning stage, CNSC will review the list of tests the licensees will be conducting and select the tests to witness based on the significance of the SSCs, alternative design approaches, etc. However, we will also ensure that there are sufficient inspections across different types of systems (safety systems, safety related systems, process systems, etc.).	
CHINA	
Criteria: Safety significance, complexity, uniqueness, equipment problem feedback. Basis: PSAR FSAR. By discussion around NNSA HQ, NNSA Regional offices, NNSA technical supports, and experts on Nuclear Safety. Selection of 79 tests including five FPOT-EPR tests, 13 FPOT-TS1 tests, 13 Specific tests, 29 Important tests, 19 other tests.	

FINLAND	
• *What are your criteria to sample licensee's tests to be inspected?* STUK: Testing programs: All testing programmes of safety classified system and plant level testing (e.g. low-power tests, power tests etc) require approval from STUK. This is defined in regulatory guides. Witnessing tests: considered case by case, tests that demonstrate important safety functions, FOAKs. • *What is the basis to establish above criteria?* STUK: Based on safety functions and other graded approach factors as experience, unique tests… • *How do you classify the tested systems?* STUK: Based on safety functions and other graded approach factors as experience, unique tests… STUK has a flexibility to focus on selected tests.	
FRANCE	
• *What are your criteria to sample licensee's tests to be inspected?* For assessing commissioning documentation, some criteria have been settled for sampling: - nature of fluid conveyed (water, steam, air, electricity); - organisation responsible for elaborating CT documentation (vendors, contractors, licensee departments…); - systems very significant from a safety point of view or with design significantly different from the one of operating reactors in France. Based on these criteria, a batch of system CTs programme to be assessed has been agreed between ASN and its TSO (IRSN). This selection represents roughly 25% of licensee CT documents for systems important to safety. IRSN is formalising its assessments in specific opinions sent to ASN. In addition, IRSN produced also a general advice on cross-cutting issues For inspection during implementation of CT, several criteria have to be taken into account: - findings during CTs documentation assessment (IRSN has to highlight CTs that seems important to inspect due to their safety importance, CT of newly designed equipment, equipment with many issues raised during design assessment…): sampling criteria for assessing commissioning documentation are thus taken into account; - licensee schedule (e.g. CWFS/ESWS pumps are the first safety classified pumps tested so it is relevant to inspect such CT) and in-house organisation (responsibilities of the staff on-site and of the engineering departments); - ASN Inspection capacity (2 inspections per month on-site including construction/commissioning activities and preparedness of future operating teams); - inspection focus on first preliminary CT to check if on-site organisation meets regulatory requirements, - Organisations actually performing the CT (vendors, contractors, licensee …);	**<u>Questions :</u>** **How do other countries take licensee's schedule into account to build an efficient inspection programme on CTs?** **How do regulators manage resources when schedule changes a lot (significant delays in the project)?**

- Defined hold-points when on-site checks are needed; - Findings on CT results: if many non-conformances are detected or a reportable event is notified to ASN; - Changes of phases in overall CT programme if safety issues are raised. • *What is the basis to establish above criteria?* Inspection goal is to ensure the licensee has adequate processes and implements them properly to prepare, perform, analyse the results of the CT and handle any deviation that may occur, including if contractors are involved. The basis for establishing above criteria is to control a batch of CTs and to have the largest efficiency on organisations or common issues. Findings of these inspections could lead to request corrective actions generalised to a larger number of CTs. Moreover, safety relevancy of CT is taken into account and need for on-site inspections is taken into account for releasing hold-points. • *How do you classify the tested systems?* First of all, systems important for safety are prioritised according to safety classification. Then, equipment (valves, pumps, cabinets, sensors…) are taken into account so that a large variety of equipment's CTs will be inspected with probably common issues. Equipment with a new design (or equipment manufactured by a new vendor) are also prioritised because licensee may not have much feedback on such equipment.	
JAPAN	
(1) Criteria to sample licensee's tests to be inspected Pre-service Inspections cover the facilities for which the construction plans have been approved. The inspections shall be conducted as a witnessed inspections (direct observation), a witnessed sampling inspection (a type of inspection combining witnessed sampling inspection and record inspection to cover 100% inspection items), or a record inspection. Each type of inspection shall basically be selected in accordance with the witness classifications listed in the NRA's Guide for Pre-service Inspection of Commercial Power Reactors, and in consideration of construction details, safety importance of the facilities, and others, in each case. In a case where a witnessed sampling inspection is to be implemented, a general rule is that the witnessed inspections shall be conducted at least once for each inspection item of each inspection procedure, and the scope shall be determined in each of the inspection procedures. **(2) Classifying the tested systems** The NRA makes a pass/fail judgment in the Pre-service Inspection for the performance and function or of SCCs, confirming the conformity to "Construction Plan" and "technical standards". In the design phase, safety functions of SCCs are classified into three grades listed in the Importance Classification Guideline (*). Class 1 is the most important grade. • Class 1-SCCs (e.g. reactor pressure vessel, ECCS, etc.) • Class 2-SCCs (e.g. spent fuel pool, fuel handling system, etc.)	• **Criteria to sample inspections;** ➢ **How to determine the number of sampling, frequency of sampling?** ➢ **The relationship between the point of view of risk** ➢ **The relationship between the point of view of performance** • **How do you consider some graded approach to inspections sampling criteria?**

• Class 3-SCCs (e.g. area radiation monitoring system, new fuel storehouse, etc.) * Guideline for Reviewing Importance Classification of Safety Functions for Light Water Nuclear Power Reactor Facilities.	
KOREA	
Answer 2.C.(1) The items for the pre-operational inspection can be different by the types of reactor and design features. The NSSC Notice prescribes the inspection items that are selected after taking into account the importance of the subject equipment and facility. The operator (applicant and licensee) tests on the Structure, System, and Component (SSCs) stipulated on the NSSC Notice, upon which the inspector conducts a pre-operational inspection during commissioning. - NSSC Notice 2014-24 (Regulation on Pre-operational Inspection of Nuclear Reactor Facilities) Even inspection item is not prescribed in the NSSC Notice related to the pre-operational inspection, the regulatory body can add a new inspection item for the pre-operational inspection programme if it is to reflect the operation experience and to resolve current issues. **Answer 2.C.(2)** Regulatory body conducts inspections on most of the inspection items that are prescribed in the NSSC Notice on the pre-operational inspection. The inspection items have been selected after considering the importance of the equipment and facilities and stipulated in the NSSC Notice. For the different pre-operational inspection, different inspection guidelines are being established to suggest detailed content of inspection, methods, and inspection standards. - NSSC Notice 2014-24 (Regulation on Pre-operational Inspection of Nuclear Reactor Facilities) - Facility inspection-KINS-GI-N02 (Pre-Operational [Facility] Inspection Guidelines for PWR Nuclear Power Plants) - Performance inspection-KINS-GI-N03 (Pre-Operational [Performance] Inspection Guidelines for PWR Nuclear Power Plants) - Regulatory guideline-KINS/RG-N18.00 (Initial Test) ※ Pre-operational inspection is conducted mainly by the field witness, interview, and document review. **Answer 2.C.(3)** Article 2 (Facilities subject to Pre-operational Inspection) of the NSSC Notice 2014-24 breaks down the facility subject to Pre-operational inspection into 11 facilities. 1. reactor pressure vessel; 2. reactor coolant system facility; 3. instrumentation and control system facility;	

4. fuel material handling and storage facility; 5. radioactive waste disposal system facility; 6. radiation control facility; 7. reactor containment facility; 8. reactor safety system facility; 9. electric power system facility; 10. power conversion system facility; and 11. other facilities related to safety of nuclear reactor. Detailed systems for different types of inspection are prescribed and categorised as tables in NSSC Notice. * Types of Pre-operational Inspection (5 stage): Inspection of Structures, Installation Inspection, Cold Functional Test of Systems Inspection, Hydrostatic and Hot Functional Test Inspection, Initial Fuel Loading and Commissioning Test Inspection	
NETHERLANDS	
The newly developed guidance for new nuclear installations contains requirements on a higher level with respect to testing. Specific criteria are not yet developed.	**Compilation of criteria by a regulatory body vs. compilation of criteria by an applicant** **Are there experiences with both approaches?** **If criteria are set by an applicant, how are these assessed by the RB?**
RUSSIA	
In line with the requirements of the effective regulatory documents, a Licensee shall submit within the set of documents for obtaining a license for a NPP unit operation the commissioning programme for a NPP unit, as well as the programmes for implementation of the main stages: pre-startup adjustment works, first criticality, power start-up and pilot operation. The mentioned programmes contain the list of all programs, in accordance with which tests are to be conducted in the course of a NPP unit commissioning. On the basis of the provided information specialists of the Regulatory body, usually in co-operation with the specialists of scientific and technical support organisations, evaluate the list of test programmes to be requested from the Licensee in addition. Evaluation of the adequacy of tests methods and procedures for new NPP systems that have no prototypes shall be performed in the process of review of SAR, as well as test programmes and methodologies for new systems. In pursuance of the requirements of the Federal Regulations and Rules in the Field of Atomic Energy Use, the NPP design establishes and substantiates, while the SAR stipulates the requirements to the sequence and scope of works to be performed at the stage of a NPP unit commissioning, as well as the procedure for conduct of checks with regard to NPP systems and elements important to safety for their compliance with the design characteristics, including the acceptance criteria.	

General requirements to systems important to safety are imposed on the scope of analysis and experiments to confirm operability safety-related systems: technical and organisational decisions taken to ensure NPP safety shall be proven by the previous experience, tests, researches, operating experience of prototypes, and to be subject to complete and direct tests in the course of commissioning to check them for compliance with the design characteristics. General requirements to systems important to safety are imposed on the tests of safety systems at the stage of commissioning, including: - confirmation of conformity of technical characteristics of systems (and their elements) with the design characteristics; - check of sequence of signal transmission and activation of equipment; - check of diagnostic system used to confirm operability of the equipment of safety systems and their components; - metrological check of measuring devices and instrumentation channels of measuring systems for compliance with the design requirements; - metal inspection, including weld joints, equipment and pipelines of passive systems; - documenting of characteristics of a system (elements) and updating of performance characteristics of a system (elements). The list of characteristics subject to documenting shall be specified in SAR and appropriate test programmes developed on its basis. Development of test programmes is provided by the operating organisation with participation of NPP and reactor installation design developers in accordance with the NPP design and SAR.	
SLOVAK REPUBLIC	
The criteria for sampling tests to be inspected are the impact to the core (its characteristic, behaviour) and if the equipment respectively its operation is regulated by L&C. Generally the basis to establish the criteria is the impact of the tested equipment on the nuclear safety. For example in case of commissioning Mochovce 3 we sampled for inspection all test of the physical commissioning and power commissioning programmes. The tested systems are classified into three groups: 1. Safety system. 2. Safety related system. 3. Non classified system.	
UNITED ARAB EMIRATES	
There is no bases for sampling criteria yet , however, the following inspection instructions for oversight Commissioning Programme COM 1, Rev0 ; Commissioning Programme , Test Results Evaluation COM-02, Rev0 and Conduct and Witnessing of Pre-Operational Test and Pre-Core HFT COM-03,Rev01 describes bases for inspection during commissioning phase. Also, As per Licence No: FANR/NF/2012/001/Rev.01 Amended Licence for the Construction of Units One and Two of the Barakah (1) Nuclear Facility and Related Regulated Activities.	

Licence condition 11(a) Every 6 months the licensee shall submit the CITP 6 month Report. As per approval letter of the CITP stage III and IV FANR-NSD-ENEC-COR-00869-2015 every 3 months the licensee will submit the CITP stage III and IV report. FANR staff review those report	
UNITED KINGDOM	
a) The criteria for selecting tests include: • the importance of the equipment to nuclear safety; • the complexity of the equipment/ test; • the novelty of the equipment/ test ; • the potential consequences should the test be inadvertently conceived/ executed, and • relevant operating experience. b) The installation's Pre-Commissioning Safety Report produced and supplied to ONR in accordance with conditions attached to the Nuclear Site Licence. c) The licensee is expected to classify the commissioning tests on the basis of the safety classification of the system being tested with appropriate adjustment to account for potential consequences should the test be inadequately conceived or executed, complexity and novelty. For integrated plant testing it would be expected that more emphasis should be given to the potential consequences of the tests as the significance of individual systems becomes less of a driver.	
UNITED STATES	
• *What are your criteria to sample licensee's tests to be inspected?* Preoperational testing and the programmatic aspect of the initial startup testing will be inspected under Inspection Manual Chapter (IMC) 2504, "Construction Inspection Program: Inspection of Construction and Operational Programs" for plants licensed under Part 52. For plants licensed under Part 50 preoperational testing and programmatic aspects of the initial test program are inspected under IMC 2513 "Light Water Reactor Inspection Program – Preoperational Testing and Operational Preparedness Phase" The implementation of the initial startup testing will be evaluated under IMC 2514, "Light Water Reactor Inspection Program – Startup Testing Phase." The purpose of the startup testing phase inspection activities is to verify that the licensee is meeting the requirements and conditions of the facility license for pre-critical tests, initial fuel loading, initial criticality, low-power testing, and power ascension tests. This verification is to be achieved through reviewing procedures and records, direct observation, witnessing tests, reviewing test data, and evaluating test results. The NRC inspection plan establishes which testing the NRC wants the inspectors to inspect (witness). As an example, Inspection Procedure (IP) 70702, "Inspection of Preoperational Test Performance" requires the inspection of those construction tests deemed targeted by the expert panel (discussed in question 1 C). The NRC will also inspect all FOAK tests and any tests specified in the License (these are usually the same). In addition, the NRC may inspect other tests based on risk significance, uniqueness, or complexity, and selected during the NRC inspection planning process. IMC 2514 is under revision due to the differences in Part 50 and 52 licensing. IMC 2514 and IP 72304, "Startup Testing for AP1000: Test Procedure	**What percentage of commissioning tests do you observe?**

Review, Test Witnessing, and Test Results Evaluation" are in revision, in part to establish which testing the NRC will inspect. The criteria proposed is similar to that in IP 70702. Links to the IMCs are as follows, IMC 2504 http://pbadupws.nrc.gov/docs/ML1229/ML12298A106.pdf IMC 2514 www.nrc.gov/reading-rm/doc-collections/insp-manual/manual-chapter/mc2514.pdf • *What is the basis to establish above criteria?* The regulatory basis for inspection is discussed in question 2B. The NRC philosophy for the inspectors is discussed in IMC 2503, "Construction Inspection program – Inspection of Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) related work", 2504, 1513 and 2514. The basis to establish the criteria comes from how the NRC regulates. The NRC's regulatory process, has five main components: (1) developing regulations and guidance for our applicants and licensees, (2) licensing or certifying applicants to use nuclear materials or operate nuclear facilities or decommissioning that permits license termination, (3) overseeing licensee operations and facilities to ensure that licensees comply with safety requirements, (4) evaluating operational experience at licensed facilities or involving licensed activities, and (5) conducting research, holding hearings to address the concerns of parties affected by agency decisions, and obtaining independent reviews to support our regulatory decisions. The NRC also strives to improve its processes in these five areas through risk-informed and performance-based regulation. Risk informed and experienced based is probably the best way to describe our basis for the criteria. The inspection program uses a process to determine what construction activities need to be inspected (described in IMC 2506, "Construction Reactor Oversight Process General Guidance and Basis Document" for construction inspection). An expert panel of NRC staff with extensive nuclear construction and NRC inspection experience was convened to weight the four attributes that contributed to determining the value of inspecting related work (such as Safety Significance; Propensity for Making Errors; Construction and Testing Experience; and Opportunity to Verify by Other Means). Inspection Procedure (IP) 70702, requires the inspection of those construction tests deemed targeted by the expert panel and all FOAK tests and any tests specified in the License (these are usually the same). In addition, the NRC may inspect other tests based on risk significance, uniqueness, or complexity, and selected during the NRC inspection planning process. The link to the NRC website that describes how we regulate is www.nrc.gov/about-nrc/regulatory.html The link for the IMCs are IMC 2503 http://pbadupws.nrc.gov/docs/ML1211/ML12110A239.pdf IMC 2506 http://pbadupws.nrc.gov/docs/ML1505/ML15055A477.pdf • *How do you classify the tested systems?* The licensee is responsible for classifying the systems. Each SSC would be classified as inoperable, or operable. Some licensees also use operable but degraded, and available. From the regulatory perspective SSCs are either	

operable, which means the SSC can perform it's safety related design function, has all required support systems and meets the Technical Specification surveillance requirements for operability, or the system is inoperable. An important point to consider is that until the SSC demonstrates by testing that it can perform its design function, it is inoperable for meeting Technical Specification requirements (with very few exceptions). The NRC resident inspectors monitor how the licensees determine operability and classify SSCs.	

2.D. Dealing with unexpected test results or occurrences

Answers	Learning
CANADA	
Although the licensee's workers are expected to always follow processes and procedures, if they identify any issues with the test results or occurrences, they are expected to identify those to their managers. As per CSA N286, Management System Requirements for Nuclear Facilities, licensees are required to have a corrective actions program. CNSC will perform inspections and/or audits to confirm that their correction actions program is adequate as well as a technical assessment of the significance of the test results, as required. In some cases, unexpected test results may result in additional hold points/witness points.	
CHINA	
By reviewing "Commissioning Program" and "Commissioning QA Program" and team inspection before commissioning start. NNSA prepared an inspection procedure about "dealing with unexpected test results or occurrences".	
FINLAND	
• *How do you check that licensee's processes are adequately established to deal with the situation of unexpected test results or occurrences?* STUK: The licensee must submit to the regulator well before the start of commissioning a procedure how to deal with unexpected results. STUK reviews the procedure. During inspections and daily supervision (by resident inspectors) it is verified that the procedure is followed. • *How do you determine that licensee's implementation and follow-up corrective action are adequate in the case of the unexpected tests results or occurrences?* STUK: The licensee is required to report to the regulator about the proceeding of commissioning and of any significant deviations. If the testing programme is modified, it must be re-submitted to STUK. In the final result report, all deviations to testing programme (their reasons and justifications) must be described, as well as the corrective actions made in order to solve the problem. The final result report is submitted to STUK for approval.	

Regular communication and meetings with the licensee ensure that STUK is informed of unexpected results and is aware of licensee's plans for corrective actions already before they are implemented.	
FRANCE	
• *How do you check that licensee's processes are adequately established to deal with the situation of unexpected test results or occurrences?* General requirements: *See licence-condition [INB167-1-1]* Management process of NCRs during CT should be defined and implemented. All NCRs should be reported in CT documentation. To deal with NCRs, licensee should establish root causes: is it a construction issue, a manufacturing issue, a design issue, a modus operandi issue? Depending on the reasons of NCRs, licensee should involve relevant stakeholders (vendors, manufacturers, builder, designer, writer of CT documentation…) and prioritise processing NCRs depending on safety issues. When a NCR is processed, license should analyse the impact of NCRs on licence application and make sure update is done when necessary. Moreover, after fuel arrival/fuel loading, an initial analysis of consequences of NCR should be performed quickly to determine whether there are immediate safety issues and whether immediate safety measures have to be implemented. This management of deviation is checked by inspections on-site during implementing CTs and assessment of submitted results of CTs with information on the way deviations have been dealt with. The licensee also periodically reports to ASN on significant deviations. Requirements for moving to the next phase of CTs overall program: *See licence-conditions [INB167-1-1] and [INB167-1-2]* Organisation and process should be defined for moving to the next phase of CTs overall programme with some requirements: - quality assurance; - transparency; - independence from people implementing CTs; - skills in construction, design, operating NPPs; - sufficient resources to reach defined aims. The process should determine whether the pre-requisites for the next commissioning phase (according to overall CTs program) are met and allow, if needed, to: - implement additional CTs; - change the way CTs from the next phase will be implemented; - adapt future operating conditions; - prioritise completion date for some deviations. The decision for moving to the next phase should take into account at least: - The results of already implemented CTs and any deviation discovered during these CTs; - A review of all deviations, including analysis of cumulative impact of these deviations; - Results of a significant internal audit programme based at least on deviation management during CTs; - A review of effectiveness of the management of repeated deviations or significant events.	**Challenges faced:** **At the beginning, as the CTs deviations are generally due to a problem that occurred in a previous phase (design, manufacturing/ construction), the licensee refers to his general process addressing management of deviations. However, this general process was not addressing deviations detected during CTs. After ASN requests following inspections, documentation was completed with special case for dealing with NCRs during CTs.** **Deviations can be met during manufacturing, building/settling, commissioning activities. As there is no immediate safety issues until (partial) commissioning, time to deal with these deviations can be very long but, finally, safety authority has to check that all deviations have been dealt with by the licensee in an appropriate way.** **Moreover, some deviations (on all these activities and on operating) may not yet be solved. It means that :** - **For manufacturing deviations not yet solved: impact on building/settling, commissioning and operating activities is analysed and taken into account,** - **For building/settling deviations not yet solved: impact on commissioning and**

This organisation and process will be checked by dedicated inspections and by assessment of reports submitted to ASN (such reports have to be submitted to ASN when ASN has fixed a hold-point for moving to the next phase. Moreover, in this case, dedicated inspections will be carried out by ASN). Requirements just before (partial) commissioning authorisation: *See licence-conditions [INB167-50-1]* No later than two months before the date planned by the licensee for (partial) commissioning, licensee should submit to ASN: - the list of CTs still to be completed before (partial) commissioning, - the list of CTs already implemented with results compromising (partial) commissioning and the actions taken or proposed to deal with these results, - the list of any other test which remains to be conducted before (partial) commissioning. Thereafter, the licensee should submit each week additional documents to demonstrate adequacy of tests, CTs and acceptability of their results for (partial) commissioning. Finally, when the licensee concludes that all tests have been implemented and results are meeting requirements for (partial) commissioning, it informs ASN and gives statement on the acceptability of any deviation not yet totally solved. These submissions will be assessed by ASN. ASN plans on-site inspections for last check just before giving operating authorisation. • *How do you determine that licensee's implementation and follow-up corrective action are adequate in the case of the unexpected tests results or occurrences?* Dedicated on-site inspections will be carried out before important safety steps (usually linked to ASN hold-points) to check that actions have been implemented. For actions that have to be implemented during first years of operating, ASN has to compile these actions and follow their implementation by dedicated inspections or meetings.	**operating activities is analysed and taken into account,** - **For commissioning deviations not yet solved: impact on operating activities is analysed and taken into account.** **The extent of the regulator review of licensee progress in solving deviation and justifying acceptability of deviations not yet solved may be a challenge considering the expected timeline for reaching a decision on operation authorisation.** **Questions:** **Before commissioning, how do other countries incite licensee to deal with deviations in a timely manner despite there is no immediate safety issue?** **In overall CTs programme, are detailed pre-requisites fixed for each phase? How to deal with deviations not yet solved concerning these pre-requisites?**
JAPAN	
(1) Checking the licensee's processes One of the standards for Approval of Construction Plan (including commissioning) is having a technically-appropriate quality management system concerning the design and construction of commercial power reactors for licensee of commercial reactor operation and system for their inspection. The requirements for quality management relating to construction plans are prescribed in the NRA Ordinance on Quality Management System, and the licensee is required to carry out the non-conformity control and corrective actions. The Commercial Reactors Ordinance requires the licensees to include the followings in the operational safety programs, and to comply with them: • to establish the quality assurance program; • to eliminate the non-conformances by themselves;	• **If unexpected inspection results or occurrences (including findings, non-conformities, etc.) are identified, how far does the RB investigate and follow up such issues or occurrences? What actions does the RB take towards the licensee?** • **Non-conformity control (how far, how to require)** • **Corrective measures (how far, how to require)**

• to plan, implement, and evaluate the corrective measures for such occurrences; • to publish information about the non-conformity. The NRA checks for the licensee's management status on the non-conformance and corrective measures through the Pre-service Inspections and operational safety inspections. When reportable accidents and failures defined in the Commercial Reactors Ordinance occur, licensees must inform the situations immediately and report the relevant statuses and measures taken in response to the occurrences to the NRA within 10 days. The Reactor Regulation Act provides that the NRA may enter the plants or other facilities of licensees, inspect related records and documentation, and interview with the concerned persons. In this regard, the NRA may conduct on-site inspections without advance notice, if a deviation from the Limiting Conditions for Operation (LCO) is reported from the licensee, in accordance with the NRA's bylaw "Implementation procedures for on-site inspections in the event of LCO deviation". **(2) Licensee's implementation and follow-up corrective action** If non-conformance situation is identified during the Pre-service Inspections where the NRA makes a pass/fail judgment, the inspection is suspended. The licensee is asked to make a report on the corrective action of the non-conformance, and the inspection may be resumed only after that report is confirmed as appropriate. The licensee must not use the reactor facility until it passes these inspections. During the operational safety inspections, when the inspectors find the licensee's activities not in compliance with approved operational safety programs, they will inspect these items at the next inspection to confirm that corrective actions have been taken to prevent recurrences.	• **To prevent similar event (how far, how to require)** • **With respect to unexpected inspection results or occurrences (including a finding, a non-conformity, etc.), what is the role of the inspectors towards the licensee? What is the limit of the inspector's authority?** • **Is the inspector allowed to order the licensee to implement the corrective measures or the countermeasures to prevent reoccurrence and similar events?** • **Is the inspector provided authority to take on-the-spot enforcement actions?** • **Inspect with the possibility for immediate enforcement if there are any violations?**
KOREA	
<u>Answer 2.D.(1)</u> According to the administration procedure for commissioning, when the test results are found to fall short of the acceptance criteria, the licensee should submit the deviation sheet and find causes of such unsatisfactory results to implement corrective actions and to conduct the test once again. • Shin-Kori units 3 and 4: Administration procedure for commissioning , Pre-operational and Start-up Test Programme (Non-conformance items) From the cause determination of unsatisfactory test results, when some of the equipment found to be non-conformant to the quality requirements, non-conformance report (NCR) should be submitted. In order to deal with such non-conformant items, the inspector confirms whether the administration procedure for commissioning is prepared in accordance with the quality assurance procedure. ※ Validity needs to be evaluated once a year according to the administration procedure for commissioning (Evaluation on the validity of the procedure) In general, according to the administration procedure for commissioning, the operator needs to come up with a response procedure to	**<u>Domestic experience</u> (2.D.(2))** When unexpected test results occur during the System Performance Test, the validity of the non-conformance record and corrective actions should be confirmed by a system inspection. In the first conduct of Safety Injection Tank discharge test, the test result was unsatisfactory with the acceptance criteria. According to the aforementioned process, the evaluation and investigation of the reason for failure was initiated. As a

unexpected results from System Performance Test (the pre-operational test), and also needs to write down the items of non-conformance such as deviation report or NCR. From the results of flow test of the safety related pumps, the flow rate of the pumps can be fell short of the acceptance criteria prescribed in the pre-operational test procedure. If so, the licensee follows the administration procedure for commissioning, writes up the deviation report, takes corrective actions and then conducts the test once again. The inspector confirms that the licensee took appropriate corrective actions to make up for the unsatisfactory test results and that the retest results are satisfied the acceptance criteria. **Answer 2.D.(2)** When the test fails to the acceptance criteria or it is impossible to perform any step of test procedure, the operator should write up the deviation report according to the administration procedure for commissioning and, if the quality requirements are found to be unsatisfied, NCR should be submitted. When unexpected results occur including a failure or suspension of the test, the inspector should determine whether the operator made appropriate measures to find causes and took corrective actions. Rather than considering the test results alone, the inspector should follow the process as below to see whether: • Test procedure is rightly followed. • Equipment for the test was appropriately managed after being installed. • NCR is issued. • Quality assurance procedure is rightly followed to find the causes and to take corrective actions. • Follow-up corrective action is implemented as planned. • Change of the design document, revision of the procedure, the improvement of the facility (repair and replacement) are appropriately implemented. • Measures for recurrence prevention are appropriately established.	result, it was found that the acceptance criteria of the test procedure need to be improved. Licensee implemented the corrective actions to improve the test acceptance criteria and discuss the changes in procedure with regulatory body. From the inspection, it was confirmed that such a process was done according to the quality assurance procedure.
NETHERLANDS	
There is no recent experience on this. The newly developed guidance for new nuclear installations has some requirements on this, e.g.: - Reliable monitoring (DSR 3.1 (2)) Also the Technical Review Plan mentions aspects, e.g.: - Treatment of non-conformances needs to be addressed in the commissioning programme	**Is there experience with solving this kind of problems/conflicts?**
RUSSIA	
Unexpected results of tests, nonconforming to the design characteristics, require from a Licensee to take corrective measures to update the NPP design or bring systems (elements) in compliance with the design characteristics. The results of test-bench experiments to substantiate operability of innovative systems (elements) important to safety, the conditions for conduct of which were inconsistent with the real operating conditions of a NPP unit systems (elements), do not bear evidence of sufficiency of safety substantiations (in this case, substantiation of sufficiency of the indirect and partial check is required in accordance with the requirements of the Federal Regulations and Rules in the Field of Atomic Energy Use).	

SLOVAK REPUBLIC	
Regarding processes for dealing with the situation of unexpected test result or occurrences, all processes have to be described in the quality assurance plan, which is submitted to RB for approval. Also all procedures for tests sets up by RB have to be approved by authority. Adequacy of the corrective action is ensured via submitting of the finals reports to RB. These reports have to be elaborated by licensee at the end of every commissioning phase and together with the application for permission of commission continuing have to be submitted to authority for approval. The reports contain evaluation of the concrete commissioning phase together with evaluation single tests, which have to be part of the concrete phase.	
UNITED ARAB EMIRATES	
FANR does not have position so far for unexpected test results.	
UNITED KINGDOM	
a) ONR will expect the licensee to have in place adequate commissioning governance arrangements including the establishment of a commissioning governance committee to oversee the entire process. During the commissioning period the licensee will be expected to set up the equivalent of a Test & Commissioning Panel to deal with the day-to-day control of testing. The governance arrangements will need to cover unexpected test results and how they are dealt. Through routine regulatory activities and assessment processes ONR will need to be assured that the commissioning governance is fit for purpose. b) ONR will look to the licensee to have appropriate arrangements for reporting incidents and issues, e.g. anomalous or unexpected results from commissioning tests. Such arrangement will include investigation and the identification of appropriate corrective actions. ONR looks to the corrective actions to include all reasonably practicable measures to modify the plant design, safety case documentation, commissioning and operating procedures.	
UNITED STATES	
• *How do you check that licensee's processes are adequately established to deal with the situation of unexpected test results or occurrences* Unexpected test results and abnormal occurrences have been a focus area for the US nuclear industry, and the NRC since the Three Mile Island and Chernobyl accidents. In IMC 2504 the NRC requires inspection of Operational Programs, including the Non Licensed Plant Staff Training Program, the Reactor Operator Training, Reactor Operator Requalification, Quality Assurance Program (which includes corrective action and test control) and Operational Program Implementation. The IPs for these cover various parts of how the licensee deals with unexpected occurrences or test results. For example, IP 70367 "Inspection of Preoperational Test Program", and IP 72401 "Inspection of the Startup Test Program", provide guidance to the inspectors to look at programmatic aspects of how the licensee deals with unexpected occurrences or test results. IP 70702 "Inspection of Preoperational Test Performance", and IP 72304, "Startup Testing for the AP1000: Test Review,	

Test Witnessing, and Test Results Evaluation", provide guidance to the inspectors to look at how the licensee performs testing including items like pre-job briefing for unexpected test results and occurrences, and if the licensee is actually identifying and performing the correct action for unexpected test results and occurrences. • *How do you determine that licensee's implementation and follow-up corrective action are adequate in the case of the unexpected tests results or occurrences?* As part of the NRC construction inspection program at a construction site, the corrective action program (CAP) is inspected in accordance with IP 35007, "Quality Assurance Program Implementation during Construction and Pre-Construction Activities," Appendix 16, "Inspection of Criterion XVI – Corrective Action". The CAP inspections described in IP 35007 include the review of QA program implementing documents, daily screening of each item entered into the CAP, the focused inspections and samples required throughout the year, including an annual team inspection. IP 35101, "Quality Assurance Program Implementation Inspection for Operational Programs," and IP 71152, "Problem Identification and Resolution," provides for similar inspection of the QA program for operating reactors. IP35101 is an initial review for plants moving from construction to operation and IP 71152 is the continuing review of the CAP. Note that IP 35101 is under review for revision at this time. In addition, the NRC inspectors will be looking at specific tests and following how the licensee addresses any unexpected test results or occurrences. The NRC residents inspectors will ask for additional (NRC regional, headquarters, or contracted) technical expertise as needed. The links for the IPs are as follows IP 35007 http://pbadupws.nrc.gov/docs/ML1323/ML13239A133.pdf IP 35101 http://pbadupws.nrc.gov/docs/ML0634/ML063410272.pdf IP 71152 http://pbadupws.nrc.gov/docs/ML1431/ML14316A042.pdf	

WORKSHOP ON REGULATORY OVERSIGHT OF THE COMMISSIONING PHASE FOR NEW REACTORS

Korea 14-16 March 2016

GROUP 3 – Organisational issues

3.A. Inspection for licensee organisational readiness

Answers	Learning
CANADA	
CNSC staff will evaluate the licensee's organisational readiness and interfaces with other organizations against our regulatory documents and codes and standards. The management system requirements include defining the organization (including roles and responsibilities and interfaces), proper resourcing and, how and by whom decisions are made. We also have staff Work Instructions which lays out CNSC's expectations related to organizational readiness (such as training and qualification). CNSC will perform inspections in those areas based on the criteria set out in documents described above.	
CHINA	
According to regulations and guidelines, licensees will submit first load materials to NNSA, including Final Safety Analysis Report (FSAR), Commissioning Programme, Quality Assurance Programme, etc. NNSA will review and approve Commissioning Programme and Quality Assurance Programme before Cold Function Test starts. NNSA HQ and regional office will develop commissioning inspection programme for every projects. Preparation of commissioning and Commissioning management are two important inspection items in Inspection Program. NNSA Staff will confirm the organisational readiness by document reviewing, on-site observation, interviews and discussion with personnel and measurement (or testing). The inspection types includes: • daily inspection; • routine inspection; • non-routine inspection; • commissioning tests inspection. NNSA HQ and regional office will organise some systematic inspection before commence commissioning ,for example, set coolant function test as a control point, execute preparation of commissioning and commissioning management inspection, etc., to verify the readiness of licensee to commence commissioning.	

FINLAND	
• *How do you verify the organisational readiness of the licensee and its contractor organisations to commence commissioning? This may include areas such as competence, resources, management and supervision, decision-making etc.* STUK: The licensee must submit to the regulator a description of commissioning organisation well in advance before start of commissioning. The description must describe e.g. training of commissioning personnel, responsibilities, how the licensee ensures they can perform all tasks that are relevant to safety, etc. STUK do not have prescriptive regulatory requirements for commissioning personnel qualifications. The questions concerning resources, competences and other matters concerning the organisation, including the supervision of contractors, are included in nearly all inspections of Construction inspection programme (10-20 inspections per year concentrating on licensee's processes and performance). • *How do you confirm that interfaces between the licensee and other key organisations (manufacturer, vendor/designer, major contractors, etc.) are clear, robust and effective?* STUK: The licensee must submit to the regulator a description of commissioning organisation well in advance before start of commissioning. The description must describe involved organisations and their responsibilities. STUK will also verify this in inspections of Construction Inspection Programme (10-20 inspections per year concentrating on licensee's processes and performance).	
FRANCE	
• *How do you verify the organisational readiness of the licensee and its contractor organisations to commence commissioning? This may include areas such as competence, resources, management and supervision, decision making, etc.* French regulatory requirements for commissioning activities are stated in general BNIs regulation (TSN Act, BNI procedure decree, order on general safety expectations…) and site specific binding requirements (creation decree, license authorisation, license conditions for construction and design – commissioning tests – Post-Fukushima issues). Early before commencing commissioning, ASN engaged with licensee (from 2008) and performed inspections on organisational readiness of the licensee and its contractors (from 2011). Thus, ASN decided to establish license-conditions specific for commissioning activities (See attached ASN decision 2013-DC-0347 -7th May 2013) to set requirements on these activities. In France, control of commissioning is done by steps: **1. Oversight of CTs documentation preparation (prior to implementation)**	**<u>Recommendation:</u> Specific regulatory requirements should be expressed very early before commissioning starts. Discussions with licensee are necessary so that the development of these requirements considers the licensee foreseen organisation. Safety authority should make profit of preliminary equipment's and systems CTs to check that regulatory requirements are implemented in a suitable way.** **<u>Challenges:</u> in France, ASN expected that non-conformances from manufacturing and construction would have been processed well before commissioning. As it may not be always the case, licensee performs impact analyses of such non-conformances before starting commissioning showing that these non-conformances have no impact on commissioning.**

Beside assessment of CT documentation by our TSO (IRSN), inspections are performed in the various organisations producing CT documentation to verify that regulatory requirements are met for such items: • organisation is defined and implemented; • Stakeholders (vendors, contractors, designers…) are involved, • General rules and processes are defined and implemented to produce CT documentation, • Supervision of all contractors is performed, • Update of CT documentation (due to design modifications) is performed, • CT documentation is suitable for site use and validated before CT implementation… **2. Oversight of performance of CT** For this oversight, on-site inspections are performed to verify that regulatory requirements and EDF management system provisions are met. They address: • Organizational aspects (definition of roles, processes to follow, interfaces…) and how the theoretical organisation is actually implemented, • Practical implementation of the general rules/processes to adapt CT documentation and to deal with non-conformances, • Actual status of the installation before starting a CT. A statement of construction completion (including design modifications) is to be established and it should conclude that remaining non-conformances have no impact on CT implementation, • Whether prerequisites defined in CT documentation (i.e. implementation of previous CT) are met, • Whether workers performing CT have a correct knowledge of equipment to test, safety criteria to check and the safety issues associated, • Supervision of all contractors. **3. Oversight of crediting CT results** • EDF staff at FLA3 are in charge of first analysis of results. Beside assessment of CT results by our TSO (IRSN), inspections are performed at Flamanville site and in EDF engineering departments (and maybe on some key contractors) involved in crediting CT results (final analysis of results) to verify that regulatory requirements and EDF management system provisions are met : • Actual implementation of management system provisions, including documenting how the test was actually performed and what observations were made or what results were measured or calculated and determination on the conclusion on whether the CT was successful or not, • How non-conformances were recorded and processed and how decisions were made to go to the next commissioning step,	**<u>Questions :</u>** **Are there regulatory requirements in some countries for specific skills/competence related to commissioning?** **How do you assess licensee's resources before commissioning starts?** **Is the future operation team strongly involved in decision-making during commissioning?** **Are there regulatory requirements in some countries for time limit for dealing with non-conformances?**

• Whether Impact of non-conformances on safety and on license application were identified and processed… During these inspections, ASN controls competences of personnel (defined training programme, feedback on commissioning activities, knowledge on electrical, I&C, mechanical fields, knowledge of safety functions of the tested equipment…), resources (is there enough people to specify, supervise, implement, analyse CT / do they meet the requirements in their activities…), management (how important issues are prioritised, is the work done in an homogeneous way, is there specific meetings scheduled to deal with safety issues…), supervision (are the key-points defined for supervision, is the rate of supervision defined according to safety issues, are all the organisations supervised…), decision making (is there a safety independent organisation that provides opinion in each decision-making, is this opinion taken into account, are all consequences of decision analysed before implementation…). • *How do you confirm that interfaces between the licensee and other key organisations (manufacturer, vendor/designer, major contractors etc.) are clear, robust and effective?* Channels of communication should be well defined within the scope of quality assurance between all stakeholders for commissioning activities. All these interfaces should be documented and understood by the various stakeholders. These channels should be adapted to the steps in commissioning. **4. Interfaces during production of CT documentation (prior to implementation)** All stakeholders should be involved depending on the topic: • For methodology issues: licensee should define a common methodology to produce CT documentation (e.g. defining safety criteria, producing CT programme for each system, proving that CT programme is complete for safety demonstration, providing common CT modus operandi for same technology of equipment, identifying prerequisite for implementing CT…). This methodology should be explicit in contracts and licensee should supervise implementation of it. • For specific equipment issues: designers and manufacturers should be involved in defining the way equipment should be tested, especially for modus operandi, checking characteristics in accordance with tests performed in factory. Moreover, licensee should know which tests have already been performed in factory and get their results in order to prove that CT programme is complete for safety demonstration. • For installation matters: people that will implement CT should review CT documentation in order to take into account installation issues such as means available during CT implementation, accessibility to equipment, needs for CT documentation according to construction progress… • For supervising issues: rules should be defined for reviewing CT documentation by licensee when	

documentation is written by contractors (e.g. time-scale for providing CT documentation, time-scale for reviewing CT documentation, time-scale for providing approved CT documentation to the people that have to implement it…). **5. Interfaces during performance of CT** Rules should govern how to modify CT documentation prior to implementation (linked to construction progress, means for implementing CT documentation, implementation of design modifications that were not taken into account during producing documentation…) and provide opportunities for relevant stakeholders (equipment manufacturer, vendor…) to give technical opinion on the modification. When dealing with non-conformances by temporary solution/means, rules should be defined so that relevant stakeholders are made aware of the temporary solutions implemented and can react quickly if they believe there is safety issue. Channels of communication should be open between people performing CT and people in charge of future operation of the reactor. These channels are useful for future operation teams in order to take into account operational aspects, for example to validate periodic tests documentation, to allow skill improvement of future operation teams… **6. Interfaces during crediting CT results.** Relevant stakeholders (including future operation teams) should be involved in dealing with non-conformances so that opinions on safety matters are considered in due time. All these opinions should be considered for giving statement on CT results and move to the next phase of overall CT programme or deal with safety issues. Decision-making should be documented with arguments on how each opinion was taken into account. All these interfaces should be defined in organisation's documentation and should be improved according to the operational experience from CT implementation and safety authority requirements.	
JAPAN	
In Japan, the regulation of nuclear power plant consists of 3 phase, basic design phase, construction phase, operation phase. In basic design and construction phase, we examine licensee's documents mainly. Thereafter, pre-service inspection is implemented for confirmation of facility design. About operation phase, licensee has to get an approval of operational safety programme prior to operation, and the suitability to design requirement in operation is ensured by implementation of operational safety program. The performance of licensee about these programmes is reviewed by safety inspection. The licensee has to get an approval of Operational Safety Programme from Nuclear Regulation Authority before the operation of reactor is started.	➢ **The inspection for commissioning after Facility Periodic Inspection has the same strictness as the inspection for commissioning at first operation?** **(In this meeting, what the wording "commissioning "means?)**

To provide management scheme in Operational Safety Programme is required by Nuclear Reactor Regulation Law. The appropriateness of technical basis is the matter in basic design phase. Specifically as follows: 1. The role sharing of organisation is clarified. 2. The engineer who has expertise and technical skill is ensured. 3. The system for quality assurance activity is built. 4. Education and training for engineer, etc. About basic design or construction phase, the licensee has to get reactor instalment license and approval of construction plan. In this phase, comprehensive quality assurance policy that involves relationship with external organisations is confirmed. Thereafter, for confirmation of plant design that involves the quality assurance policy, pre-service inspection is implemented. About operation phase, the licensee has to get an approval of Operational Safety Programme from Nuclear Regulation Authority before the operation of reactor is started. To provide the quality assurance programme in Operational Safety Programme is required by Nuclear Reactor Law. This programme involves ordering management scheme to some contractors.	
KOREA	
<u>Answer 3.A.(1)</u> **A. Verification of the technical capability** According to the Article 11.1 and the Article 21.1 of the Nuclear Safety Act (NSA), those who apply a construction permit (CP)/ operating license (OL) shall obtain the technical capability necessary for construction/operation of a nuclear power reactor. It is also prescribed in the Article 4.5 and the Article 16.5 of the Enforcement Regulation of the NSA that "Explanatory Statement on Technical Capabilities (ESTC)" in respect to installation and operation of reactor facilities shall be submitted as an application document for CP/OL. The Article 8 of the Enforcement Regulation of the NSA stipulates the requirements of the "technical capability for construction of reactor facilities" to be satisfied while the Article 50.2 imposes the requirements of the "technical capability for operation of reactor facilities" to be met. The Nuclear Safety and Security Commission (NSSC) Notice 2014-33 (Regulation on preparation of technical capability description concerning installation and operation of nuclear reactor facility) provides the matters concerning the preparation of ESTC that shall be attached to the application documents for CP or OL in accordance with the Article 4.5 and the Article 16.5 of the Enforcement Regulation of the NSA, respectively. The regulatory body reviews the ESTC submitted for CP or OL to verify that it conforms the legal requirements and the description on the implementation methods is objective and inspectable. The site inspection is also performed	**<u>Domestic experience</u>** **A. Summary of the domestic experience by the type of inspection** **(1) Check on the applicants for CP or OL prior to the issuance of license.** **Back in 2014 when the Shin-Kori unit 3 was prior to OL, the check of technical capability on its operating organization was performed. The Shin-Kori units 5 and 6 which were also scheduled for the CP conducted a check of its technical capability for the installation of the nuclear facility. Such test is not prescribed in the law but performed to check upon the technical capability and readiness before the issuance of license and also to induce an enhancement when non-conformances are detected.** **(2) QA inspection on the plant under construction (2015)** **After the issuance of construction permit, Shin-Kori units 3 and 4 and Shin-Hanul units 1 and 2, the quality assurance**

prior to the issuance of the construction permit or operating license to verify what is described in the document is well followed at the site. Since the issues related to the technical capability such as organisation, qualification, training of personnel, and so on are easily changeable matters, the further implementing status of ESTC is confirmed regularly through annual quality assurance (QA) inspection during the construction period and confirmed in the operation period through periodic inspection performed by QA inspectors during the overhaul period of the NPP. **B. Standards for the technical capability [Refer to Annex 3.A.(1)]** **<u>Answer 3.A.(2)</u>** The applicant (licensee) for the CP of the nuclear facilities shall submit the ESTC and the chapter 17 of PSAR as part of the application documents. As for the quality assurance programme document (QAPD), applicant shall submit the QAPD of the designer, major contractors, fuel manufacturer and construction company as well as of the licensee. The submitted documents are thoroughly reviewed to see the responsibility and authority of the licensee and core organisations and ways to manage the interface areas among organisations. The designer and major component suppliers are subject to the annual inspection of suppliers and the fuel manufacture and construction company are subject to the annual QA inspection to confirm the validity of the implementation status.	**inspections were conducted to confirm the implementation status of ESTC such as the responsibility and authority of the core organisations, procedures to control the interface areas, and personnel qualification and training of licensee and construction company.** **(3) Inspection of suppliers on the designer and vendors (2015)** **13 times of Inspection of suppliers were performed on the designer and vendors for equipment important to safety. The responsibility and authority of the core organisation, ways to control the interface areas among organisations, qualification and training of employees were inspected.** **B. Inspection methods** **For each inspection which lasted 5 days, three to five inspectors in charge of the quality assurance performed the document review, interview with relevant personnel, and site walk-down to verify the system to acquire the technical competence, implementation status of education and training plan, and qualification system for the maintenance of technical competence, etc. As for the issues to be improved, the findings or recommendations were issued according to the importance to the safety and it was requested that corrective actions shall be taken within the certain period.** **<u>Items to be discussed during the group session</u>** **- Discussion on the inspection standards for technical capability** **- Discussion on ways to share different inspection methods and experience of member countries regarding technical capability of licensee and other key organisations.**
NETHERLANDS	
With respect to the project for a new research reactor pre-licensing meetings with the applicant are organised. In these meetings, discussions on a possible early assessment of the applicants' organisation are held. The TRP mentions that during the review by ANVS it will be assessed whether the applicant has considered the organisational side of commissioning during the development of a commissioning programme.	1. At which moment should the first inspection of an applicant/licensee be carried out? What are the experiences in the pre-licensing phase? 2. Would it make sense to require a kind of organisational readiness self-assessment or a third party assessment of the organisational readiness?

The commissioning programme should contain the following elements. The commissioning programme shall provide the reviewer with information on the organisational structure of the commissioning team and their responsibilities. In addition, the commissioning programme shall contain a reflection on the required organisational capabilities during commissioning and full-power operation (organisational readiness). The following aspects may contribute to the review: • reflection on the term organisational capabilities/readiness; • relation to safety culture, management system and quality assurance; • anticipated organisational challenges and required organisational capabilities; • self-assessment; • strategy for developing sufficient organisational capabilities and timeline; • implementation in commissioning programme. The licenses in The Netherlands focus on functions (description on responsibilities). However, processes and organisational structures are not covered in detail.	3. How is the experience with respect to goal-oriented vs prescriptive requirements? 4. Is there any specific guidance for inspection?
RUSSIA	
In the process of review of SAR, submitted by a Licensee within the set of documents substantiating NPP nuclear and radiation safety, there shall be evaluated: issues of organisational preparedness of a Licensee to perform works on a NPP unit commissioning, the stage-by-stage procedure of a NPP unit commissioning, and the procedure of a NPP unit acceptance to commercial operation. In the process of review of SAR, the organisational structure of a Licensee at the stage of a NPP unit commissioning, as well as the issues related to recruitment of commissioning personnel, selection of organisations to provide general and scientific and technical management, designer supervision and performance of works within the period of a NPP unit commissioning shall be observed. Furthermore, competency of organisations engaged to perform NPP unit commissioning works shall be evaluated by the Regulator, when issuing a license granting the right to the operating organization to perform works and render services. It is not allowed to engage organisations, which have no license for implementation of activities in the field of atomic energy use. The Regulator does not administrate directly the relations between organisations involved in NPP unit commissioning works. In compliance with the Article 34 of the Federal Law "On the Use of Atomic Energy", arrangement and co-ordination of works at all stages of a NPP lifecycle, including NPP unit commissioning, shall be provided by Licensee. The Regulator does not exercise direct control over the exchange of information, knowledge, and	

experience at different stages of works. The Regulator shall control the results of implementation of works and meeting of the requirements of the Federal Regulations and Rules in the Field of Atomic Energy Use at all stages of works. The Regulator communicates with public by means of several tools. The Regulator maintains the official Internet site, where the reports about the Regulator's activity, as well as information about the results of the conducted inspections and checks are published. Internet sites of scientific and technical support organisations are also available. Public is systematically and objectively informed through the mass media. "Nuclear and Radiation Safety" periodical is issued quarterly. The procedure for dealing with public messages through e-mail and Internet site has been developed. The community liaison office has been established and is functioning for reception of citizens to discuss any issues related to the Regulator's activity.	
SLOVAK REPUBLIC	
According our Regulation 52/2006 the permit holder shall determine all job positions in which work activities are performed with an impact on nuclear safety, and other job positions with a direct impact on nuclear safety along with a description of work activities in the quality system documentation. This Decree lays down details on: work activities that may be performed only by professionally competent employees or by, selected employees, professional training, conditions for verification of professional competence of employees and special professional competence of selected employees, establishment of an expert commission and an examination commission, issuing certificates, but also qualification requirements for lecturers and instructors and conditions for verification of lecturers' professional competence. We review and approve the Stage Quality assurance programme for commissioning where are define mutual relations, rights and unambiguous responsibilities for all activities during individual commissioning stages so to assure quality of commissioning works at first in compliance with nuclear safety requirements, and to assure safety of persons and equipment. The document is applicable not only to commissioning, but also for not active testing. All the working place involving work activities affecting the nuclear safety in construction and commissioning phases are determined. Training needs are analysed and the personnel training system is defined and planned. Education, experience, training and psychological and health competence requirements shall be specified on every working place, what shall ensure that the employee will acquire knowledge, skills and attitudes required to perform the work activities, to obtain and maintain professional competence. Professional competence of employees with impact on the nuclear safety shall be achieved at least at the level defined by the relevant regulations and requirements of the state nuclear safety supervision. All the employees shall meet the determined professional competence requirements for the performance of activities and the work shall be assigned to employees who have valid working position descriptions at the assigned working place and meet the determined qualification requirements. We verify	

during inspections fulfilment of determined rules, requirements and duties. The Stage quality assurance plan is not directly provided to employees of contractors´ organisations. Its requirements, if concerning directly the performance of activities with influence on the quality and safety of the NPP, are transferred through Reference Quality Assurance Programme and subsequent project rules, which constitute annexes to contracts with contractors. Contractors are thereby contractually bound to respect and fulfil these requirements. The transfer of the licensee requirements to the supplier is carried out by means of contracts and Safety and technical conditions of performance as well as by elaborating quality plans of supplies (in accordance with the graded approached to quality assurance). Requirements for contracts are subject to the process Purchasing and Material Management, chapter 6.5 of this SQAP.	
UNITED ARAB EMIRATES	
The construction licences for Barakah NPP units 1-4 authorise all commissioning activities up to fuel loading. FANR has conducted several inspections of activities for Stages 1 and 2 of commissioning – construction and installation – and these inspections assess aspects of the Licensee's organisational readiness against the licensing basis (PSAR) and FANR REG-01 "Regulation for Management Systems". A recent inspection also examined aspects of organisational readiness for Stage 3 commissioning – Cold Functional Testing. FANR REG-01 establishes requirements for the following related to organisational readiness: • availability and management of resources; • competence of staff performing commissioning activities; • communication between the Licensee and contractors to ensure understanding of safety and quality goals. In accordance with FANR REG-01, the Licensee is also required to conduct periodic self-assessments to assess the effectiveness of their management system during commissioning. FANR also conducts inspections of Licensee contractors with a focus on verifying conformance with quality assurance requirements, specifically ASME NQA-1.	
UNITED KINGDOM	
a) Our intention will be to examine and test the licensee's plans for identifying and confirming the project's organisational readiness to proceed into commissioning. The licensee's key requirements should be set out in a "management expectations document" (MED). The elements identified in the MED effectively form part of what can be considered an "organisational safety case" for commissioning. ONR will expect to review the analysis and assumptions underpinning the MED and then test the rigour of the licensee's process for confirming that the MED expectations have been met before commissioning starts.	**a) Too early to say as no new build plants have started commissioning yet. However, the proposed approach is based on practice and learning to date as we set out our approach to reviewing the licensee's readiness to start construction. It offers a structured way of addressing regulatory oversight of organisational readiness.**

ONR's review will cover areas such as people and processes needed to maintain oversight and control of commissioning, including contractors' activities - ie, delivering the "intelligent customer" function. ONR will do this by reviewing arrangements and sampling some of the claims on organisational readiness to ensure the arrangements are implemented and effective. ONR's specialist Inspectors will prepare a report setting out their views on the licensee's readiness to proceed; this will form a key input to ONR's decision on whether to Consent (i.e. agree to) the licensee commencing commissioning activities. ONR's examination at the start of commissioning will benefit from an extensive programme of monitoring and engagement prior to, and during the construction phase of work. This engagement should have established high confidence in the licensee's key capabilities and its own control processes (via "hold points"). Key areas for consideration include: • leadership and governance; • organisational competence and capability; • control of design and safety case processes; • supply chain management and intelligent customer capability; • safety culture – within the licensee organisation, supply chain and on-site workforce; • internal regulator & assurance capability; • control of construction activities; • development of the commissioning and Pre-Operations team. b) ONR will look closely at the interfaces between the licensee and its contractors. As noted above, we expect to see the licensee in control and discharging its intelligent customer function. We may sample both the licensee's oversight of contractors' work and the supply chain activities themselves in order to be satisfied with the interface and control and supervision arrangements. We will also expect directly to sample aspects of the contractors' processes such as its management systems and competence assurance processes to gain assurance that the licensee has satisfied itself that the contractor is complying with its expectations.	**ONR considers organisational readiness to be fundamental to move between stages of construction/commissioning. This approach ensures that organisational readiness is formalised as well as technical/safety case readiness.** b) **Positive experience from ONR accompanying licensee on inspections of manufacturing facilities to gain assurance that QA etc expectations are being met by the contractor, and confidence that the licensee is maintaining oversight of quality. We expect to repeat this approach.** **We will also reproduce the approach we have taken to monitoring licensee oversight of other contractor activity to ensure IC capability is maintained and delivered (see left). This worked well during our pre- and post-licensing work.**
UNITED STATES	
For plants licensed under Part 50 (or restarting from an extended outage) NRC performs an inspection under, IP 93806 "Operations Readiness Assessment Team Inspections (ORAT)." This IP uses a series of other IPs to look at specific areas, including training, operations, procedures, maintenance, engineering and technical support, startup test program, QA program, safety assessment and corrective action, emergency preparedness, radiological controls, chemistry, and security. For plants licensed under Part 52, some of the operation readiness program review is performed by IPs under IMC 2504, "Construction Inspection Program; Inspection of Construction and Operational Programs" and some of the	

inspection will performed under IP 93806. Currently these procedures are being reviewed to see how best to modify them to make them work together better (first plants to use the Part 52 process are still in construction). For both processes competence, resources, management and supervision, and decision-making are looked at and NRC inspectors consider nuclear safety culture as an ongoing activity. The link for IP 93806 is www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/ip93806.pdf The NRC has the regulatory authority to inspect all of these key organizations. The NRC vendor inspection program performs inspections at the key organizations to ensure adequate oversight is provided by the licensee. The vendor inspection reports are publicly available on the NRC public website at (www.nrc.gov/reactors/new-reactors/oversight/quality-assurance.html). There are different links on this page that take you to inspections for Vendor QA Inspections and QA Inspections for New Reactor Licensing. These inspections look at the non-licensee organisations. The Construction Inspection Programme for New Reactors (www.nrc.gov/reactors/new-reactors/oversight/cip.html), and Construction Reactor Oversight Process (cROP), (www.nrc.gov/reactors/new-reactors/oversight/crop.html), detail how this is inspected and assessed (cROP) for the licensees still constructing. In addition, the NRC holds periodic meetings with the licensees and other key organisations as needed.	

3.B. Oversight of safety culture during commissioning stage

Answers	Learning
CANADA	
CNSC has laid out the requirements for safety culture in REGDOC-2.1.2, Safety Culture for Nuclear Licensees. CNSC staff will verify the adequacy of the licensee's safety culture self-assessment process as well as the adequacy of the management system in ensuring safety is given due priority in decisions and actions. Licensees report events as required by CNSC REGDOC-3.1.1, Reporting Requirements for NPP which extends to contractors doing work on behalf of the licensees, An element of our inspection includes conducting interviews with workers and contractors as well as reviewing station conditions records.	
CHINA	
NNSA implement whole process supervision to nuclear power plants in China. We have been emphasising the importance of establishing and maintaining safety culture during site choosing, construction, manufacturing, installation, commissioning and operation and de-commissioning. NNSA HQ and regional office	

usually confirm the safety culture will maintain from installation phase to commissioning through: • Review and approve the Commissioning Programme and Quality Assurance Program • Organise control point inspection and systematic inspection before commissioning phase • Follow the components performance tests and check the results • Strengthen commissioning inspection to verify the maintenance of nuclear culture According to regulations and guidelines, the licensee should report to NNSA after events are found, the event report contain root cause analysis and NNSA staff will review the event report. NNSA will review FSAR, Commissioning Programme and Quality Assurance Programme, when any miss that will lead to revise FSAR, Commissioning Programme or Quality Assurance Programme, the licensee will apply for NNSA's approval. NNSA Resident inspectors from regional office require the licensee to provide NCR list, follow the important non-conformance and check out the status and results. After commissioning, the licensee will submit UFSAR to NNSA and NNSA staff will check out whether UFSAR meet the laws, regulations, standards and licensee promises. We implement open and transparent nuclear safety culture and encourage the licensee as well as the contractors initiate report misses that is safety-related.	
FINLAND	
• *How do you confirm that the safety culture of the licensee and its contractors is appropriate to commence and conduct commissioning?* STUK: • STUK observes the licensee's actions from safety culture point of view in all communications with the licensee. STUK has a data base, where all inspectors are encouraged to record observations (both positive and negative). • Licensee's actions to ensure the safety culture of its contractors is discussed in meetings and verified in inspections (e.g. safety culture training, different surveys, what kind of guidelines and procedures the licensee has to enhance safety culture etc). • Specific surveys are performed in order to evaluate the safety culture in different project phases, including commissioning phase. • *How do you check that events and near misses are reported openly by the licensee and its contractors, and that learning is acted upon*? STUK: open reporting is linked to safety culture (see answer to previous question). Resident inspectors are continuously present on	

site, and they are well aware of any incidents. When the incidents are known, it can be discussed in meeting or verified during inspections that learning is acted upon. Event reports as well as non-conformance reports of significant deviations are reviewed by STUK.	
FRANCE	
• *How do you confirm that the safety culture of the licensee and its contractors is appropriate to commence and conduct commissioning?* Discussions (meetings and inspections) with the licensee and its contractors about commissioning activities should be initiated early to ensure their foreseen organisations meets regulatory requirements. In getting an opinion on the licensee's safety culture, some questions may be emphasised : • Has the licensee and its contractors any feedback on commissioning activities? Do they take into account such feedback? Do they benchmark other countries with similar projects? • Is their organisations defined well in advance? Do they anticipate predictable problems that could occur during commissioning? Do they anticipate transition from construction to commissioning and from commissioning to operating? Do they anticipate resources and skills for commissioning people? • Is the methodology implemented for CT documentation appropriate (completeness of safety demonstration, common rules, identifying safety criteria…) and is its implementation questioned? • Are the questions asked by the inspectors understood, i.e. are the safety matters underlying the question understood by the staff even if not expressed by the inspector? • Is there any refrain in documenting deviation or investigating their causes and potential safety impact? Safety authority should make profit of preliminary equipment' and systems CTs to check the safety culture even if there is no major safety issue. • *How do you check that events and near misses are reported openly by the licensee and its contractors, and that learning is acted upon?* There is usually 2 steps for such check : • Performing inspections to check that all non-conformances are documented and that safety authority is informed of these non –conformances (a list of NCRs is sent to safety authority every month for FLA3). • Investigating non-conformances documentation by sampling to check that events are effectively reported, analysed and that corrective/preventive actions are defined and implemented.	**<u>Challenges faced :</u>** **Licensee's goal is to provide formal demonstration that commissioning tests' results are satisfactory. When licensee faces non-conformances easy to correct (cabling error, parameters adjustment…), licensee may only document final result of the commissioning test and may not always document the way he dealt with such non-conformances.** **Is there any threshold or a significant criteria for documenting a deviation detected and immediately corrected during CTs?**

JAPAN	
To provide the safety culture in Operational Safety Programme is required by Nuclear Reactor Law. The Safety Culture involves the positive participation of top management, continuous cultivating the culture. These items are examined in approval process of Operational Safety Program. If an unsuitable event on quality control occurs, appropriate measure is performed by licensee. These processes have to be provided in Operational Safety Program. As NRA's On-Site-Inspector watches such an event, according to the importance of these events, Nuclear Regulation Authority requires that licensee analyses causes and remedies.	➢ **Are there On-Site-Inspector?** ➢ **If these inspectors exist, what are roles of them?**
KOREA	
<u>Answer 3.B.(1)</u> There is no consistent and formal oversight programme as safety culture is not a regulatory requirements. However, we have proceeded provisional safety culture inspection following the administrative order. As for the nuclear power plants (NPPs) under construction, safety culture inspection on Shin-Wolsong units 1,2 and Shin-Kori units 1,2 operating organisation and recently on Shin-Kori unit 3 operating organisation in 2015 was conducted. Safety culture becomes more important when the fuel is loaded after the issuance of the operating license (OL). In response to such increased significance, the safety culture oversight focuses on plans to enhance safety culture during operating status. As for Shin-Kori unit 3, the inspection was carried out focusing on the areas as follows: • adequacy of safety culture management system including: 1) current safety culture improvement plan and implementation status (the inspection was conducted before the fuel loading) to secure safety culture of the organisation; 2) future plan after the issuance of OL; 3) the implementation framework; and 4) the organisational capability in order to determine whether the safety culture would be managed in an appropriate manner after the commissioning. • effectiveness and sustainability of follow-up measures on safety culture related issues and incidents that took place in Shin-Kori unit 1. Safety culture inspection method consists of interviews, document reviews and observation. For instance, KHNP conducts safety culture assessment every two year for NPPs operating organisation according to the standard procedure of 'safety culture assessment and improvement'. And supervisor monitoring,	**(Challenges faced) Development of appropriate safety culture traits embracing characteristics of the construction/ commissioning stage** **(Recommendations) Invitation of international peer reviews such as IAEA and WANO are encouraged for licensees. Interview with top management and site walk-down are useful to understand organisational decision making structure and work practices for regulators as a safety culture inspection method.** **<u>Domestic experience</u>** **Safety Culture Inspection(Feb, 2015) in Shin-Kori unit 3** **A. Background and Summary** **Safety culture inspection was carried out for three days (Feb. 9~11, 2015) on the Shin-Kori unit 3 operating organisation, which was scheduled to issue an OL for Shin-Kori unit 3. The oversight was a part of site walk-down to lead improvement by checking preparedness and capability for organisation's safety culture management.** **B. Inspection approach and content** **Three inspectors conducted the document review, interview and survey, as well as site walk-down observation to examine the safety culture implementation framework and current status, the capability specialised on the safety culture management, future plan after the issuance of OL, and organisational atmosphere.**

corrective action programme, and self-assessment process are also used to enforce safety culture. The safety culture procedures are applied to the NPPs under commissioning stage even before the issuance of OL. Safety culture inspection is conducted not to assess the organisation's safety culture but to confirm the adequacy of safety culture management system by focusing on the implementation framework and the organisational capability. **Answer 3.B.(2)** In accordance with the requirement of 'reporting of non-conformance' under the NSA of Korea, applicant and holder of construction and operation license, safety related equipment suppliers, and those who verify the performance of safety related equipment or facilities are obliged to report any non-conformance in any safety-related equipment or facility that fails to meet the standards prescribed in the NSA. The validity of the reporting system on non-conformance is primarily confirmed by a vendor inspection along with other oversights including pre-operational inspection and daily inspection of the regional office. The point is to establish an environment where anyone could report an event spontaneously and lessons learned are rightly acted upon, thereby improving the system. However, it is hard to identify whether reporting culture is built in or reporting system is widely recognised before experiencing any incident first hand. Interview is one of a few ways to handle the difficulties.	**C. Result** **It was confirmed that the Shin-Kori unit 3 operating organisation designated a person and department dedicated to safety culture management and assigned role appropriately. The corporate's safety culture related procedure and systems were adopted and implemented in advance. In February 2013, 'Safety Culture Promotion Plan' for Shin-Kori unit 3 was established and actions were accomplished. After which self-assessment on safety culture was conducted in May 2014 to draw issues for improvement. By and large employees were found to be well aware of their responsibility, roles, and the importance of safety culture. After the inspection, 4 items were suggested to have additional measures for safety culture enhancement.** **Items to be discussed during the group session** **A. Lessons learned in the safety culture oversight in Shin-Kori unit 3** **B. Things to consider when it comes to the safety culture in the commissioning stage**
NETHERLANDS	
There is no experience with respect to new builds. The newly developed guidance (DSR) gives some requirements with respect to this item, e.g. • Recording, evaluation and safety related use of the operating experience. (DSR 3.1 (2)) • The organisational regulations relevant for ensuring safe plant operation (structural and procedural organisation). (DSR 6 (1)). • The minimum requirements for the number and qualification of the personnel and the minimum availability of personnel at the plant for ensuring safe plant operation and control of anticipated operational occurrences, postulated single initiating events, postulated multiple failure events and postulated core melt accidents; here postulated initiating events or consequential events of internal or external hazards and occupational accidents, shall also be considered. (DSR 6 (1) **Specific for research reactors the following guidance is compiled (DSR, Annex 6)** 4.6 (1) Human factors are an important aspect in the safety of research reactors as the state of the reactor changes frequently and the operator has easy access to the reactor core and to experiments. 4.6 (2) Special consideration shall be given in design to ensure reliance on necessary administrative controls and procedures.	**1. When there is not much regulation with respect to safety culture/management and organisation; how should this be covered?** • **What should be required in a license?** • **What topics/aspect can be left open? Would it make sense to require a kind of safety culture self-assessment or a third party assessment of the safety culture?**

Administrative procedures may include operating rules in the form of operational limits and conditions, which are derived from the design of the reactor and the safety analysis. Human factors and human-machine interfaces shall be given systematic consideration at an early stage of the design and throughout the entire de-sign process. 4.6 (3) Persons manipulating experimental devices and materials in the vicinity of the reactor core shall adhere strictly to the procedures and restrictions established to prevent any nuclear or mechanical interference with the reactor. With respect to management and organisation ANVS is following the recent IAEA developments (IAEA safety standards DS456; Leadership for management and organisation).	
RUSSIA	
The state of the safety culture is one of the items superintended by the Regulator in the course of inspections. In the newly adopted Federal Regulations and Rules "General Provisions for NPP Safety" NP-001-15 the concept of safety culture was considerably expanded, which contributes to deeper understanding by inspectors, which aspects are to be controlled.	
SLOVAK REPUBLIC	
Safety culture area is a part of integrated management system, which documentation is a subject of approval by authority. Application is a subject of RB inspections. During every inspection SC characteristics chosen by inspectors are inspected and evaluated. As regards events and near misses reporting the licence holder of the construct licence is obliged to fulfil all legislative requirements as licensee for operation. There is the set of requirements for reporting of the events and near misses prescribed by our legislation. We are also preparing the safety guide for events reporting, which should be issued in 2016. Fulfilment of the legislative requirements id the subject of the authority inspections.	
UNITED ARAB EMIRATES	
The licensee is required by Regulation 16 Article 7 "An operational policy implemented by the Licensee shall give Safety the utmost priority thereby over-riding the demands of production and project schedules. The Safety policy shall promote a strong Safety Culture including a questioning attitude and a commitment to excellent performance in relation to all activities that are important to Safety. Managers shall promote an attitude of Safety consciousness amongst Nuclear Facility personnel." FANR management systems support strong safety culture by ensuring a common understanding of the key aspects of the safety culture.	
UNITED KINGDOM	
a) As indicated in 3a above, monitoring of safety culture is a key element during the design, construction and procurement activities. ONR will expect the licensee's commissioning MED to explicitly consider relevant aspects of safety culture.	**a) A number of contractors are new to nuclear – so seek assurance that the licensee places the right emphasis on safety and security**

ONR will examine selected aspects of the licensee's evidence for fostering and maintaining its safety culture. Relevant areas include: • safety culture assessments (project, site and supply chain partners); • demonstrable active learning processes; • safety culture fostering and maintenance processes; • effective leadership at all levels; • preparation, contingency planning and pre-activity briefings for discrete commissioning activities. At the start of commissioning ONR should have already established confidence in the licensee's safety culture and its approaches for fostering an appropriate safety culture. This allows the focus to be placed on the measures aimed more specifically at groups of personnel involved in commissioning and the particular safety challenges from commissioning activities. b) ONR seeks evidence of active learning processes including site and project event reporting that encompasses site contractors. This is done by: • occasional inspections of reporting, trending and action tracking processes (including effectiveness follow-up); • review of Internal Regulator assessments of learning processes; • detailed engagement on planning and implementation of learning from significant events or milestones. ONR's approach focuses on learning behaviour as well as processes and seeks evidence of learning from a wide variety of sources (internal and external, positive as well as negative).	**culture – values, attitudes, behaviours – and is setting clear expectations of its supply chain. Encourage this to be done early.** **b) Look at the licensee's arrangements – and again focus on the way that it deals with individuals who report: open reporting will only take place with a "fair blame" culture.** **Also – we look to see that learning actually takes place: there is no point reporting if remedial action is not then taken.**
UNITED STATES	
NRC inspectors consider nuclear safety culture as an ongoing activity. As discussed in 3A organizational readiness is also inspected prior to commissioning. The NRC also has inspection procedures that look specifically at safety culture, IP 93100, "Safety-Conscious Work Environment Issue of Concern Follow-up," which is used if there has been adverse observations by the NRC inspectors on safety culture. The NRC may ask that the licensee or vendor perform a safety culture assessment, and then the NRC could use IP 40100 to inspect how they performed the assessment. Another procedure that the NRC may use for licensees is IP 95003.02, "Guidance for Conducting an Independent NRC Safety Culture Assessment". Good information on how the NRC, with nuclear power industry and the public, developed common language, for classifying and grouping traits and attributes of a healthy nuclear safety culture is contained in NUREG-2165, "Safety Culture Common Language." The links for the referenced procedures and NUREG are as follows: IP 93100 http://pbadupws.nrc.gov/docs/ML1509/ML15090A433.pdf IP 40100 http://pbadupws.nrc.gov/docs/ML1509/ML15090A437.pdf	

IP 95003.02 http://pbadupws.nrc.gov/docs/ML1409/ML14090A072.pdf The NRC performs inspections and maintains resident inspectors at nuclear power plants under construction and operating, to monitor that the licensees and contractors are reporting events and near misses as well as performing activities in accordance with their procedures and regulatory requirements. The resident inspectors monitor production and problem reporting meetings, as well as general work activities. The licensees are required to train employees and post the NRC Form 3, which provides an NRC hotline for reporting to the NRC a safety concern or violation of NRC requirements. In addition, licensees and manufactures/vendors/contractors who perform nuclear safety related work are required to post the 10 CFR Part 21, "Reporting of defects and noncompliances", information including a hotline to the NRC for reporting of defects and noncompliance with NRC regulations.	

3.C. Oversight of maintenance and preservation of equipment

Answers	Learning
CANADA	
If this question is related to impact of commissioning activities on other facilities at the site, then: Applicant has to submit an evaluation of the impact of site-related issues, including emergency preparedness and accident management If this question is related to whether the commissioning test will cause damage to the facility, it is the applicant's responsibility to provide the regulator with that analysis and provide alternative means in demonstrating that the SSCs will function as per design.	
CHINA	
Before commissioning commence, NNSA regional office will organise some systematic inspection, include commissioning preparedness and safety related issues. We will make sure that the licensee and its contractors have abundant considerations of protecting staff and facility during commissioning stage. During commissioning stage, NNSA will check out commissioning impact by conducting systematic inspection, control point inspection, specific commissioning test inspection, etc. to reconfirm the specific safety consideration is abundant. NNSA have selected 79 AP1000 commissioning tests and 79 EPR commissioning tests to conduct inspection. The staff will review commissioning test procedure and develop inspection procedure, and check out whether impact is considered and relevant implement have been taken place. The start clock is cold function test.	

During specific commissioning test, regional office staff will check out the prerequisite conditions (include equipment maintenance and related settings.), and follow the commissioning test process by W R points, and check out the important equipment maintenance status to reconfirm that equipment will not impacted by commissioning test.	
FINLAND	
• *How do you ensure the commissioning activities do not adversely impact the facility (e.g. settings)?* The licensee must have a work management system for performing any work on equipment/systems during commissioning, as well as systematic and documented procedures for the isolation, isolation tagging, and recovery of components and systems. Furthermore, STUK requires PRA to be used to reduce the risks arising from the commissioning tests. • *How do you ensure that the licensee, equipment installer and equipment supplier are aware of, and account for, environmental and other conditions that newly installed equipment may be exposed to prior to commissioning and operations (e.g. potential for heat, condensation, dust, impact, etc.)? How do you ensure that responsibilities for maintaining installed equipment prior to commissioning are clearly defined? When does the clock start for maintenance and periodic testing?* STUK: The licensee must have procedures in place to ensure the mentioned items. STUK can verify in inspections, that the procedures are followed and that the responsibilities are clearly defined. Also resident inspectors supervise the licensee's actions on site (e.g. protection of equipment, monitoring of environmental conditions, general cleanliness, etc.). Periodic testing must start before fuel loading, so that the operability of the equipment is demonstrated. Before start of commissioning, the licensee must submit to the regulator a description of needed maintenance activities during commissioning.	
FRANCE	
• *How do you ensure the commissioning activities do not adversely impact the facility (e.g. settings)?* *See license conditions [INB167-C], [INB167-2-2] and [INB167-2-4]* CTs system programme and CTs procedures should define preconditions to CT and layout of systems after each CT performed. It means that: • Prior to each CT, licensee should identify which systems/functions are/remain available (prerequisite identified in CT procedures or programs) to performed this CT and which CTs of these systems/functions should have been implemented with satisfactory results. • After each CT, licensee should identify the final state of systems that have been commissioned (including settings…).	**<u>Challenges faced /recommendation:</u>** **It can take several years between manufacturing, construction, installation, commissioning and operating authorisation. Finally before operating authorisation, licensee should demonstrate that all manufactured, constructed, installed and commissioned equipment meet safety requirements as designed in the safety demonstration. To assess this demonstration, regulators should have investigate maintenance and preservation of equipment during all these steps and keep in mind conclusion of these assessments to perform a final check of main issues before operating authorisation.**

If licensee discovers non-conformances, he has to deal with these non-conformances in a timeframe commensurate with safety issues or operational reasons (e.g. before another division of the same system should be commissioned). Moreover, to keep settings of systems in accordance with safety requirements, licensee should implement maintenance and monitoring programme for equipment important to safety, taking into account provisions needed for maintaining the operability and qualification of this equipment during commissioning. Partial/final operating application should take into account special features of commissioning activities. It means that, for example, GOR should take into account special features/configurations related to commissioning activities (e.g. core-tests). • *How do you check the equipment is well-maintained while out of the operation regular maintenance programme?* See license condition [INB167-2-4] To keep settings and general state of systems in accordance with safety requirements, licensee should implement maintenance and monitoring programme for equipment important to safety, taking into account requirements needed for maintaining the operability and qualification of this equipment during commissioning. ASN performs inspection on implementation of such programmes including : • Preservation activities (rust/dust/spatter/bump protection, temperature, hygrometry, cleanliness…), • "Light" maintenance (monitoring, greasing, settings check, replacement of classic wearing parts…), • Monitoring of sensors deviation/alarms during pre-operation… Moreover, some activities of maintenance programme or periodic testing could be required before operating authorisation (see next question). • *When does the clock start for maintenance and periodic testing?* For maintenance : • Before fuel arrival / fuel loading," light" maintenance (1st and 2nd level of standard FD X 60-000: e.g. monitoring, greasing, settings check, replacement of classic wearing parts…) and preservation activities are performed on equipment. These activities are implemented usually under the same requirements as for future operation. • After fuel arrival / fuel loading, operating maintenance programme are implemented. First activities from maintenance programmes are scheduled according to conditions of use before fuel loading (e.g. the "clock" starts for electrical cabinets when they are switched on because pre-operational conditions are the same as operational conditions), multi-years schedule (maintenance activities of equipment of the 4 trains should be done on different periods) and ageing kinetics of materials. It means that the "clock" for maintenance programme can start at different time depending on the equipment and the division involved and taking into account previous aspects.	**<u>Questions :</u>** **How does the licensee ensure representativeness of partial CTs when settings have to be changed during overall CTs? Does it analyse impact of settings change on already performed CTs results?** **Should safety authority rely on some performed CTs to consider that the clock starts for periodic testing when procedures (CTs and periodic tests) and people implementing it (manufacturer and operating team) are different?** **Same question for maintenance.**

For periodic testing : • Before fuel arrival / fuel loading, commissioning tests could be considered as "T0" for periodic tests if CT are representative of periodic tests that will be implemented and periodicity is respected. Some periodic tests could be performed just before fuel arrival / fuel loading in order to smooth scheduling of 1st periodic tests after (avoid to do all the periodic tests at the same time after fuel arrival / fuel loading). • After fuel arrival / fuel loading, periodic tests will be performed according to periodic tests programme included in the GOR. It means that the "clock" for periodic tests programme can start at different times depending on the equipment and the safety train involved, taking into account previous aspects.	
JAPAN	
As operational limits are provided in Operational Safety Programme, licensee has to operate plant within these limits. These operational limits are set based on safety analysis in basic plant design. The manual to maintain plant condition within an allowance is decided by licensee. Safety Equipment's integrity against environmental condition at Normal Operation, Abnormal Transients or Design basis Accident is ensured in basic plant design or detail plant design. The maintenance of these plant designs is performed by licensee based on Operational Safety Programme, and also, Operational Safety Programme involves education and training scheme on plant design, maintenance, etc. The licensee has to get an approval of Operational Safety Programme from Nuclear Regulation Authority before the operation of reactor is started. To provide quality assurance programme in Operational Safety Programme is required by Nuclear Reactor Law, these provisions required that authority and responsibility of quality assurance programme is clear. Nuclear Reactor Law requires that the first starting point of licensee's maintenance is equivalent to NRA's facility periodic inspection.	
KOREA	
Answer 3.C.(1) The performance of the facility or set values of components may not be easily changed in case that licensee's maintenance and repair procedures are normally conducted. Therefore, regulatory body will not re-verify the performance or set values as a general rule after confirming the performance or set values which are determined through the test in the commissioning phase. However, regulatory body requires that major safety valves (safety class 1 safety valves and main steam safety valves) be tested within 6 months from initial criticality in case of long-term commissioning process. In this case,	**Domestic experience** **During the system performance test, document reviews and plant walk-down should be performed to verify that the facilities are appropriately managed through the maintenance and repair procedures.** **A. Insufficient maintenance of the equipment in the component cooling water system**

regulatory body should re-verify the set values of components. Regulatory body also requires that in-service test for safety-related pumps and valves be conducted in the commissioning phase. Regulatory body should re-verify the performance of the facility through conducting in-service test after repair when corrective maintenance or repair is followed in the commissioning phase. **Answer 3.C.(2)** (i) Regulatory body should confirm that licensee's preventive management procedures for newly installed components including the measures for the foreign material exclusion (e.g. plastic cover) are implemented and managed to minimise effect of environmental and other condition (e.g. dust) during commissioning phase. Regulatory body should not only review the record of preventive management procedures conducted by licensee but also verify those results through plant walk-down. (ii) Regulatory body should review that licensee adequately describes organisational structure and delegated responsibilities in order to maintain the facility according to licensee's preventive management procedures. Regulatory body should also conduct plant walk-down for verifying licensee's implementation. (iii) Regulatory body should inspect the status of the facilities stored in the licensee's warehouse in case that the delivered facilities are stored in the plant. Regulatory body should confirm that licensee periodically conducts the preventive management procedures after the facilities are installed in the plant	**The check valve located in the discharge side of the component cooling water system and some of the bolts and nuts installed in the pump suction side were found rusty. The rust was removed and the protective action was taken following the relevant procedure. To prevent the recurrence of the event, regulatory body ordered the training on the personnel in charge and the enhanced site verification.**
NETHERLANDS	
The newly developed guidance and the TRP give requirements and guidance on this aspect. E.g.: - The environmental conditions considered in the qualification programme for items important to safety at a nuclear power plant shall include the variations in ambient environmental conditions that are anticipated in the design basis for the plant. DSR 3.1 (6) - For each item important to safety maintenance standards shall be provided. (DSR 6(4)) - Information that should be provided is amongst others assurance that no commissioning tests are performed that might place the plant in an unanalysed condition. (TRP)	**1. Who has to be leading to establish the maintenance requirements, the licensee or the Original Equipment Manufacturer?**
RUSSIA	
Federal Regulations and Rules require that NPP unit completed and being commissioned shall be separated from other operating units and areas where constructions works are being continued to ensure that works being carried out and possible infringement Compliance to this requirement is checked by Regulatory body both through licensing activity and inspections. All safety related equipment supplied to NPP are subject to regulation of Federal Regulations and Rules "The rules of assessment of conformity of equipment, components, materials and	

semi-finished products supplied to the objects of use of atomic energy" NP-071-06. This regulatory document requires that all such equipment, components, materials and semi-finished products shall be supplied and tested in accordance with quality assurance regulates various issues including organisation of storage, transportation, preservation and packaging of equipment. Compliance to the requirements is checked by Regulatory body through licensing activity, inspections and the acceptance of equipment at a factory.	
SLOVAK REPUBLIC	
The Construction department SE is responsible for co-ordination of works and safety in the rooms and on equipment during the installation period. After installation completion and issue of the mechanical erection completion protocol, the room or equipment is handed over for testing. Responsibility for co-ordination of works and for safety in taken over rooms and systems passes from the SE Construction to the SE Commissioning department. There is always only one room or equipment Owner appointed. Room or equipment Owner is appointed based on prevailing works (company performing majority of activities) in the room or on equipment. Discrepancies with ownerships are solved by Team of Main Technologists (TMT), but during test execution in the room is always owner Commissioning department SE. Priority of works in rooms and equipment taken over for testing is defined by TMT. All activities in rooms or equipment taken over for testing can be performed only based on issued Work permit. Risk assessment in rooms or equipment taken over for testing is done by TMT at preparation of two-week and daily plans of non-active tests and commissioning. In the frame of equipment qualification licensee established procedure for elaboration of qualification specifications. This qualification specifications is reviewed by Regulatory Body in the framework of the technical documentation. According our Regulation selected facilities must be qualified for their required functionality and presumed effects of their surroundings for conditions considered in their design, including earthquake resistance, during their commissioning, operation, decommissioning and during breakdowns. The qualification method shall correspond to the safety class of the selected facilities. In the beginning of the qualification process there is chosen appropriate method that shell demonstrate the performance of safety functions of equipment to be qualified. The method are specified in the Qualification Program. The exposure during testing, commissioning and operation are involved in the environmental conditions for qualification. The installed equipment are under responsibility of equipment installer until they are taken over to non-active testing and commissioning. Pre service inspections of primary circuit equipment shall be performed at the latest before the completion of the widened revision after 2nd hydro test. The purpose of this inspection is to verify serviceability of the equipment under the conditions of getting near as much as possible to the operating conditions. Supplier	

ensures the evaluation of pre service inspections. The Operational permission is the point when we start to count intervals for in service inspections according to Inspection and maintenance program.	
UNITED ARAB EMIRATES	
There is no requirement for FANR to check the maintenance and preservation of equipment during commission; However in Regulation 16 article 15 (Equipment qualification) states:- "The Licensee shall ensure that a systematic Assessment is carried out to provide reliable confirmation that Safety related items are capable of the required performance for all Operational States and for Accident Conditions" And it goes further explaining about maintenance in first point within the same article "Appropriate concepts and the scope and process of equipment qualification shall be established, and effective and practicable methods shall be used to upgrade and preserve equipment qualification. A programme to establish, to confirm and to maintain required equipment qualification shall be launched from the initial phases of Design, supply and installation of the equipment. The effectiveness of Equipment qualification programmes shall be periodically reviewed".	
UNITED KINGDOM	
a) ONR will review the licensee's processes (procedures, training, auditing) for controlling foreign material during construction activities and the provision of temporary covers, etc. to prevent contamination (dust), impact damage during subsequent activities. ONR would expect licensees to identify the need for, and provide, temporary installations to control environmental conditions e.g. HVAC. ONR would expect licensee's and on site contractors to have adequate training and processes in place to establish a culture in which damage to/ contamination of installed equipment is minimised and any events of potential concern are reported. b) ONR will review the adequacy of licensee's arrangements for maintaining installed equipment and undertake inspections during the construction phase to confirm their effectiveness. c) ONR will seek evidence that the licensee's procurement specifications clearly set out the suppliers' responsibilities/ obligations for maintenance/ preservation prior to final handover of the equipment for station operation. The suppliers' responsibilities depending upon the nature of the contract e.g. Design Manufacture & Supply, Design Manufacture Install & Commission. ONR will expect the licensee to produce interface definition documents in a timely manner outlining the process for equipment handover and the transfer of responsibilities between the construction team and its contractors, the commissioning function and the operations function. ONR's regulatory approach includes the requirement for licensees to have arrangements in place for adequate records to be made of activities, including maintenance, which may affect safety. Evidence will be sought that appropriate records are made of early	**ONR will be looking for UK licensees and associated NPP vendors to demonstrate learning from other new build projects to better understand problems that have resulted from inadequate maintenance/preservation of installed equipment prior to commissioning.** **ONR will work with other regulators to understand the issues**. **ONR will undertake site inspections to gain confidence that installed equipment is being maintained/preserved appropriately in the period prior to handover to station operations.**

maintenance activities in advance of formal implementation of the Maintenance Schedule supporting station operation. ONR would expect the licensee to agree with the suppliers when it is appropriate for equipment to be placed in a preservation state prior to the commencement of maintenance and periodic testing to ensure that the equipment condition/ performance remain in accordance with the safety case. At the end of any period of preservation the supplier will need to demonstrate the acceptable condition of the equipment. ONR would expect licensee's to implement the Maintenance Schedule prior to active commissioning.	
UNITED STATES	
Most of this is answered in question 3A. For plants licensed under Part 50 the ORAT inspections in IP93806 uses a series of other IPs to look at specific areas, including training, operations, procedures, maintenance, engineering and technical support, startup test program, QA program, safety assessment and corrective action, emergency preparedness, radiological controls, chemistry, and security. They perform both programmatic and implementation reviews. For plants licensed under Part 52, some of the operation readiness program review is performed by IPs under IMC 2504, and some of the inspection will performed under IP 93806. Currently these procedures are being reviewed to see how best to modify them to make them work together better (first plants to use the Part 52 process are still in construction). Once fuel is in the core all the applicable License, Technical Specification, and FSAR requirements have to be met. The licensee is responsible for this, but the NRC regulatory oversight process is monitoring and inspecting that these requirements are met. In addition, the NRC resident inspectors focus on nuclear safety and licensee performance. For both licensing processes, the competence, resources, management and supervision, and decision-making of licensees are evaluated and NRC inspectors focus on nuclear safety. As part of the licensing process, licensees are required to commit to applicable regulation guides (RGs). RG 1.28, "Quality Assurance Program Criteria (Design and Construction)" endorses Part I and Part II requirements included in NQA-1-2008 and the NQA-1a-2009 Addenda, "Quality Assurance Requirements for Nuclear Facility Applications". NQA-1-2008 Part 2 (SUBPART 2.1 Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants, SUBPART 2.2 Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants, Subpart 2.3 Quality Assurance Requirements for Housekeeping for Nuclear Power Plants, and Subpart 2.18 Quality Assurance Requirements for Maintenance of Nuclear Facilities) address the issues associated with storage and maintenance of installed equipment. (Note that the current AP1000 units under construction are committed to NQA-1 1994 and NQA 1a 1995 which have the same requirements, and NQA-1 2015 also has the same requirements.) The licensee is responsible for implementing these QA program requirements. The NRC inspects the licensee implementation in IP 35007, "Quality Assurance Program Implementation During Construction and Pre-Construction Activities," and IP 35101, "QA Program Implementation Inspection	

for Operational Programs." In these IPs the NRC does not have a large focus on these issues, but the NRC does have a large focus on operational readiness, including these issues during the ORAT, which was discussed in question 3A. In addition, the NRC resident inspectors perform various walk downs which include observation of how the licensee is maintaining their equipment. The maintenance and periodic testing requirements need to be meet before the SSC can be considered operable. As part of plant startup the licensee is responsible for determining and documenting the operability of SSCs. To be considered operable, the SSC must be able to perform it's safety related design function, has all required support systems, and meets the Technical Specification surveillance requirements for operability. To be able to perform its design function, the required prior maintenance must be performed. The licensee is responsible to ensure this happens. Operability determinations are a focus area for NRC inspectors. In IP 72304, "Startup Testing for the AP1000: Test Review, Test Witnessing, and Test Results Evaluation," the NRC inspectors are instructed to check that required SSCs are operable. IP 72304 is currently under revision.	

3.D. Deployment of regulatory resource

Answers	Learning
CANADA	
A generic oversight plan for construction/commissioning program has been developed taking into account the resources that are required. A more detailed plan will be developed prior to start of construction/commissioning. CNSC staff will meet with the licensee on a regular basis to ensure that our oversight does not impact on the licensee's schedule.	
CHINA	
Since 2013, NNSA have formed AP1000 and EPR commissioning review and inspection group, group members have developed commissioning test selecting principle, that is uniqueness, importance of safety, complexity, related tests to three shields, test balances and risks. Based on the six principles, we have scored the commissioning tests of AP1000 and EPR commissioning tests and we have selected 79 AP1000 tests and 79 EPR tests to conduct specific inspection. In addition, control points inspection and systematic inspection are conducted by NNSA. NNSA have strengthen communicate with the licensee during commissioning phase. We have transmit to the licensee of all the routine commissioning inspection items, the license have feedback to us the commissioning tests plan and update the plan monthly. According to the agreement between NNSA and the licensee, the licensee will announce to NNSA HQ and regional office 1 month before commissioning tests commence and check out the prerequisites compliance 1 week before the commissioning tests.	

We have formed group for every commissioning test that NNSA will conduct inspection, every group contains 3-5 inspectors to make sure we will keeps pace with on-site commissioning.	
FINLAND	
• *How do you determine, prioritise and manage regulatory resource needs to oversee commissioning?* STUK: The regulatory guides define well the supervision tasks during commissioning. The required resources can be planned before. Communication with the licensee ensures, that STUK have real time schedules and STUK receives the documents for approval timely. Graded approach is used in witnessing the tests, and resident inspectors perform part of the work. • *How do you ensure that regulatory oversight keeps pace with commissioning and does not unnecessarily impact on the licensee's schedule?* STUK: Amount of regulatory hold points is limited during actual commissioning tests (only before major steps like fuel loading, first criticality, starting tests on a new power level). The hold points are well known to the licensee, and practices can be agreed well in advance between regulator and the licensee and take into account when commissioning schedule is prepared. STUK can witness tests, but STUK's presence is not a precondition for starting the test. After performing an individual test, no permit from STUK is required to continue (except the major hold points described above). Testing programmes must be approved by STUK before starting testing. It is up to the licensee to submit the programmes to review in time. If needed, STUK can prioritise review of individual testing programmes in order not to delay start of testing.	
FRANCE	
• *How do you determine, prioritise and manage regulatory resource needs to oversee commissioning?* Needs in regulatory resources are strongly linked to licensee's schedule in terms of organisation definition for commissioning, providing CT documentation for assessment prior to performance of CT, start of commissioning activities, start of overall CTs, providing CT documentation after CT performance, licensee's general opinion on CT results for going to the next step of overall CTs program… In chronological order : • Organisation definition for commissioning (project manager + safety inspectors + TSO involved): resources should be available to plan meetings and perform first inspections on organisation to establish license-conditions specific for commissioning activities and to check that these requirements and the licensee foreseen organisation coincide.	**<u>Challenges faced :</u>** **To assess CT procedures prior to implementation, ASN and its TSO need to have updated documentation relevant with FSAR. Unfortunately, due to a large amount of modifications, CT procedures may be updated just prior to implementation and regulatory assessment may therefore have been done on obsolete documentation. Findings of this assessment on obsolete documentation (e.g. lack of a safety criteria) may nevertheless be later used during on-site inspection to check whether the latest CT documentation has been correctly updated.** **That's why a strong link is needed between assessment and inspections onsite.**

• Providing CT documentation for assessment prior to CT performance (project manager + safety inspectors + TSO involved): regulator and its TSO should define the way assessment of CT procedures/programmes will be performed and make sure they have adequate resources to perform this assessment in a timeframe consistent, as far as possible, with licensee' commissioning plan. If assessment is not exhaustive, a strategy is needed so that relevant topics to be assessed allow the regulator to be confident that CT to be performed and associated criteria have been adequately identified by the licensee. • Start of commissioning activities (project manager + safety inspectors + TSO involved): Safety authority should make profit of preliminary equipment' and systems CTs to check that regulatory requirements are implemented in a suitable way (many inspections on site) and that inspection guidelines are appropriate. Moreover a link is needed between conclusion of assessment of CT documentation and inspection on implementation on site. • Start of overall CTs (project manager + safety inspectors + TSO including 1 representative on site involved): ASN plans that one representative of our TSO will stay on site during overall CTs and will be informed on CT proceedings. ASN will also perform many inspections on site. • Providing CT documentation after CT implementation (project manager + safety inspectors + TSO including 1 representative on site involved): ASN plans to perform inspections and assessment of final CT documentation focusing on main safety criteria and on dealing with non-conformances. This should be done in real-time when documentation is completed. • Licensee's general opinion on CT results for going to the next step of overall CTs programme (project manager + 3 safety inspectors + TSO including 1 representative on site involved): ASN plans to have a focus on main safety criteria to be checked and on dealing with non-conformances. Licensee has to provide a final statement on CT results for each phases of CT overall programme so that assessment will be done in real time depending on hold points fixed by ASN (inner containment pressure test, fuel arriving on site, fuel loading, first criticality, power levels). • *How do you ensure that regulatory oversight keeps pace with commissioning and does not unnecessarily impact on the licensee's schedule?* Hold points and witness points have to be considered differently: • A witness point (WP) does not have any expected impact on the licensee's schedule (the regulator needs to be informed on the specific test for a potential inspection or to focus on assessment of the results of CT concerned by WP).	**Due to late update of some CT procedures, assessment of these procedures is performed at the same time as assessment of operating license application, of final design, of readiness of operating teams: there is a challenge to come to a consistent global assessment when operating license is provided.** **Another challenge is that final validated as-performed CT documentation (with final results) may become available several months after CT implementation due to a long process of validation within the licensee's organisation (first analysis done on-site then second analyses done by designers…).** **<u>Questions :</u>** **How to manage regulatory resources when all documentation is updated at the same time, when licensing application is provided. How assessment of an obsolete documentation be used effectively for assessment of updated documentation or for inspections?** **Are there any regulatory requirements on timescale for providing final validated CT documentation or can licensee only provide its first analysis of safety results?** **Which WP/ HP are defined during commissioning tests?** **How much visibility is given to the licensee on the criteria for the acceptance of a hold point, in order to conduct an anticipated assessment to a maximum extent?**

• A hold point (HP) may have an impact on the licensee's schedule. To define witness points, the regulator has to think about the benefits of an on-site inspection against an office assessment of the test's results, and the necessity to be informed as soon as the test is performed in order to assess its results in anticipation of an upcoming hold point. To define a hold point, the safety significance of moving past the hold point has to be understood (test stage when tests results and the state of the reactor have to be questioned). Therefore, for hold points, the regulator has to define what it wants to control and decide as early as possible of information needed to make a decision and define detailed agenda for on-site inspection. When the regulator selects a hold point, it is important to clarify the content of the licensee's report for as much anticipation as possible regarding the fulfillment of the hold point criteria. The question is: how much visibility is given to the licensee on the criteria for the acceptance of a hold point, in order to conduct an anticipated assessment to a maximum extent? Despite this anticipation efforts, when it is necessary, ASN takes the required time to treat subjects with major impact(s) on safety.	
JAPAN	
Prior to inspection (Before Operation Inspection or Facility Periodic Inspection), such documents as inspection guidelines are prepared by NRA, and the inspection is conducted according to these documents. By this process, the viewpoint about implementation of inspection is studied and prioritised. To become inspector, receiving training and satisfying eligibility requirements for inspection is needed. The human resources are secured by planned implementation of such training. The inspection on equipment or facility by Nuclear Regulation Authority consists of mainly 2 types. It is Inspection before operation (pre-service inspection) and Facility periodic inspection (in-service inspection). In both cases, licensee has to apply to Nuclear Regulation Authority for implementation of inspection, and needs to show inspection daily and working schedule in these applications. About pre-service inspection, the inspection order is regulated by law. Such documents as inspection guidelines are prepared by NRA, and the inspection is conducted according to these documents. In this guideline, inspection system is provided. By these processes, implementation of efficient and effective inspection may be ensured. But if a deviation from technical requirement is found in these inspections, licensee has to take necessary actions.	➢ **How many inspectors will participate in one commissioning?** ➢ **What are the eligibility requirements of inspector?** ➢ **How training is implemented?**

KOREA	
Answer, 3.D.(1) The regulatory oversight during the entire construction period is made through the pre-operational inspection (POI). In accordance with Article 29 (Time, etc. of POI) of the Enforcement Decree of the NSA and the NSSC Notice 2014-27 (Regulation on POI of Nuclear Reactor Facilities), the time and items of inspection are prescribed for the main unit process, divided into structural inspection, installation inspection, cold functional test, hydrostatic and hot functional tests, post-fuelling commissioning test inspections. The commissioning POI includes the last three main processes for each unit. The licensee should submit an application for commissioning inspection before each main unit process starts. Based on the licensee's application, the regulatory body set up the POI plan for commissioning which includes the entire inspection schedule, inspection items, and regulatory resource needs. The regulatory resource needs for commissioning oversight is determined taking into account the inspection schedule and items. And the regulatory resource may be rearranged, when certain abnormal situations like unplanned reactor trips or unexpected test results arise in the commissioning reactors, depending on safety significance of those incidents. The regulatory resource needs is prioritised for tests of more safety significant Structures, Systems and Components, taking into account the commissioning and operating experiences from the existing (reference) power plant, the first of a kind (FOAK) tests, etc. The regulatory resource is basically managed in conformance with the regulatory resource needs in the POI plan, however, sometimes affected by other regulatory activities such as operating reactor inspection, incident examination. **Answer, 3.D.(2)** The licensee should submit the application for the commissioning inspection before the main unit process starts, then the regulatory body set up the POI plan not to affect the entire commissioning process. In addition, the schedule for each commissioning test is provided to the regulatory body on a weekly basis. The e-mail and telephone correspondence is commonly made between the licensee counterparts and regulatory inspectors as frequently as necessary. This ensures that regulatory oversight can keep pace with commissioning without significant impact on the licensee's schedule.	
NETHERLANDS	
Because of few recent experience with new build activities international experience is gained with respect to the necessary resources. Also the hiring of expert organisations is foreseen. An inspection programme still has to be compiled. The new build of the research reactor is foreseen to start not earlier then	**1. International comparison on the needed amount of resources.** **2. What knowledge should a Regulatory body have and what knowledge can be hired from experts?**

2019/2020 so an inspection programme for this project still needs to be compiled. However, on shorter notice some new build activities will be carried out at the waste storage facility.	**3. Are there different resources/expertise needed when comparing the new build of an NPP vs. the new build of a research reactor?**
RUSSIA	
The Regulator's inspection branch for oversight over nuclear and radiation safety shall be established on NPP construction site. The Regulator shall have adequate resources, which can be required in case of delays in deadlines of works performed by a Licensee, as well as for the sake of occurrence of unexpected events. Scheduled and unscheduled checks shall be performed by efforts of the Regulator's inspection branch arranged on-site. Personnel of an Interregional Territorial Department for Supervision over Nuclear and Radiation Safety, and of the Regulator's Headquarters can be engaged, if necessary.	
SLOVAK REPUBLIC	
Resources needed to oversee commissioning are managed by RB management based on commissioning schedule. Based on legislative requirements regarding every single commissioning phase the management plans and manages the need of resources. The need depends on the amount of approved documentation and expected number of the inspections. There are no strictly defined requirements for regulatory resources for commissioning. Except internal resources the external resources (TSO) are also utilised. Firstly, to be in compliance with commissioning schedule is not the task of the RB. It is the task of the licensee. If the licensee fulfil all legislative requirements there is no reason to prolong the commissioning. Nevertheless the RB puts the adequate effort to keeps pace with commissioning via planning adequate resources for all single commissioning phase together with utilising external resources.	
UNITED ARAB EMIRATES	
—	
UNITED KINGDOM	
a) UK regulatory approach is one of gaining confidence in the licensee's control and oversight of its own and its contractors' activities, and subsequently deploying the necessary regulatory resource to verify this. Clearly, poor performance by the licensee would necessarily require increased scrutiny by the regulator in certain activities and perhaps more regulatory hold points, thereby requiring additional regulatory resource. Conversely, good performance on behalf of the licensee would result in a lighter touch by the regulator, and hence use of less resource. Confidence in these functions will have been	**a) Key learning points from ONR approach to resource allocation on new build (albeit not commissioning) are:** • **Understand licensee schedules so that regulatory resources can be planned.** • **Be adaptable: NPP projects are vulnerable to delay and new work can arise. So the regulator may need to have access to additional resource or to return resource.**

established and learning applied through the construction phase. ONR will review the licensee's schedule of commissioning activities as an ongoing activity and assess the potential impact of these activities on nuclear safety. Licensee arrangements made under the nuclear site licence require them to provide a means of assessing their own readiness to proceed between stages of commissioning. ONR can also set regulatory hold points against the licensee's own hold point list and these are communicated early in the project – although they can be added to or reduced, in number or in scope. Deployment of regulatory resource is therefore related to nuclear safety impact; confidence in the licensee's own arrangements, including its own self-regulation function; and the specific activities that are planned/ conducted. We do expect to deploy a combination of technical topic specialists and site inspection resource, plus human and organisational factors specialists. We place particular emphasis on the licensee's oversight and control of commissioning activities. b) ONR's regulatory activities are exercised with the aim of minimising any disruption on the licensees programme. As stated, Regulatory hold points against the licensee's own hold point list are communicated early in the project, as is the requirement in terms of timescales for submission of any documentation to support the regulatory assessment, in order that the licensee can plan and produce the necessary documentation to enable the regulatory process the complete. ONR engages with the licensee as an ongoing basis to ensure that issues and solutions are identified early.	• **Don't try to do everything – target regulatory focus on basis of hazard and risk and sample licensee work.** • **Consider using technical support contractors – but always be sure that regulator oversight is in place – and be aware that it can take time to get the TSC contracts** • **Note that different skills are needed at different times. Organisational capability is a key enduring element. And make sure that Inspectors from different disciplines are joined-up. Don't give the licensee inconsistent messages.** • **Good project/programme management is vital to ensure that interactions between regulator and licensee go smoothly (planning, reporting, identifying and progressing issues, resolving conflict, etc.)** **b) Key learning points re not unnecessarily impacting on licensee schedule (again from ONR's new build work to date, albeit not on commissioning):** • **Understand the schedule! And press to know how confident licensee is in this schedule.** • **Be clear where regulatory hold points or other formal intervention points are and be sure that licensee understands these.** • **Plan availability of regulatory effort so that it is ready to go.** • **Ensure licensee is clear what documents etc it needs to deliver and when in order to enable regulator to do its assessments to time.** • **Vital – have an open, honest and constructive relationship with licensee so that any risks/problems are reported and discussed early.** • **Be pragmatic – if problems are found does the regulator need to delay the programme or can remedial measures be agreed without slowing the schedule?**

UNITED STATES	
The NRC has performed detailed planning for the oversight of new construction under 10 CFR Part 52, including the preoperational inspections and operational program reviews. IMC 2506, "Construction Reactor Oversight Process General Guidance and Basis Document" provides the NRC guidance (http://pbadupws.nrc.gov/docs/ML1505/ML15055A477.pdf). As an example from IMC 2506, inspector hour estimate for NRC inspection of Construction and Operational Programs, which includes QA verifications, IMC-2504 construction programs, pre-operational inspections, and operational program readiness reviews, is 10 000 hours. Prioritization for inspection of preoperational tests is included in IP 70702, "Inspection of Preoperational Test Performance" which requires that the inspection of those construction tests deemed targeted by the expert panel (discussed in question 1 C). The NRC will also inspect all FOAK tests and any tests specified in the license (these are usually the same). In addition, the NRC may inspect other tests based on risk significance, uniqueness, or complexity, and selected during the NRC inspection planning process. The NRC hired additional personnel and provided extensive training to support new reactor construction starting in the mid 2000's. NRC inspection resources and management of resource needs are discussed in the next question. The NRC is currently planning for the oversight of transition from construction to operation. IMC 1514, "Light Water Reactor Inspection Program - Startup Testing Phase," IMC 2514 AppA, "Startup Test Program Inspection Procedures," and IP 72304, "Startup Testing for the AP1000: Test Review, Test Witnessing, and Test Results Evaluation," are under revision. Currently the plan is for the NRC to inspect all FOAK tests and any tests specified in the License (these are usually the same), and a significant portion of commissioning tests, based on risk significance, uniqueness, or complexity, and selected during the NRC inspection planning process. NRC inspection resources and management of resource needs are discussed in the next question. Watts Bar Unit 2 is currently in commissioning tests, but is very unique in that the plant was basically completed in the mid 1980's but then because of quality issues the licensee stopped construction. With the changes in NRC regulation and processes, and the unique requirements for the licensee to address the long term stoppage in construction, previous quality issues, and spare part scavenging (basically reconstructing a large part of the plant) the NRC created a process and procedures specifically for Watts Bar 2. IMC 2517, "Watts Bar Unit 2 Construction Inspection Program" along with IMC 2514 provide the NRC guidance for the construction and commissioning oversight of Watts Bar 2. The Watts Bar 2 construction and commissioning oversight is consistent with this presentation but different in details. Watts Bar 2 IMC 2517 link is http://pbadupws.nrc.gov/docs/ML1313/ML13136A301.pdf The NRC maintains construction resident inspectors onsite (currently 4 at each 2 unit site under construction) and augments those	

inspectors with additional and expert inspectors as needed. The NRC is currently planning for the oversight of transition from construction to operation. Current NRC plans are to bring the NRC operating reactor resident inspectors on site prior to preoperational testing (having 4 construction and 2 or 3 operating residents) to support inspection of all the testing, as well as using other NRC inspectors as needed. As construction and testing completes, the construction resident inspectors will be reduced in numbers. The licensee is required to keep the NRC informed of their construction/testing/operation schedule (the residents normally sit in on the licensee daily planning meetings). Each site has a lead resident inspector who is responsible for managing the onsite NRC resources to support inspection needs. The senior resident coordinates with the NRC Region 2 management on unit schedule and NRC inspection needs. NRC Region 2, NRC Headquarters, and even other NRC Regions (1, 3, and 4) supply additional NRC inspectors/technical experts as required. The NRC does not require the licensee to wait for an inspector under most circumstances. If the licensee has requested a change to the FSAR that requires NRC prior approval and would affect the licensee construction schedule, the licensee can continue work "at risk" before the NRC approves the change. Any changes that require NRC prior approval have to be resolved prior to SSC being declared operable for Technical Specification requirements.	

APPENDIX B. WORKSHOP PROCEEDINGS

B.1 Background of workshop

The Committee on Nuclear Regulatory Activities (CNRA) Working Group on the Regulation of New Reactors (WGRNR) constitutes a forum of experts on the licensing of new and advanced commercial nuclear power reactors seeking to facilitate a co-operative approach to identifying key new regulatory issues, and to promote a common resolution.

The main purposes of the WGRNR and its products are:

D. to improve regulatory reviews by comparing practices in member countries;
E. to improve the licensing process of new reactors by learning from best practices in member countries;
F. to ensure that construction inspection issues and construction experience are shared;
G. to promote co-operation among member countries to improve safety and enhance the effectiveness and efficiency of the regulatory process.

The Multinational Design Evaluation Programme (MDEP) was established in 2006 as a multinational initiative to develop innovative approaches to leverage the resource and knowledge of the national regulatory authorities that are currently or will be tasked with the review of new nuclear reactor designs. The nuclear regulatory authorities participate in MDEP, which includes design specific working groups (DSWGs) and issue specific working groups. The NEA facilitates MDEP activities by technical secretariat services for the programme. The MDEP Policy Group (PG) and the Steering Technical Committee Group (STC) oversee the programme.

The WGRNR is the main point of contact between the Multinational Design Evaluation Programme (MDEP) and the CNRA, and aims to co-ordinate its work with that of the MDEP in such a way that it utilises its outputs and does not duplicate its efforts. It also extends the results of MDEP to other CNRA members.

At its first meeting in 2014 (31st meeting), the CNRA recognised the generic aspects of regulatory oversight of the commissioning phase for new reactors as a new task for the WGRNR. Accordingly, WGRNR has covered generic commissioning activities and MDEP DSWGs have addressed commissioning activities specific to a design. This was formally agreed on by the CNRA and MDEP chairs.

In this context, the WGRNR organised a joint workshop with the MDEP on the regulatory oversight of the commissioning phase for new reactors. The workshop was an opportunity to bring together experts from nuclear regulatory organisations (NROs) on commissioning activities. Its main purpose was to foster broad international co-operation and to share commendable practices and recent experience related to the commissioning of new reactors. The workshop focused on generic aspects of the topics, including regulatory priorities and practices, the oversight and regulation of commissioning tests and activities, and commissioning issues which are not design-specific. Information obtained as a result of this workshop should give understanding keys of regulatory issues of commissioning phase of new reactors, and promoting a method to address them.

The WGRNR-MDEP Joint Workshop on Regulatory Oversight of the Commissioning Phase of New Reactors was held on 14-16 March 2016, in Gyeongju, Republic of Korea and hosted by the Korea Institute of Nuclear Safety (KINS). The workshop was attended by participants from 15 countries and provided a forum to communicate and share experience on commissioning programmes and recent activities. The workshop also provided an opportunity to get feedback from participants on additional focus areas. Presentations were given by all MDEP DSWGs and the WGRNR. This report documents the proceedings of the workshop.

B.2 Overview of workshop

Opening session

The morning session of the first day was dedicated to an introductory presentation from WGRNR as well as to MDEP DSWGs' presentation and discussion on specific commissioning activities.

Group discussion session

The three group sessions took place in parallel and were devoted to discussions among participants on each topic. The group sessions was moderated by a Chair from WGRNR or MDEP assisted by a Rapporteur from MDEP or WGRNR. The Rapporteur took notes of the topical discussions and prepared a summary on each topic.

GROUP 1 C: K. KAVANAGH (US NRC) R: S.-W. WOO (KINS)	GROUP 2 C: A.-C. RIGAIL (ASN) R: S. DOWNEY (US NRC)	GROUP 3 C: C. REIERSEN (ONR) R: M. TUOMAINEN (STUK)
Commissioning management	**Commissioning oversight**	**Organisational issues**
1.A. Application of commissioning experience and operating experience	2.A. Regulatory hold points and witness points	3.A. Inspection for licensee organisational readiness
1.B. Selection of tests and acceptance of tests results	**2.B. Bases for inspection**	**3.B. Oversight of safety culture during commissioning stage**
1.C. Configuration management reflecting design change	2.C. Tests sampling criteria	**3.C. Oversight of maintenance and preservation of equipment**
	2.D. Dealing with unexpected test results or occurrences	**3.D. Deployment of regulatory resource**

C: Chair, R: Rapporteur.

Closing session

At the closure session, the three Rapporteurs presented the summary of each topic of their group, and conclusions and recommendations. There was a discussion following each presentation.

Technical tour

One day technical tour was organised on 16 March 2016 to the construction site (Shin-Kori units 3 and 4).

H. Overview of the Kori and Shin-Kori Plant Site (including Shin-Kori units 3 and 4).

I. Presentation for the Commissioning status of Shin-Kori units 3 and 4.

B.3 Workshop progress

B.3.1 Opening session

The workshop was opened by a welcome address from the R.O.K NSSC Secretary General, Yong Hwan Kim (Currently NSSC chairman) and Mr Ho Nieh, Head of the Division of Nuclear Safety Technology and Regulation, NEA. Mr Janne Nevalainen, WGRNR Chair gave presentation of WGRNR current activities and task on Regulatory Oversight of the Commissioning Phase for New Reactors. Then, current activities of MDEP design specific working groups on commissioning were introduced by each WG representative, EPRWG, AP1000WG, ABWRWG, VVERWG, APR1400WG.

Chair: Mr In-Goo Kim, Director of Division of Reactor Licensing, KINS (MDEP STC member)

Mr In-goo Kim opened the Workshop on Regulatory Oversight of the Commissioning Phase for New Reactors by welcoming participants. Participants were informed of the composition of the workshop and the speakers for the opening remarks were introduced.

Mr Yong Hwan Kim, Secretary General of NSSC (Korean MDEP PG member)

Mr Yong Hwan Kim, the Korean representative of the MDEP Policy Group, welcomed participants and expressed his gratitude to Key Yong Sung, the vice president of KINS, and Mr Ho Nieh, NEA Director, Mr Janne Nevalainen, Chair of the WGRNR. He briefly introduced MDEP and its role. It was explained that MDEP was established to increase co-operation among member countries in regards to regulatory practices for safety of new reactor designs. It was hoped that the regulatory design reviews will be more effective and efficient through sharing knowledge, experiences and information among members. Mr Kim emphasised that MDEP needs to look at the design-specific issues during commissioning together with its main focus on regulatory safety review of new reactor designs.

MDEP design-specific working groups endorsed by MDEP PG and its purpose were mentioned and the background of this joint workshop was explained. Mr Kim stressed the fact that commissioning activities for new reactors play an important role in assuring the safety of their future operation.

Korean situation of nuclear power plants including Shin-Kori units 3, 4, 5, 6 and Shin-Hanul units 1 and 2 was introduced and he mentioned that it was important to the Korean regulatory authorities that the regulatory oversight of the commissioning phase for new reactors is carried out efficiently and effectively. He also hoped that this forum would be a great opportunity to share best practices and experiences in regulatory activities around the world.

Mr Ho Nieh, Head of the Division of Nuclear Safety Technology and Regulation, NEA

Mr Ho Nieh thanked the host and welcomed the participants to the first joint workshop between the CNRA and the MDEP program. He explained and commended how CNRA established working groups on regulation of new reactors and how WGRNR and the chair played an important role as the liaison between CNRA and the MDEP. Mr Nieh pointed out the significance this workshop had in further co-operation and synergy between the two.

Mr Nieh explained the situation where there had been efforts to transfer the issue-specific working groups under NEA to either CNRA or CSNI. He mentioned that it was encouraging to see high level of participation and that the workshop was very timely. He also commended Korea’s progress in nuclear power plants and their designs.

Mr Nieh said he was satisfied with the agenda which included the safe commissioning of the new reactor units, the testing programs, the hold points, the inspection regimes and the safety culture. The fact that NEA had made some organisational changes was pointed out as well. Lastly, the report on the Fukushima Daiichi nuclear accident issued by the NEA was introduced and the participants were invited to look at it.

Mr Janne Nevalainen, STUK, WGRNR Chair

Mr Janne Nevalainen thanked the host of the workshop and welcomed the participants. He emphasised that it was a great opportunity to discuss both the general issues dealt by WGRNR and the design-specific issues within the MDEP design-specific working groups at the same time. The general format of the workshop and how it was formed were introduced. It was explained how the position paper prepared by each member country would help the discussion. He thanked the NEA secretariat, KINS and all chairs of different sessions for their efforts. He identified three main goals of the workshop as reporting lessons learned, recognising the best practices and identifying future challenges.

He also introduced the definition of commissioning and invited the participants to have further discussion on this matter.

Mr In-Goo Kim, KINS, MDEP STC member

Mr In-Goo Kim welcomed the participants on behalf of MDEP STC and delivered an apology from the chairman of the STC for not attending the workshop. Mr Kim briefly introduced five design-specific working groups and three generic issue-specific working groups and their objectives. He also emphasised the importance of commissioning and early phase operations and how they are now incorporated by the design-specific working groups. The workshop was pointed out as the result of strengthened collaboration between MDEP and CNRA regarding commissioning. Lastly, he thanked the participants and expected future co-operation between MDEP and CNRA in the future.

WGRNR current activities and task on Regulatory Oversight of the Commissioning Phase for New Reactors (Mr Janne Nevalainen, STUK, WGRNR Chair)

This session was aimed to give overall information on commissioning activities which are taking place in MDEP design specific working groups.

Mr Janne Nevalainen introduced overall information on WGRNR activities and its meeting. Developments in programmes, regulations and policies related to licensing, construction, and oversight of new NPP carried out by WGRNR and their timelines were pointed out. ConEx data base entries were mentioned and Mr Nevalainen pointed out that many countries still lack participation and encouraged member countries to join in ConEx. Second ConEx synthesis report was introduced in details. He noted and emphasised conclusions drawn by the report including management system processes, safety culture, human and organisational issues, and supply chain management.

Regulatory practice to assess passive safety systems used in new NPP designs was explained and it was pointed out that questionnaires had been distributed among the member countries on that subject. He highlighted that the fourth chapter of draft survey, the commissioning and periodic verification testing, will be discussed since there were some challenges in commissioning of the passive safety system.

He lastly touched on regulatory oversight of new licensee organisational capability by explaining series of workshops and surveys associated with this topic.

Mr Nevalainen concluded the presentation by providing the scope of the workshop and also invited participants to share best practices and to identify future challenges.

Through the Question and Answer, it was highlighted that WGRNR only collects and understand lessons learned and best practices.

Current activities of MDEP design specific working groups on commissioning

EPR working group (Ms Anne-Cécile Rigail, ASN, WG Deputy-Chair)

Ms Anne-Cécile Rigail started by introducing the EPR working group including its position in MDEP, its member countries, and its meetings. She then introduced different technical experts-subgroups under the working group with emphasis on technical expert subgroups for commissioning activities.

Current activities of EPRWG on commissioning include testing activities recently completed and planned in the future with examples. First-plant-only-tests and the reactor pressure vessel internal vibration test were especially elaborated in details.

MDEP EPR Commissioning Workshop 2013 held in China was introduced with their results. It was mentioned that the first-plant-only-tests acceptance principles were being reviewed by other design-specific working group as a common position for MDEP.

She provided details regarding the recent kick-off meeting of the commissioning activities TESG. This technical experts subgroup would be working with a first focus on the first-plant-only-tests. It was concluded that, considering current progress of EPR projects, commissioning oversight and sharing information on EPR commissioning became of greater interest to EPRWG and EPRWG developed a common position on FPOT and very recently established a Commissioning Activities TESG. She also welcomed this workshop since it was a good opportunity to share experiences and challenges beyond those that were specific to EPR with a broader audience. She noted that EPRWG was willing to continue further co-operation with WGRNR.

Through the Question and Answer, it was responded that the EPRWG had not been performing detailed tasks on first-of-a-kind tests since all the regulators would like to take tests at home. It was also discussed about joint inspections of commissioning over whether legal implication was a concern. The idea was to witness the FPOT not conducting inspections due to legal reasons, and it was noted that the EPRWG regulators could only ask questions to their licensees.

AP1000 working group (Mr Lawrence Burkhart, NRC, WG Chair)

Mr Lawrence BURKHART briefly explained about his career including MDEP. He noted that much of the EPRWG presentation was applicable to AP1000WG. The overview and the structure of this WG were introduced with a highlight that AP1000WG was cooperating with Vendor Inspection Co-operation WG in particular. He provided summary of status for four countries; China, United Kingdom, United States, and Canada. It was pointed out that the commissioning had been discussed at every biannual meeting of AP1000WG since September 2012. He mentioned that the AP1000WG, just as the EPRWG, was also interested in observing and witnessing the commissioning testing activities. Some other specific meetings on commissioning/initial test programme were introduced between the US and China. He also explained about some of the co-operation efforts carried out by AP1000WG and other organisations for commissioning activities. Also, exchanges of information on significant design change issues especially in the Chinese nuclear power plant sites were noted. To conclude, he summarised that AP1000WG was efficiently and effectively cooperating on commissioning/initial test programme issues with various meetings in the future.

Through the Question and Answer, it was responded that all of the passive systems were part of the initial test programs, so the WG's position was that the licensees had to carry out the commissioning programme as approved in the FSAR and the WG.

It was also discussed about NRC position for the condition to accept the results of initial test programme performed at the Chinese NPP sites for Vogtle and Summer. It was responded that NRC is open to the licensees to provide that information as long as they provided sufficient justification that there were no significant differences in design and they had sufficient quality assurance. However, they would have to be done by meeting the NRC requirements.

ABWR working group (Mr Hiroshi Ono, NRA, WG member)

Mr Hiroshi Ono started off with background information on ABWRWG. He explained in details about the formation history of ABWRWG. Detailed activities carried out by ABWRWG member regulators, including ONR (UK), NRC (US), and NRA (Japan), were introduced with examples. Major activities conducted by ABWRWG were provided and it was noted that unlike the other four MDEP design specific working groups (EPR, AP1000, APR1400, and VVER), there were currently no active ABWR commissioning activities.

Mr Ono provided the current status of Japanese ABWR sites including licensing review and construction records. Furthermore, demonstration and validation tests related to ABWR conducted in Japan were introduced. He explained pre-service inspection and operational safety inspection.

Through the Question and Answer, it was responded that there were inspection rules in Japan, and there had been no discussion on commissioning among the members of WG if those two inspections could be considered analogous to commissioning/initial test programme conducted by other regulators.

It was also discussed, about pre-service inspection and operational safety inspection, details of the USNRC's review on renewing design certification assessing the renewal submitted by GE-Hitachi and Toshiba.

VVER working group (Mr Mikhail Lankin, SEC NRS, WG member)

Mr Mikhail Lankin briefly introduced VVERWG and its organisation and member countries. He provided the current status of VVER in member countries including Russia, China, Finland, Hungary, Turkey, and India. Recent VVERWG meetings were noted. Information on three technical experts sub groups (RPV&PC, Fukushima-related issues, and severe accident) was provided. Mr Lankin mentioned that this WG was not so much focusing on the issues related to commissioning; therefore, the presentation would provide information that VVERWG member countries wished to share with the participants of the workshop. Commissioning-related activities by each member country were introduced.

Through the Question and Answer, it was responded that the WG tried to cover all different types of VVER for all member countries, and the WG was not focusing on commissioning. The possibility for any non-MDEP member to join MDEP VVER WG was discussed.

APR1400 working group (Mr Sweng-Woong Woo, KINS, WG Chair)

Mr Sweng-Woong Woo greeted and introduced APR1400WG, including its establishment and member countries. Two TESGs were introduced. Mr Woo elaborated on licensing status of APR1400 fleet in different countries including Korea, United Arab Emirates, and United States. He further explained about timeline of construction permit and operating license of each NPPs in Korea, the United Arab Emirates, and the United States in detail.

He then provided information about activities of Shin-Kori units 3 and 4, detailing time schedule, error discovered, test results, etc. The construction status of Shin-Hanul units 1 and 2 was briefly touched on, too. Commissioning activities of APR1400 in the United Arab Emirates were explained with emphasis on fission chamber and fuel storage. FANR's inspection programme was elaborated with number of inspections at different venues. Fukushima follow-up activities of APR1400 in Korea were pointed out, including design improvement and emergency cooling water supply for severe accident.

Through the Question and Answer, it was responded that Korea improved all of its relevant requirements since the NRC raised the instrumentation problem in spent fuel pool (SFP) level and temperature monitoring in case of electrical power loss. It also discussed and commented the types of interaction between Korea and the United Arab Emirates to help the FANR inspectors.

B.3.2 Group discussion session

The three group sessions took place in parallel in separate rooms and was devoted to discussions among participants on each topic. The group sessions were moderated by a Chair from WGRNR or MDEP assisted by a Rapporteur from MDEP or WGRNR. The Rapporteur took notes of the topical discussions and prepare a summary on each topic.

B.3.3 Closing session

B.3.3.1 Group presentation

The presentation of each group was incorporated into the main report.

B.3.3.2 Panel discussion summary

Panel discussion was made among the 3 groups' Chairs and Rapporteurs.

Ms Kerri KAVANAGH commented generally and mentioned that they formed questions in a way that every member could participate by understanding which countries recognised FOAK and FPOT and which didn't. She also mentioned that she was surprised because she thought everybody would talk about FOAK and FPOT, however, which was not the case.

Mr John D. MONNINGER commented on passive systems. Ms Kavanagh noted that passive system needed to be tested as part of commissioning. In addition, Mr Woo elaborated more on passive system with detailed examples. Mr Nevalainen also added on to Mr Woo's comment about passive system. He highlighted the fact that it was important to see questions and discussions had been raised in regards to passive system in this workshop and this issue should definitely be discussed in the future meetings.

Mr Nevalainen suggested having discussion on future challenges regarding information exchange. A gentleman mentioned that ConEx was a great system for co-operation. However, he raised concern that it would normally take more than one or even two years for ConEx to produce a report. He, therefore, invited any suggestions for faster information sharing. Participants agreed that there should be a discussion to solve this problem of slow information sharing and report generation.

Mr Woo suggested that the utilities who designed the same NPPs in different countries, for example, Korea and the United Arab Emirates, could communicate between regulatory bodies of different country once they found any problems in one country's NPP. Mr Burkhart and some other participants expressed concerns that vendors were not reliable sources of information and pointed out that that he was not sure whether vendors could be solution for faster information sharing.

Ms Anne-Cécile RIGAIL mentioned that the organisation for configuration management and design changes can be also discussed in the Group 1 discussion since they had problems in common. Mr Nevalainen suggested discussing this issue again in Group 2 discussion.

Mr Fabien FERON asked whether FPOT, in some countries where FPOT was not reflected in their regulations, was prevented by the regulation or if it was just not mentioned at all. Ms Kavanagh answered that those countries without FPOT and/or FOAK in their regulation did not prevent them but they simply did not recognise that those could be done. Mr Tapani VIROLAINEN mentioned that although Finland did not have FPOT/FOAK in its regulations, licensees could propose if they wished to have them.

Panel discussion took place after the presentation based on the open questions suggested by the 3 groups. Several questions and answers, or comments were exchanged among the panel and the participants on the floor. The items discussed follow:

J. sampling philosophy for test selection

K. unexpected situation such as failing to meet criteria

L. selection of witness point and hold points

M. commissioning oversight strategy such as the lessons learnt to be timely reflected, management of commissioning test schedule by inspectors

N. handling of the organisational factors

O. training of inspectors particularly in countries without commissioning experience

P. requirements for safety culture required for regulators

Q. third party review of safety culture in licensee organisation

After the panel discussion, it was moved to general conclusion and closing. The chair suggested that all the chairs and rapporteurs come to the floor all together and once again talk about the topics raised.

B.3.3.3 General conclusion and closing remarks

Mr Janne Nevalainen, the WGRNR Chair suggested to capture the points and identify topics being left as open questions, which would be the basis for a following workshop later on.

The topics were largely divided into three (3) parts: Open issues for WGRNR; Open issues for MDEP; and key messages to industry. Detailed issues and messages elaborated are as follows:

1. Open issues for WGRNR

Commissioning task:

- Criteria for selection of tests to be witnessed by the regulator (safety significance, organisational capability, etc.).
- How do you articulate technical review and QA review (configuration management, PSAR vs. rev. of PSAR/PSAR vs. FSAR)?
- How do you assess the results of commissioning activities?
- Dealing with non-conformances (commissioning acceptance criteria missed) – How do we ensure that the licensee takes the appropriate preventive actions in order to ensure that commissioning lessons learned are incorporated in a timely manner?
- Identification of additional skills/experience needed for regulatory oversight of commissioning.
- How early in the licensing process should hold points and witness points be discussed with the applicant?

Within other tasks:

- Enhance ConEx sharing experience (QA vs. timely sharing).
- Testing of passive safety systems under design basis accident.
- Assessment of organisational readiness: ongoing task.

2. Open issues for MDEP
   - Develop the library for quick sharing of commissioning experience.
   - DSWG: enhance exchange of information between regulator and licensee on commissioning issues going on.
3. Key messages to the industry
   - Open, honest and regular communication with regulators is crucial (commissioning tests planning to be shared but also early communication of potential issues).
   - Good configuration control, reflected in PSAR and/or FSAR, is essential to support the commissioning oversight.
   - Regulators need accurate justification for crediting First Plant Only Tests and access to testing information (e.g. procedures, results).
   - It needs to be ensured that there are processes and procedures in place to manage unexpected occurrence during commissioning.
   - Particular attention should be given to the handover between construction, commissioning and operation phases.

While discussing about the messages to the industry, a question was raised on how to deliver such messages and whom would be the target. The chair and participants suggested channels to convey the messages, especially for those who haven't many experiences on this matter. The chair said that how to distribute the materials presented today's session and the content internally and externally needs to be decided, either by publishing the material and updating it to the website. Those who do not want to disclose certain parts can send such information to the people in charge. The participants agreed to open the data and material on the website.

Lastly, the chair gave opportunity for free speech for all the participants before formerly closing the workshop. Participants said that it was a very well organised and informative workshop. Having not too long but not too short questionnaires before the workshop was very effective. And dividing into smaller group to exchange and share different regulatory measures was quite practical and informative. The shortage of time compared to a large number of questions was the only drawback. All the items discussed could not be included in a short presentation. Participants hoped to have another venue to have continued discussion. It was also suggested that, on following workshops, it would be better to have one or two presentations solely dedicated to examples from the countries and to talk a little about the industry other than nuclear one, to get lesson learned there as well.

The chair announced the closing of all the sessions of the workshop by expressing a deep gratitude to KINS for such a successful event.

B.4 Workshop evaluation

R. Evaluation Form Results

All participants at the workshop were requested to complete an evaluation form. The results of this questionnaire summarised below, are utilised in setting up future workshops and to look at key

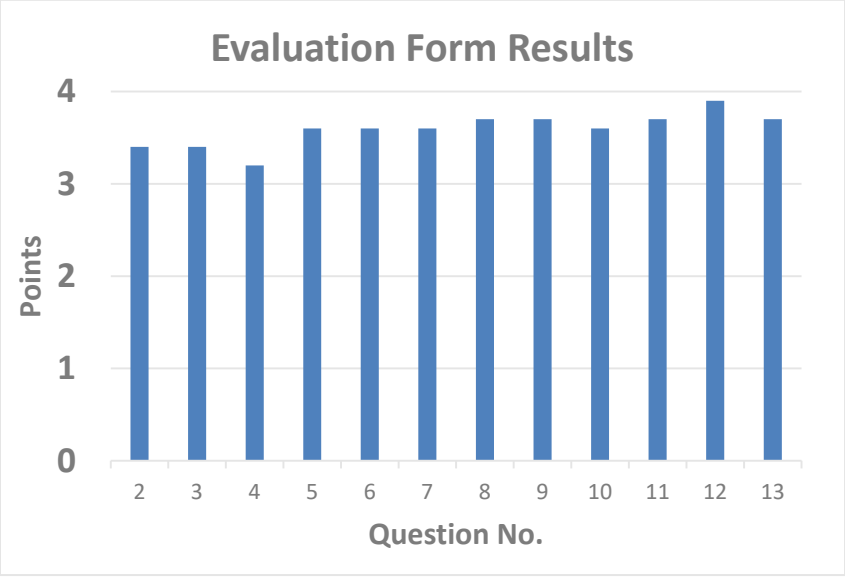
issues for in the programme of work over the next few years. Of the 51 total participants 45 responses were received.

The evaluation form, which was similar to ones issued at previous workshops, asked questions in four areas: general - workshop objectives, workshop format, workshop topics and future workshops. Participants were asked to rate the various questions on a scale of one to four, with one being a low (poor) score and four being a high (excellent) score. Results are provided in the following charts along with a brief written summary.

Table B.4: Summary of the results

No.	Question	/4
1	Selection of the 11 topics addressed	3.6
2	Selection of Questions around the Topics	3.4
3	Usefulness of outcomes for WGRNR and/or MDEP	3.4
4	How much information from the workshop will you disseminate into your organisation?	3.2
5	Preparation of national position papers	3.6
6	Dissemination of national position papers compilation	3.6
7	Preparation of group discussions	3.6
8	Format (priority given to discussion rather than presentations)	3.7
9	Time allocated to Opening Session	3.7
10	Time allocated to Group Sessions	3.6
11	Time allocated to Closing Session	3.7
12	Logistics of the workshop	3.9
13	Information received about the workshop	3.7

Figure B.4: Evaluation form results



S. Overview of the Evaluation Results
   - Quantitative evaluation : 3.6/4
   - Appreciated:
     - Very well organised, very good working conditions
     - Excellent format
     - Excellent topics
     - Useful and comprehensive contents
     - Providing position papers in advance is a good way of working
     - Testing of your own regulation and practices
     - Unique and important exchange between WGRNR and MDEP and amongst countries

T. Suggestions:
   - Less questions and more time for discussion
   - Allocate more time to chairs and rapporteurs to prepare conclusions and enable them to have the report approved by their group
   - More case studies and concrete examples of challenges
   - Presentation from non-nuclear area

B.5 List of participants

CANADA

Mr Kenneth LUN	CNSC	kenneth.lun@canada.ca

CHINA

Mr Ailin LU	NNSA	lv.ailin@mep.gov.cn
Mr Zhaoran WANG	NNSA	wangzr12000@163.com
Ms Jianying XIANG	NNSA	xiangjianying@gdgro.cn
Mr Lei XUE	NNSA	xuel@ecro.cn

FINLAND

Ms Essi AHONEN	STUK	essi.ahonen@stuk.fi
Mr Janne NEVALAINEN	STUK	janne.nevalainen@stuk.fi
Ms Minna TUOMAINEN	STUK	minna.tuomainen@stuk.fi
Mr Tapani VIROLAINEN	STUK	tapani.virolainen@stuk.fi

FRANCE

Mr Pierre COCHÉ	ASN	pierre.coche@asn.fr
Mr Fabien FERON	ASN	fabien.feron@asn.fr
Ms Adeline MORLIERE	ASN	adeline.morliere@asn.fr
Ms Anne-Cécile RIGAIL	ASN	anne-cecile.rigail@asn.fr

GERMANY

Mr Justus OLDENBURG	GRS	justus.oldenburg@grs.de

HUNGARY

Mr Mihály LEHOTA	HAEA	lehota@haea.gov.hu

JAPAN

Mr Yusuke KASAGAWA	NRA	yusuke_kasagawa@nsr.go.jp
Mr Gen MURAKAMI	NRA	gen_murakami01@nsr.go.jp
Mr Hiroshi ONO	NRA	hiroshi_ono@nsr.go.jp

KOREA

Mr Yong Hwan KIM	NSSC	yhkmost@korea.kr
Mr Moo Hwan KIM	KINS	mhkim@kins.re.kr
Mr Key Yong SUNG	KINS	k109sky@kins.re.kr
Mr Seunghoon AHN	KINS	shahn@kins.re.kr
Mr Kyung Lok BAEK	KINS	klbaek@kins.re.kr
Mr Young Seok BANG	KINS	k164bys@kins.re.kr
Mr Yeon-Ki CHUNG	KINS	key@kins.re.kr

Mr Charles GOO	KINS	goo@kins.re.kr
Mr Seonghyon JI	KINS	shji@kins.re.kr
Ms Su Jin JUNG	KINS	sjj@kins.re.kr
Mr Youngdoo KANG	KINS	y.kang@kins.re.kr
Mr Hyo Jun KIM	KINS	k660khj@kins.re.kr
Mr In-Goo KIM	KINS	igkim@kins.re.kr
Mr Jin-Gyum KIM	KINS	jgkim@kins.re.kr
Mr Jin-Su KIM	KINS	jinsu@kins.re.kr
Mr Yunil KIM	KINS	yikim@kins.re.kr
Mr Durk-Hun LEE	KINS	leedh@kins.re.kr
Mr Jae Hun LEE	KINS	jhlee@kins.re.kr
Mr Jonghyeok LEE	KINS	j.lee@kins.re.kr
Mr Sangkyu LEE	KINS	sklee@kins.re.kr
Mr Gunnyong PARK	KINS	withgodiwin@kins.re.kr
Mr Jong Seuk PARK	KINS	park@kins.re.kr
Mr Jun Young SON	KINS	jyson@kins.re.kr
Mr Seon Ho SONG	KINS	shsong@kins.re.kr
Mr Sweng-Woong WOO	KINS	k097wsw@kins.re.kr
Mr Jihyun CHA	KHNP	chajihyun@khnp.co.kr
Mr Junkou LEE	KHNP	leejktheory@khnp.co.kr
Mr Yangsoon PARK	KHNP	queenysnet@khnp.co.kr

NETHERLANDS

Mr Wouter VAN LONKHUYZEN	ANVS	wouter.van.lonkhuyzen@anvs.nl

POLAND

Mr Pawel SMOLIŃSKI	UDT	pawel.smolinski@udt.gov.pl
Mr Norbert WRONSKI	UDT	norbert.wronski@udt.gov.pl
Mr Marcin ZAGRAJEK	PAA	marcin.zagrajek@paa.gov.pl

RUSSIA

Mr Nikolai ABRAMOV	VOSAFETY	abramov_ni@vosafety.ru
Mr Nikolay KUZNETSOV	ROSTECH	n.kuznetsov@gosnadzor.ru
Mr Mikhail LANKIN	SEC-NRS	lankin@secnrs.ru
Mr Sergey OSHEPKOV	ROSTECH.	s.oshepkov@gosnadzor.ru
Ms Tatiana TETUSHINA	VOSAFETY	vt@vosafety.ru

SLOVAK REPUBLIC

Mr Henrich FRÁJ	UJD	henrich.fraj@ujd.gov.sk
Mr Ladislav HALUSKA	UJD	ladislav.haluska@ujd.gov.sk

UNITED ARAB EMIRATES

Mr Khalid AL NAQBI	FANR	khalid.alnaqbi@fanr.gov.ae
Mr Haitham AL SENAANI	FANR	haitham.alsenaani@fanr.gov.ae

UNITED KINGDOM

Mr Craig REIERSEN	ONR	craig.reiersen@onr.gsi.gov.uk
Mr Simon YATES	ONR	simon.yates@onr.gsi.gov.uk

UNITED STATES

Mr Lawrence BURKHART	NRC	lawrence.burkhart@nrc.gov
Mr Steven DOWNEY	NRC	steven.downey@nrc.gov
Ms Kerri KAVANAGH	NRC	kerri.kavanagh@nrc.gov
Mr John D. MONNINGER	NRC	john.monninger@nrc.gov

International Organisations

Mr Young Joon CHOI	NEA	youngjoon.choi@oecd.org
Ms Aurélie LORIN	NEA	aurelie.lorin@oecd.org
Mr Ho NIEH	NEA	ho.nieh@oecd.org