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Proceedings of the 15th International Nuclear Regulatory Inspection Workshop on Inspection Challenges Related to Nuclear Power Plant Ageing Management, Graded Approach to Optimise the Inspection Process and the Effects of the COVID-19 Pandemic on Inspection Programmes and Practices

2-6 October 2022
Warsaw, Poland

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COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

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NUCLEAR ENERGY AGENCY

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The mission of the NEA is:

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

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

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COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES (CNRA)

The Committee on Nuclear Regulatory Activities (CNRA) addresses 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 In accordance with the NEA's Strategic Plan, 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 NEA 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 (CSNI) 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 (CRPPH), the Radioactive Waste Management Committee (RWMC), and other NEA committees and activities on matters of common interest.

Foreword

The Nuclear Energy Agency (NEA) Committee on Nuclear Regulatory Activities (CNRA) believes that an essential factor in ensuring the safety of nuclear installations is the continued exchange and analysis of technical information and data. To facilitate this exchange, the Committee has established working groups and groups of experts in specialised topics. The Working Group on Inspection Practices (WGIP) was formed in 1990 and its mandate directs the WGIP to "identify practical methods to help regulatory bodies advance the effectiveness and efficiency of their inspection practices and programmes." The WGIP facilitates the exchange of information and experience related to regulatory safety inspections between CNRA member countries.

The main purpose of the 15th International Nuclear Regulatory Inspection Workshop on Inspection Challenges Related to Nuclear Power Plant Ageing Management, Graded Approach to Optimise the Inspection Process and the Effects of the COVID-19 Pandemic on Inspection Programmes and Practices, held in Warsaw, Poland, on 2-6 October 2022, was to provide a forum for the exchange of information on regulatory inspection activities. Participants had the opportunity to meet with their counterparts from other countries and organisations, to have discussions on these topics, to develop conclusions, and to identify methods that could help improve their own inspection programmes in this area.

Members of the workshop organising committee acknowledged the work of the staff of the Polish host organisation, the National Atomic Energy Agency (PAA), in planning the event. Special acknowledgement was also given to the WGIP members who facilitated the topic discussion groups: Ms Simone Stratmann (Germany), Mr Mahtab Khan (United Kingdom), Mr Sebastjan Šavli (Slovenia), Mr Miroslav Jakes (Czechia), Mr Thomas Hipschman (United States), and Mr Gideon York (United Kingdom). The contribution of the NEA (Mr C.J. Fong, WGIP Technical Secretariat, and Ms Carrie Richardson, assistant) was also highlighted.

This report was approved by the CNRA during its 49th meeting held on 8-9 June 2023, in Boulogne-Billancourt, France.

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List of abbreviations and acronyms

AM	Ageing management
ASN	Autorité de Sûreté Nucléaire (France)
CAP	Corrective action programme
CNRA	Committee on Nuclear Regulatory Activities (NEA)
CNSC	Canadian Nuclear Safety Commission
CP	Commendable practices
CUF	Cumulative usage factor
ENSREG	European Nuclear Safety Regulators Group
GA	Graded approach
IP	Inspection programme
IAEA	International Atomic Energy Agency
INIRW	International Nuclear Regulatory Inspection Workshop
IRSN	Institut de Radioprotection et de Sûreté Nucléaire (France)
KPI	Key performance indicator
LTO	Long-term operation
NEA	Nuclear Energy Agency
NRC	Nuclear Regulatory Commission (United States)
ONR	Office of Nuclear Regulation (United Kingdom)
PAA	National Atomic Energy Authority (Poland)
PSA	Probabilistic safety assessment
PSR	Periodic safety review
PWR	Pressurised water reactor
RB	Regulatory body
SMR	Small modular reactor
SNSA	Slovenian Nuclear Safety Administration
SSC	Systems, structures and components
SSG	Specific safety guide
SÚJB	State Office for Nuclear Safety
TLAA	Time limited ageing analysis
TS	Technical specifications
TSO	Technical support organisation
UDT	Polish Office of Technical Inspection

UM BW	Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg
WENRA	Western European Nuclear Regulators Association
WGIP	Working Group on Inspection Practices (NEA)
WGRO	Working Group on Reactor Oversight (NEA)

Executive summary

The Nuclear Energy Agency (NEA) Working Group on Inspection Practices (WGIP) organised an international workshop on 2-6 October 2022 with the objective of identifying commendable practices (CPs) related to:

- nuclear power plant ageing management;
- graded approach to optimise inspection processes; and
- the effects of the COVID-19 pandemic on inspection programmes and practices.

After convening several organising meetings, the WGIP workshop was held in Warsaw, Poland. Approximately 50 participants took part in the workshop, representing governmental organisations from 13 countries, as well as the International Atomic Energy Agency (IAEA). The participating countries were Canada, Czechia, Finland, France, Germany, Hungary, Japan, the Netherlands, Poland, Slovenia, Switzerland, the United Kingdom and the United States.

The workshop began with plenary sessions to introduce participants to each topic and to identify key questions to be answered. Next, the participants divided into six groups for detailed breakout sessions where they exchanged information and developed draft commendable practices.

To spur innovation and discussion, the workshop also included plenary sessions from Poland's National Atomic Energy Authority (PAA), the Nuclear Energy Agency (NEA), the Polish Office of Technical Inspection (UDT), and the IAEA.

On the last day, a general discussion session concluded the workshop. The workshop participants developed a set of commendable practices that can be found in Sections 2.6, 3.6 and 4.6 of this report. The commendable practices were drawn from the discussions on the topics the workshop participants. These are neither international standards nor guidelines but are meant to serve as references for member countries, which should determine their own inspection practices, taking into consideration their historical, social and cultural backgrounds.

1. Organisation and overview of the workshop

1.1. Planning

The NEA Committee on Nuclear Regulatory Activities (CNRA) discussed and approved the organisation of the 15th International Nuclear Regulatory Inspection Workshop (INRIW) during its December 2018 meeting. The workshop was originally planned for May 2020 but was delayed due to the COVID-19 pandemic. It was ultimately hosted in Warsaw from 2-6 October 2022 by the PAA.

Six potential topics were initially identified and three were selected according to the results of the survey included in the questionnaire sent to WGIP members. One of the original topics (external events) was deferred to a later date to allow for the time-sensitive topic related to COVID-19.

The responses to the questionnaire were used to prepare the opening topic presentations and the background material to conduct group discussions. As part of registration, each participant selected their preferred topic for discussion.

In the plenary opening session, the three topic leads provided their preliminary analyses of the questionnaire responses. Subsequently, the participants were divided into six groups of seven to nine participants to discuss the topics in detail.

1.2. Overview of workshop

Leads and co-leads pre-meeting

Prior to starting the workshop, the organising committee met to discuss and confirm the final organisational details.

Mr Alexandre Leblanc (CNSC), WGIP Chair, reminded the topic leads and co-leads of the general objectives of the workshop. He reviewed the document "Guidance on developing and approving commendable practices", as approved by the CNRA on 1 July 2018, emphasising not to leave out a good practice even if it did not meet the guidance criteria; such practices could be considered as observations.

He noted the importance of the facilitator's role in opening and leading discussions, guiding the group and continually monitoring to ensure full participation of the group members. He also reminded the organising committee of various methods to manage an effective discussion and to promote active participation.

Instructions were given that the sub-groups for each topic must interact during the workshop. This would provide an opportunity for comparing results.

Mr Leblanc also said that there were no targets or quotas regarding the number of commendable practices (CPs). Participants were encouraged to focus on quality rather than quantity.

Meet-and-greet session

The evening before the workshop, the PAA held a reception to allow participants to meet in an informal setting. This informal session was intended to create a good atmosphere between all participants and to make everyone feel comfortable for the next steps of the workshop.

Opening session

Mr Leblanc opened the workshop and welcomed participants. He gave a brief background of the WGIP, which for the past 30 years had provided a unique venue for experts to identify and promote commendable practices. He stated that the WGIP represents 21 regulatory bodies from NEA member countries and has hosted 17 workshops (18 biennial workshops plus two special workshops on digital systems and one on operating experience). Next, he briefly introduced the workshop topics, and he thanked the topic leads and co-leads for volunteering:

Topic A: Inspection challenges related to nuclear power plant ageing management

- Lead: Dr Simone Stratmann (UM BW, Germany).
- Co-Lead: Mr Mahtab Khan (ONR, United Kingdom).

Topic B: Graded approaches used to optimise the inspection process

- Lead: Mr Sebastjan Šavli (SNSA, Slovenia).
- Co-Lead: Mr Miroslav Jakeš (SÚJB, Slovak Republic).

Topic C: The effects of the COVID-19 pandemic on inspection programmes and practices

- Lead: Mr Thomas Hipschman (NRC, United States).
- Co-Lead: Mr Gideon York (ONR, United Kingdom).

Mr Leblanc concluded his initial remarks by providing an overview of the workshop's schedule and logistics. Afterwards, he introduced and gave the floor to Mr Andrzej Glowacki, Vice President of the PAA.

Mr Glowacki stated that he was glad to see so many participants from different parts of the world in the audience. He stated that Poland, as an embarking country, needed to take steps to prepare for its first nuclear power plants. He stated that one key step is capacity building of human capital and he pointed out that the PAA had recently hired 35 new employees. He stated that this workshop would be a valuable learning opportunity for many of them and he thanked the WGIP and NEA for their assistance in organising the event. He wished the workshop participants a productive week and he encouraged them to exchange their views in an open and transparent manner.

Following Mr Glowacki's remarks, Mr Andrzej Ziolkowski, the President of the UDT, provided remarks, stressing that Europe was entering an energy crisis, and that nuclear power would likely be a key element in enduring and ultimately emerging from the crisis. He also stated that for this to occur, safe operations will be vital, and a strong inspection programme is key to verifying safety.

Next, Mr Christopher Joseph ("C.J.") Fong from the NEA took the floor. He described an ongoing package of reforms underway that would reshape the WGIP's parent committee, the CNRA, starting on 1 January 2023. He reassured participants that although the WGIP would no longer exist under the new structure, the new Working Group on Reactor Oversight (WGRO) would continue to work on inspection-related topics. He also informed participants that observed inspections planned by the WGIP in 2023 and 2024 would still be implemented with the support of host countries. He closed by informing participants that he would be leaving the NEA at the end of 2022 and would be replaced by Mr John Nakoski (United States), and stated that it had been an honour to serve as the WGIP Technical Secretariat.

Mr Leblanc described the approach for conducting the workshop. He informed participants that member countries had been provided with three questionnaires (one per workshop topic) and that 9 to 12 responses had been received per questionnaire. The topic leads and co-leads had reviewed the responses, and this information would be used to inform the workshop discussions.

Next, Mr Leblanc reminded participants about the definition of a commendable practice as defined by WGIP procedure NEA/SEN/NRA/WGIP(2021)4, "*Guidance on Developing and Approving Commendable Practices*", not publicly available). Specifically, a commendable practice:

- Promotes the enhancement of a regulatory body's (RB's) framework by proposing ideas to improve the efficiency and/or effectiveness of inspection practices/programmes.
- Must be of a nature whereby their promotion throughout the RB community is deemed acceptable and beneficial.
- Is not an international code, standard or guideline.

He also reminded participants that before adopting a commendable practice, each RB is responsible for conducting its own due diligence considering its legislative and regulatory frameworks. He provided some additional examples of past commendable practices, and he gave recommendations based on past workshops about how to most effectively conduct group discussions. He closed by identifying the following workshop deliverables:

- Closing presentations containing summaries of the group discussions and proposed CPs.
- Draft workshop proceedings, to be completed by the NEA Secretariat and the WGIP with the ultimate review and approval being the responsibility of the CNRA.

Presentations from topic leads

Topic leads were invited to provide a presentation on their topic. The presentations focused on the importance of each topic and gave some thoughts and ideas to initiate group discussions:

- Ms Stratmann gave a presentation on Topic A.
- Mr Savli gave a presentation on Topic B.
- Mr Hipschman gave a presentation on Topic C.

Group discussion sessions

Participants were divided into six discussion groups, based on their preference given at registration.

Three half-day sessions were held. A facilitator and recorder worked with each group to stimulate and encourage discussions. For each of the three topics, two discussion groups were formed. The facilitators co-ordinated their discussion groups to give the participants sufficient time to express their views as well as to discuss the views with one other.

Host country presentations

Mr Leblanc thanked the PAA again for hosting the event and he asked participants to provide any feedback that they may have. He committed to including any constructive suggestions in the conference proceedings.

Mr Jastrzębski gave a presentation that provided additional information about Poland's nuclear power programme. First, he provided some background information on the PAA, which was formed in 1982 and currently has 134 inspectors. He noted that the original Polish nuclear reactor was a VVER-440 but was abandoned in the 1990s.

He gave a high-level overview of the organisational structure of the PAA and provided a summary of the types of inspections performed by the PAA. He described several examples of characteristics of the Polish regulatory structure, including inspectors' immediate, unlimited access to sites, documentation, logbooks, as well as the ability to conduct independent technical and dosimetry measurements.

Mr Jastrzębski next provided a description of Poland's nuclear facilities, including MARIA (a 30 MWth research reactor), EWA (a decommissioned 10 MWth research reactor), a spent fuel storage site, and national radioactive waste repository.

With respect to the Polish nuclear power programme, he informed participants that on 2 October 2020, the Polish government made the decision to implement a nuclear power programme as well as other activities necessary for ensuring safe operation and eventual decommissioning. He also discussed the potential sites for new reactors and explained that the government's objective is to build 6-9 GWe of capacity based on large, proven pressurised water reactor (PWR) technology. He provided several key milestones for the programme including:

- Selection of technology Q4 2022.
- Application for construction licence 2024.
- Issuance of construction licence in 2025.
- Issuance of operating licence for first nuclear plant 2032.

Mr Jastrzębski pointed out that Poland is also considering deployment of a small modular reactor (SMR) and that NuScale and BWRX-300 are under consideration as well as a possible high-temperature reactor. He also described the PAA's key tasks under the Polish nuclear power programme, including strengthening the PAA's technical capability and expanding its capacity. Finally, Mr Jastrzębski explained that several institutes have received approval to provide technical support to the PAA (e.g. University of Warsaw, Institute of Nuclear Chemistry and Technology) and that several other applications are pending (e.g. IRSN).

In response to questions, Mr Jastrzębski clarified:

- In the context of the PAA's framework for SMRs, the term "General Opinion" refers to a process where the PAA performs a limited review of an SMR design to confirm that there are no major legal or regulatory hurdles that are likely to prevent eventual licensing and operation of the design in Poland. It is not equivalent to approval of the design.
- The PAA intends to co-operate with other regulators once a design is selected and will seek to leverage portions of the technical work that other regulators have already performed.
- The PAA can manage oversight of novel or advanced design, but some additional preparations might be necessary.

Next, Mr Paweł Smoliński gave a presentation about the Office of Technical Inspection (UDT), a state-owned company that provides certain technical support organisation (TSO) services to the PAA. He explained that the UTD is over 110 years old and employs

1 800 people that work in various technical safety fields. UTD is responsible for equipment that:

- is under pressure (e.g. tanks containing pressurised liquids or gases);
- contains potential energy or kinetic energy (e.g. cranes);
- could spread hazardous materials during operation, transport or storage.

He explained the legal and regulatory framework that defines the roles and responsibilities of the UDT and its relationship to the PAA.

Next, Ms Kirsi Maria Alm-lytz (IAEA) gave a presentation on IAEA activities related to regulatory inspections. First, she explained the purpose and relationship between various IAEA documents including safety fundamentals, general safety requirements, specific safety requirements, and safety guides and highlighted key information contained within that is relevant to inspection.

Next, she provided a summary of the *Handbook for Regulatory Inspectors of Nuclear Power Plants,* IAEA TECDOC-1867 (www.iaea.org/publications/13514), a handbook for inspectors that contains guidance especially for new inspectors. She explained that this TECDOC contains practical guidance in how to plan, prepare, conduct inspections, document results and evaluate safety significance. She stated that it is mainly for operating nuclear power plants but there are some general insights that can apply to other phases of reactor lifetime (e.g. guidance on planning would also be applicable to planning construction inspections). She also informed participants that the TECDOC is used as a reference during IAEA training courses.

Finally, she described the Zwentendorf Nuclear Power Plant, which is a non-operating plant in Austria. She explained that the plant had completed construction but was never operated. The site is now used for IAEA's two-week training workshop offered twice a year (one-week classroom + one week in the nuclear power plant). The target audience of the course is embarking countries.

In response to questions from the audience, Ms Alm-lytz offered the following clarifications:

- The most recent cohort consisted of about 25 students and the workshop was not open to all countries as the focus is on students from embarking countries. Slots in the course are available by invite only.
- The IAEA does not have immediate plans to open the course to a wider audience, but it might be possible in the future if additional funding is made available.

Closing presentation of topics

A closing presentation on each of the workshop topics was made by the topic leads. Each of them presented a set of commendable practices developed by the discussion groups. Each presentation was followed by general questions and comments from the audience.

CPs were extracted from the topics, which were discussed by the workshop participants and were viewed as references for member countries. These are neither international standards nor guidelines. Each country should determine its inspection practices on DI&C, considering its own historical, social and cultural backgrounds and the CPs can be useful references when a country seeks to improve its inspection practices on DI&C.

Closing remarks

The President of the PAA, Dr Łukasz Młynarkiewicz, provided closing remarks. First, he thanked all of the workshop participants including the NEA and PAA team members who

were instrumental in organising the workshop. He observed that the participation rate of 13 countries was impressive, especially given the challenging circumstances involving Russia's invasion of Ukraine. He stated that all three of the topics discussed during the workshop were relevant to the PAA and that he was pleased that the PAA was able to play an active role in the conference. He noted that the discussions he had observed throughout the day had been lively and energetic and that participants were still engaged and asking questions even later in the day. He observed that COVID-19 had certainly presented regulatory bodies with numerous challenges and that these challenges could be overcome.

Next, Dr Młynarkiewicz informed the participants that 2022 was the 40th anniversary of the PAA's creation and that current focus is on human capacity building. He noted that while the pace of Poland's nuclear power programme was slow at first, it was now proceeding at a very high speed and he stated that the PAA would need to grow quickly as well, in terms of human resources and budget. He described the PAA's commitment to fundamental safety principles and he stated that the PAA would be ready for an application once it was submitted. He wished the participants luck in their future endeavours.

Mr Leblanc added that the discussions on the workshop topics have shown three things:

- These workshops continue to provide a valuable occasion for participants to exchange information on current issues, to gain insights and to validate their own processes.
- The topics were well developed, and the participants were well prepared and made important contributions.
- The development of CPs and the development of new challenges to be faced were successful and participants and their national organisations should benefit from the insights gained.

In closing, Mr Leblanc thanked the participants for their contributions. He acknowledged and thanked those who had helped support the activity. In addition, he thanked Mr CJ Fong for his support as NEA Secretariat and Ms Carrie Richardson for her indispensable role in organising the logistical elements of the workshop, including managing the registration process.

In conclusion, Mr Leblanc thanked all the workshop participants, facilitators and recorders remarking that without their contributions, hard work, dedication and commitment the workshop would not have been a success.

2. Topic A: Inspection challenges related to nuclear power plant ageing management

2.1. Topic introduction

Ageing management is a relevant topic for many countries in the context of the long-term operation or lifetime extension programmes of their respective nuclear power plants. Additionally, many countries are experiencing effective knowledge transfer challenges due to the age profile of staff within the licensee, vendor and the regulatory bodies (RBs).

This workshop topic built on the results of the following previous workshops on inspection practices:

- NEA (1999), *Regulatory Inspection Activities Related to Older Operating NPPs Risk Evaluation and Licensee Resource Commitment, Proceedings from International Workshop Prague, Czechia, 8 to 11 June 1998*, OECD Publishing, Paris [NEA/CNRA/R(99)2], www.oecd-nea.org/jcms/pl_113956.
- NEA (2012), *Eleventh International Nuclear Regulatory Inspection Workshop on Experience from Inspection of Ageing and Equipment Qualification, Competency of Operators and Licensee's Oversight of Contractors, Workshop Proceedings, Hosted by ENSI, the Swiss Federal Nuclear Safety Inspectorate Baden, Switzerland 21 to 24 May 2012*, OECD Publishing, Paris [NEA/CNRA/R(2012)6], www.oecd-nea.org/jcms/pl_19202.

The objectives covered in this topic are technical and non-technical aspects related to ageing management that were either briefly covered or not considered in previous workshops. These aspects include inspection challenges related to:

- newly discovered ageing effects;
- decreasing safety margins due to ageing systems, structures and components (SSCs) that cannot be replaced;
- the ageing of civil structures and related components;
- concealed or inaccessible SSCs; and
- the obsolescence of knowledge.

It is worthy of note here that the European Nuclear Safety Regulator's Group (ENSREG) conducted a so-called Topical Peer Review in 2017 and 2018:

- ENSREG (1998), *ENSREG First Topical Peer Review Report "Ageing Management" Country Specific Findings, October 2018*, www.ensreg.eu/sites/default/files/attachments/hlg_p2018-37_161_1st_tpr_country_findings.pdf

The ENSREG First Topical Peer Review dealt mainly with the review of the licensee's ageing management provisions against international standards (in particular Western European Nuclear Regulators' Association [WENRA] Safety Reference Levels, IAEA Safety Standards), whereas the WGIP's 15th INRIW focused on the inspection practices of the RB in the field of ageing management.

2.2. Discussion group members

Group 1	Group 2
Stratmann Simone, Germany* (Topic lead)	Khan Mahtab, United Kingdom (Topic co-lead)
Dlouha Hana, Czechia	Glasbrenner Heike, Switzerland*
Kasagawa Yusuke, Japan*	Leso Niko, Finland
Mészáros István, Hungary*	Szymanski Paul, Canada
Van vliet Martijn, Netherlands	Kochmański Andrzej, Poland
Dulny Karol, Poland	Mińko Rafał, Poland
Giżowska Paulina, Poland	Domitr Paweł, Poland
Łuczak Anna, Poland	Teler Mateusz, Poland

*WGIP members

2.3. Pre-workshop questionnaire

To prepare the workshop, participants were invited to provide information relevant to their national inspection approaches. This information was captured utilising Questionnaire A provided in Annex B of this report.

2.4. Opening presentation

To provide the two discussion groups with a common basis for discussing the topic, Dr Simone Stratmann made a presentation summarising the responses that she had received to the pre-workshop questionnaire.

Eleven countries had provided responses to the pre-workshop questionnaire and a review of the answers provided the following observations:

- Typically, the RB's oversight on ageing management considers the licensee's activities from plant programmes that are ageing-related (e.g. maintenance or surveillance activities) and, where applicable, it considers the licensee's overall ageing management programme (e.g. considering the ageing management processes, organisation and responsibilities).
- The oversight methods of the RB typically include on-site inspections (e.g. plant-walkdowns, SSC-focused inspections, discussions/interviews with plant personnel) as well as desktop-reviews of ageing-related documents (e.g. ageing management reports or safety reports).
- Among the countries there are a variety of factors that trigger inspections on ageing management. For example, an inspection may be performed as a reactive activity in response to an ageing-related finding, it may be performed periodically as part of the RB's regular inspection programme, or it may be part of the RB's long-term operation review.
- Some countries responded that their RB involves internal or external experts for their inspection and review activities on ageing management. On special occasions,

some RBs even assign advisory committees for support on complex ageing management topics.

- As a broad source of information on newly discovered ageing effects, responses include: the licensee's event reporting and ageing management, the RB's inspections and document reviews, communication with industry and research organisations as well as with other RBs, the membership of international organisations (IAEA, NEA, EPRI, etc.), the monitoring of international operating experience exchange (e.g. IRS), research initiatives funded or performed by the RB, setup and upkeep of an RB knowledge base, and specific activities to follow the state of the art in science and technology.
- Regarding the issue of decreasing safety margins associated with SSCs that cannot (easily) be replaced, a typical response from the RB is as follows: The licensee has to present to the RB the concept of monitoring, testing, inspection and calculations to determine how long such SSCs will continue to deliver their function. If predefined acceptance criteria cannot be fulfilled, a specific safety assessment (e.g. more detailed modelling, seeking empirical data) must be performed to demonstrate that continued operation is justified because the SSCs still fulfil their safety function. Following this, the RB will assess this information in depth, which can include making independent calculations. If the in-depth assessment shows that safety functions are not compromised (or it is extremely unlikely that they are compromised), the RB might decide to tolerate a formal deviation from original quality requirements/acceptance criteria.
- In the light of staff turnover and evolution of regulatory requirements, the RBs seek assurance that the technical competence and experience of the licensee's personnel is maintained and kept up to date as necessary. Many countries have reported having baseline inspections on the technical qualification and training of the licensee's staff, with some countries reporting that this is restricted to key operating staff. One country responded that the RB inspects how the licensee manages the issue of competence and know-how of vendors and contractors, and another country responded that it may inspect suppliers directly. Several countries responded that they assess the adequacy and effectiveness of the licensee's human performance management/knowledge management in the framework of inspections, periodical safety reviews or long-term operation reviews. One country reported that the RB assesses and certifies training courses for the licensee's key operating staff.
- A few countries also responded to the question of how the RB ensures competence and know-how of its own personnel. These countries pointed out that the RB staff benefit from certain IAEA training/knowledge tools as well as from the participation in relevant national and international organisations.

2.5. Group discussion summary

The group discussions were carried out in two sub-groups and identified the following areas for in-depth discussion:

- General aspects of ageing management inspections
  - The group exchanged national experiences on how the licensee manages the effects of ageing, and which regulatory requirements specific to ageing management have to be applied. This was used as the basis for discussing RB's

approach to inspections relating to ageing management and review of the effectiveness of the approach adopted.

- It was noted that countries adopt different approaches to inspecting ageing management. Some countries have ageing management requirements for all phases of a nuclear power plant's lifetime, while others make an in-depth review at specific points in the life cycle of the facilities, such as a periodic safety review (e.g. every ten years), or a long-term operation assessment driven by lifetime extension applications. While the legal and licensing frameworks related to ageing management can differ from country to country, the group emphasised that for all RBs there is a common need to have regulatory requirements on ageing management clearly addressed in the respective regulatory frameworks. This provides a well-founded justification and a common ground for corresponding inspection activities. Furthermore, one group member reported that when revising the regulatory framework recently, the IAEA Specific Safety Guide No. SSG-48, *Ageing Management and Development of a Programme for Long-Term Operation of Nuclear Power Plants* (IAEA, 2018), had served as a valuable source of guidance.

This discussion led to the formulation of the potential CP 1.

- When discussing the oversight practices in the field of ageing management, two typical approaches were mentioned as being used by RBs to get a picture of the licensee's ageing management activities and their effectiveness: The RB can inspect the ageing status of selected SSCs, or it can inspect (elements of) the licensee's overall ageing management programme. The group called these two oversight approaches "SSC-based" and "programme-based" and concluded that it is most effective if the RB performs both types of oversight activities.

This discussion led to the formulation of the potential CP 2, which also contains examples for SSC-based and programme-based oversight activities.

- Newly discovered ageing effects, early signs of ageing, slowly evolving trends
  - The group discussed how the RB can facilitate the detection by inspectors of early signs of emerging new ageing effects or slowly evolving negative trends. In these discussions, participants discussed good experiences with teamwork of inspectors that are familiar with a specific site or nuclear power plant (in particular site or resident inspectors) and ageing management specialists. In some of the countries represented, the ageing management specialists are RB inspectors, while in other countries they come from the TSO or a research organisation that is closely collaborating with the RB. The methods of co-operation of the site inspectors and specialists included team inspections and discussions of inspection results (in person or online). Moreover, it was noted that the specialists' assessment of ageing-related issues could be a valuable input that should be considered when the overall inspection programme is developed for the next inspection period (which is typically done annually).

This discussion led to the formulation of the potential CP 3.

- The group discussed how the RB can follow up the development of the ageing status of SSCs to verify that it is adequately addressed by the licensee. Participants highlighted that to them it had proven to be valuable to be periodically informed in detail on the licensee's assessment of ageing phenomena. The examples sighted came from the field of mechanical ageing

effects such as low cycle fatigue, radiation embrittlement and corrosion issues. The group concluded that it would be a good oversight practice to review the licensee's corresponding ageing reports in depth, e.g. annually. The additional benefit of this approach is that the knowledge within the RB or its TSO is kept up to date with the complex issues that are involved. Good knowledge on ageing management issues then makes the RB capable of reacting in a timely and competent manner, if a major ageing problem occurs.

This discussion led to the formulation of the potential CP 4.

- Decreasing safety margins

  The group discussed the challenges that the licensee and RB face when there seems to be a safety margin reduction. Typically, the first thing is to clarify whether this is really the case, because the reduction of a parameter's safety margin may be an artefact of an overly conservative calculation, or a particular measurement method being used.

  From the group there were indications that time limited ageing analyses (TLAAs), i.e. that demonstrate that the analysed ageing effect will not adversely affect the capability of a structure or component to perform its intended safety function throughout an assumed period of operation (see "Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants" [IAEA, 2018]) can have overly conservative outcomes. In such cases, the period in question is already in the near future, and the licensee and the RB are under pressure with the necessary further evaluations, actions and assessments. The advice was that such analyses should be performed at an earlier stage of operation to mitigate this problem.

  This discussion led to the formulation of Observation 5. Its content is related to CP 4.

- Ageing of civil structures and related components

  The group discussed how the RB performs inspections and oversight activities concerning the ageing of civil structures in nuclear power plants. It was observed that in some countries, the strategy of inspection and oversight is different (usually less intense or less frequent) in comparison to mechanical or electrical components. The group concluded that especially in a situation with long-term operation it is important that the RB has established an adequate inspection and oversight strategy for civil structures.

  It was also observed that acceptance criteria of deviations in the characteristics of civil structures are not always as clear as for other systems and components. Additionally, the interface between the conventional regulatory framework and the nuclear framework for civil structures can be a challenge for the RB.

  This discussion led to the formulation of Observation 1, which also contains some examples that were considered relevant topics by the group.

- Concealed or inaccessible SSCs

  From the group there was experience that sometimes, when an ageing effect occurs after a long period of operation, the licensee does not always have historic information available that is necessary for the assessment of the ageing effect. Therefore, in the group's opinion, the licensee's data collection, record keeping and keeping of relevant material samples is an important topic.

This discussion led to the formulation of Observation 3.

- Ageing management considerations for new build of nuclear power plants

  The group discussion focused on the need to implement the learning from ageing-related issues into new reactor programmes that are either undergoing construction or are at an advanced design stage. Several participants represented countries that have some experience in reviewing the ageing-related programmes for civil structures. The group agreed that this approach would be equally valid for other SSCs. The key conclusion was that consideration, development and implementation of a fit for purpose ageing management strategy and plan at the design and construction stage would be of benefit. These approaches would allow the RBs to inspect the ageing management plans at the construction stage to influence any changes necessary. This approach would result in proactive consideration of ageing-related issues by the RBs and the licensees. Moreover, it would allow the regulatory body to inspect and gain assurance on the adequacy of implementation of ageing-related plans. Two countries noted that this would also act to prevent future anomalies, delays and events.

  This discussion resulted in the formulation of potential CP 5.

- Knowledge sharing of ageing-related matters within the RBs

  The group discussed the issue relating to the loss of critical regulatory knowledge and the potential for learning not being effectively promulgated between various technical disciplines for various reasons. These reasons include individually focused inspection plans and staff turnover. One RB representative shared the practice of the use of multidisciplinary internal working groups where technical knowledge associated with ageing management (and other areas) is actively shared and recorded. This affords the opportunity for cross-discipline collaboration on ageing-related issues, which in turn means that inspection plans are better joined up and duplication of regulatory effort is avoided as well as potentially missing more vital learning that could be applicable more broadly. One key advantage that was discussed related to effective coverage of interfacing issues between different SSCs, e.g. mechanical equipment installation to civil structures.

  This discussion resulted in the formulation of potential CP 6.

- Effective knowledge transfer within RBs and the licensees

  The group discussed how RBs and licensees ensure that knowledge transfer mechanisms are effective in supporting delivery of their respective mandates. The discussion was broader than just ageing-related issues as it covers all relevant technical areas supported both by the RBs and the licensees. Several examples were sighted by various representatives to support this area. These included operational experience programmes, effective succession planning of staff with RBs and the licensees. For the licensees, RBs can also inspect these arrangements. Other examples cited included where one RB undertakes self-assessments against relevant technical competencies that enable the identification of specific training, coaching and mentoring needs. Several other suggestions included inspection guides, checklists and handover guides/checklists for inspectors moving between roles with the RB.

  This discussion resulted in the formulation of CP 7.

- Obsolescence of knowledge
  - The group discussed how to deal with the obsolescence of knowledge of the RB and the licensee staff that occurs due to generational change during the relatively long operational cycle of nuclear power plants. It was noted that inspection and other oversight activities, which are closely related to the knowledge on the how and why of the design and the actual state of a nuclear power plant, are good opportunities to facilitate the RB's task of knowledge transfer. In particular, the oversight activities related to periodic safety review, and the assessments of long-term operation are useful to practice knowledge transfer, if they are performed by a team that is composed of newer and experienced staff.

    This discussion led to the formulation of the potential CP 8.
  - Furthermore, one member of the group presented an example of how the RB uses a digital web portal to provide knowledge and access to technical background information as well as to other documents of the management system. The group appreciated this example because it gives easy access to information, which is especially useful for new staff, and which can support a harmonised approach within the RB.

    This presentation led to the formulation of Observation 2.
  - From the group it was reported that there was good experience with "know-why" training courses that were held by licensee staff members with longstanding experience (sometimes even from the time of design or commissioning of the nuclear power plant). This was considered a valuable add-on to the usual "know-how" education and training on the nuclear power plant's systems and components.
  - In the discussion, the group developed the idea that the "know-why" aspect is also useful for the RB, because with the generational change of staff and also the reasons/aims for certain regulatory or licence requirements may get lost.

    This discussion led to the formulation of Observation 4.

Throughout the discussions, the exchange of experience and practices among participants was informative. The sub-groups met on a few occasions to discuss the results of each group. Generally, the sub-groups shared similar opinions, and the participants agreed with the results of each group.

2.6. Conclusions and closing presentation

The following potential CPs and observations emerged from discussions during the workshop. It is important to note that the potential CPs are based on workshop discussions and have not yet been approved by the CNRA. Nevertheless, they can be utilised as a general benchmark for basic comparisons of those issues shared with inspectors from participating countries.

Although the discussions in the two discussion sub-groups were different (reflecting the individual experiences of the participants and showing different emphasis of aspects of the workshop topic within the groups), both groups agreed on the potential CPs, as well as the justification for each, during a joint group meeting before the closing presentation given by Dr Stratmann and Mr Khan (see complete presentation in Annex C). The criteria for CPs are defined in the WGIP document "Guidance on Developing and Approving

Commendable Practices – Version 2" [NEA/SEN/NRA/WGIP(2021)4] (not publicly available).

The potential CPs from the discussions of group A are listed below; some sub-bullets provide guidance on how to implement the proposed CP or an explanation of its purpose.

Potential CP 1: *The RB should implement requirements concerning ageing management programmes for nuclear power plants in the regulatory framework.*

- If ageing management requirements are implemented in the regulatory framework, this enables the RB to demand their implementation, e.g. on the occasion of licensing, periodic safety reviews (PSR) or long-term operation (LTO) assessments (depending on the country's individual approach concerning the legal basis and the licensing basis).
- The IAEA Specific Safety Guide No. SSG-48 "Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants" (IAEA, 2018) can serve as a useful source for the development of a national framework.

This is a potential commendable practice because:

- An ageing management programme generally enhances the safety of the considered SSCs, because the degradation of SSCs and their safety functions can be prevented or mitigated (criterion 1).
- If the requirements on ageing management that apply during the different phases of a nuclear power plant's lifetime are clearly addressed in the regulatory framework, the RB's inspectors have a common ground for their oversight activities in the field of ageing management (criteria 2 and 4).
- The implementation of requirements on ageing management programmes in the regulatory framework (and consequently into the licensing basis, PSR, or LTO) has been adopted by several RBs (criterion 5).

Potential CP 2: *The regulatory body should perform both SSC-based and programme-based oversight activities on the licensee's ageing management (AM) programme.*

- Examples for SSC-based oversight activities are:
  - review and assessment of measurement results, e.g. indications in steam generator tubes;
  - review and assessment of ageing effect calculation results, e.g. the fatigue of a material, depending on the loads that affected the structure or component during its operating history;
  - witnessing on-site in-service inspections/functional testing of systems (e.g. testing of diesel generators) or reviewing reports on the results of such activities.
- Examples for programme-based oversight activities are:
  - review and assessment of the documents that describe the licensee's processes/approach from the ageing management programme (e.g. submitted for the approval of long-term operation);
  - on-site inspections of ageing management processes on the level of the management system (e.g. discussions with the licensee about roles,

procedures, responsibilities, co-operation of different parts of the organisation, outcome and improvement of the ageing management programme);

- inspections on the operating experience process of the licensee.

This is a potential commendable practice because:

- The combination of results of SSC-based and programme-based oversight activities can provide a good picture to the regulatory body of whether the AM processes and procedures are systematically implemented and whether they are effective, which means that the SSCs are in a good state with respect to their safety functions (criterion 1).
- The CP provides a common understanding for RBs because it shows the value of pursuing different approaches to ageing management oversight at the same time. In consequence, the combination of approaches also leads to a harmonisation of different inspection practices (criteria 2 and 4).
- The CP has been adopted by several RBs (criterion 5).

Potential CP 3: *SSC or ageing specialists (from the RB, TSO or research organisation) and site inspectors should closely co-operate to optimise the RB's capability to notice early signs of ageing or slowly evolving trends.*

- For example, a close co-operation could be achieved by
  - conducting team inspections with teams that include site inspectors and specialists;
  - discussing inspection results with each other frequently (e.g. using videoconferences between the site inspectors and headquarters);
  - using the combined specialists' and site inspectors' experience for the planning or improvement of the RB's next inspection programme.

This is a potential commendable practice because:

- The co-operation of site inspectors and specialists can improve safety, because inspectors who are familiar with a certain nuclear power plant and in close contact with the licensee might notice early that something is different from usual, whereas the specialists have more expertise to assess (independent from the licensee) whether a deviation or a trend that was noticed is safety-relevant (criterion 1).
- The close co-operation can improve the capability of the RB's insights about the nuclear power plant's ageing status and therefore make its work more effective (criterion 2).
- The examples for types of co-operation given above have been adopted by several RBs (criterion 5).

Potential CP 4: *The RB should make provisions to be periodically informed on the results of the licensee's evaluations of ageing phenomena that are safety-significant (i.e. also between PSR).*

- Licensees usually make predictions for safety-significant structures and components e.g. using a design load catalogue and using certain assumptions on environmental conditions. Then they periodically validate their predictions under consideration of the load cycles that occurred and measurement results at critical locations.

- Typical examples for ageing effects that are followed up closely are the cumulative usage factor (CUF) in low cycle fatigue, radiation embrittlement or corrosion issues.
- The reporting on the results could be done e.g. by sending yearly reports to the RB.

This is a potential commendable practice because:

- By following the licensee's results on the ageing status of safety-significant structures and components the RB improves its knowledge on potentially critical safety issues (criterion 1).
- The frequent review of the licensee's ageing management evaluations keeps the RB (and/or its TSO) up to date with the complex issues that are involved. In this way, in the case that major ageing problems occur, the RB is well prepared to review and assess the licensee's proposals to corrective actions in a timely and competent manner (criterion 2).
- There are several RBs that have imposed regular reporting requirements on the licensee either through the regulatory framework or by corresponding licence conditions (criterion 5).

Potential CP 5: *For new reactor build, the RB framework should ensure that ageing management is taken into account at the design and construction stage in the licensee's application/documentation.*

- Ensures that the basis/programme for ageing management (specifically design and construction) is suitable and sufficient for later operating phases of the facility.
- Ageing management approaches are embedded on a proactive basis to prevent unexpected events/anomalies/delays.
- RB should inspect to verify that ageing management practices have been implemented prior to construction. E.g. construction plans, outputs from testing activities, etc.
- See also Observation 3.

This is a potential commendable practice because:

- Proactive implementation of ageing management approaches will support the SSCs fulfilling their safety function/design feature throughout the design life and prevent erosion of the safety margin (criterion 1).
- Inclusion of the CP within the regulatory framework will facilitate a systematic and consistent approach to ageing management (criterion 2).
- This CP supports harmonisation of regulatory approaches (criterion 4).

Potential CP 6: *RB should establish multidisciplinary internal working group/knowledge sharing forum within their regulatory framework for ageing-related issues.*

- The forum should consider maintenance strategies, operational experience, anomalies/event reporting and other relevant findings. These requirements can also be incorporated within an existing forum, if one exists.
- Supports effective ageing management regulatory oversight processes.
- Helps identify any interfacing issues between different SSCs.
- RBs should consider the size, age and complexities of their nuclear facilities when implementing this CP.

This is a potential commendable practice because:

- It facilitates identification of ageing management-related risks and potential gaps in the licensee's arrangements/procedures (criterion 1).
- It ensures that the RBs oversight activities associated with ageing management are effective and comprehensive (criteria 1 and 2).
- It facilitates a consistent and well-informed regulatory oversight approach through improved knowledge retention and transfer (criteria 1, 2 and 4).

Potential CP 7: *RB should have processes in place to ensure the RB, as well as licensees, have effective knowledge transfer mechanisms to fulfil their mandates and core business requirements.*

- Operational experience programmes are a key component of knowledge management.
- Effective succession planning will support continuous organisational capability and capacity to deliver licencees' respective mandates.
- Participation in codes and standard committees and other relevant domestic and international platforms (including e.g. peer reviews, benchmarking) can promote the sharing of up-to-date knowledge and experience for RB and licensee staff.
- Self-assessments against relevant technical competencies can identify the required training and development needs for staff.
- Tools, including inspection guides and/or checklists, provide a knowledge transfer mechanism for requirements for RB inspectors.

This is a potential commendable practice because:

- Failure to maintain organisational memory could leave hazards unrevealed (criterion 1).
- More effective knowledge transfer results in competent staff and better safety outcomes (criterion 1 and 2).
- RB staff must have sufficient knowledge to identify deficiencies proactively and prevent undesired events (criterion 1 and 2).

Potential CP 8: *The RB (and/or TSO) should consider assigning oversight tasks that are related to PSR and LTO to teams that are composed of both newer staff and experienced staff to enhance the knowledge transfer between generations.*

This is a potential commendable practice because:

- For nuclear power plants that are operated during a long period, a successful knowledge transfer between generations is a safety-relevant issue (criterion 1).
- These oversight activities in the fields of PSR and LTO are closely related to knowledge on the how and why of the design and the actual state of the nuclear power plant; therefore, they can serve as good opportunities to facilitate the RB's task of knowledge transfer (criterion 2).

The observations from the discussions of group A are listed below.

Observation 1: It is observed that at least in some countries the strategy of the RB's supervision of the civil components is different (usually less intense or less frequent) from the supervision of mechanical or electrical components. Given that safety-relevant ageing

mechanisms can be present in civil structures, and that repairs are not always easy/feasible, it is important that the RB has established an adequate oversight strategy not only for mechanical and electrical components but also for civil structures (especially in an LTO situation). Some examples of relevant topics:

- settlement differences between different buildings (structures);
- concrete in high radiation environments;
- pre-stressed tendons in concrete containments;
- evaluation (comparison of test results with the structure model) of periodic leak-rate testing of concrete containments;
- acceptance criteria of deviations are not always clear;
- problems could be met at the interface between the conventional regulatory framework for civil structures (including design/evaluation codes) and the nuclear regulatory framework.

Observation 2: It was observed that a (larger) RB uses the method of a digital web portal to provide knowledge and access concerning technical background information as well as management system documents (e.g. inspection guides). This practice helps the RB's staff to have easy access to the same, relevant information, which is especially useful for new staff, and which can support the goal of a harmonised approach.

Observation 3: Several RBs have requirements in place that oblige the licensees to collect data and keep records related to

- design and manufacturing documentation;
- quality control documentation;
- plant operational records (commissioning and operation phase);
- qualification records;
- environmental records.

There should be a clear understanding about how long data are stored and how these data are maintained (as data storage systems change over the years).

Another important practice is the keeping of relevant material samples of new build or modified SSCs, as surveillance programmes can change over the years (e.g. passive components, electrical and instrumentation components and structure materials).

Observation 4: Given the longer lifetime of nuclear power plants, it was already noted that – both at the licensees and at the RBs – a change of generations is taking place. To maintain the competence of the organisations, it would be highly valuable if vendors and/or licensees documented the "know-why" aspects of important SSCs to make it available for newer licensee staff, and/or preserve this knowledge in another way (e.g. by so-called "know-why" training courses that are held by staff members with longstanding experience). This know-why aspect can also be of relevance to the RB, e.g. with respect to understanding the original idea/aim behind certain regulatory or licence requirements.

Observation 5: It is important for the RB to distinguish between real and seeming safety margin reductions, where the latter might be a result of a calculation being too conservative, a measurement not being well suited for the purpose, or a general lack of data in the beginning of an investigation. It can happen that a safety margin assessment (e.g. in the assessment of TLAAs) is based on preliminary assumptions of data that lead to a

conservative outcome. As a result, there might be a future period where additional calculation and/or material testing is necessary. It is helpful for the RB to make sure there is enough time between the assessment of TLAAs and the period for which this evaluation is done, so that it is possible to thoroughly discuss further evaluations or other actions.

3. Topic B: Graded approach to optimise the inspection process

3.1. Topic introduction

The inspection programme of a regulatory body has to include all types of nuclear facilities and all of their operation areas, but the focus should be on those with high safety importance, high associated risk or degraded performance.

Based on deviations, non-compliances or violations found during inspections, remedial or enforcement actions should be required by the inspector or regulatory body to ensure safe operation in accordance with licences, legislation and best practices. Actions required should be linked to the significance of the inspection finding.

The above are important characteristics of an effective inspection process. A continuous optimisation of the inspection programme should be in place to achieve it, taking into account graded approach principles.

The purpose of the workshop was to share information about methods, practices, organisational perspectives, and criteria used to apply a graded approach (GA) to optimise the inspection process and to identify commendable practices that member countries can use to improve the efficiency and/or effectiveness of their inspection process.

3.2. Discussion group members

Group 3	Group 4
Sebastjan Šavli, Slovenia* (Topic lead)	Miroslav Jakes, Czechia* (Topic co-lead)
Kirsi Alm-lytz, IAEA	Carol Chan, Canada
Yves Guannel, France*	Burkhard Lensing, Germany
Theo Neuffer, Germany	Essi Vanhanen, Finland
Tatsuki Watanabe, Japan	Sebastian Kozikowski, Poland*
Marek Jastrzębski, Poland*	Mateusz Włostowski, Poland
Paweł Smoliński, Poland	Kamila Machnicka, Poland
Tadeusz Dziubiak, Poland	

*WGIP members

3.3. Pre-workshop questionnaire

For the preparation of the workshop, participants were invited to supply their national inspection approaches used according to Questionnaire B, provided in Annex B of this report.

3.4. Opening presentation

To provide the two discussion groups with a common basis for discussing the topic, Mr Šavli made a presentation summarising the different responses that he had received to the pre-workshop questionnaire.

Twelve countries provided responses to the pre-workshop questionnaire. The review of the answers provided the following observations:

RBs in almost all countries use the graded approach (GA) principles to develop their initial inspection programme, which depends on the classification of the nuclear facilities, based on hazard.

Most countries have a well-developed inspection programme for the operation stage of nuclear facilities while there is less experience for other life cycle stages (permanent shutdown, decommissioning, design, construction, commissioning).

All RBs evaluate inspection findings, but some of them for that purpose apply clear GA elements to define the significance of inspection findings for further optimisation of the process or to define corrective actions.

All RBs perform periodic reviews of the effectiveness and efficiency of their inspection process within their management system or by internal or external audits. Some of them have in place a continuous optimisation process, based on GA indicators.

3.5. Group discussion summary

The group discussions were carried out in two sub-groups and identified the following areas for in-depth discussion:

- Two sub-groups use the same criteria for commendable practices. They are: the practices' safety significance, whether they facilitate the work of RBs, their adoption by several RBs, their innovative character, their relevance as tools to harmonise/improve inspection practices and whether they facilitate the work of RBs.
- Two sub-groups use the same sub-group roundtable questions to minimise significant deviation from the topic.
- The essential discussion topic was the determination of quantitative and qualitative criteria for the selection of safety-relevant components and licensee processes in the initial inspection programme and additional criteria for optimisation of inspection programme.
- In two areas, i.e. software inspection plans and configuration management, one group discussed high-level concepts while the other focused more on practical situations. For example, one group focused on a risk-informed inspection plan; the other group focused on attributes in the inspection plan.
- Emphasis was also placed on the specifics of the inspection programmes and the application of GA during permanent shutdown, decommissioning, design, construction, and commissioning of a nuclear facility.

Throughout the discussions, the exchange of experience and practices among participants was informative. The sub-groups met on a few occasions to discuss the results of each group. Generally, the sub-groups shared similar opinions, and the participants agreed with the results of each group.

The section below and the closing presentation outline the identified potential commendable practices, together with their justifications and methods of implementation. Some important conclusions from the discussions are not recorded in the form of commendable practices. These conclusions are stated as observations.

3.6. Conclusions and closing presentation

The following CPs emerged from discussions during the workshop. It is important to note that these CPs are based on workshop discussions and have not yet been approved by the CNRA. Nevertheless, they can be utilised as a general benchmark for basic comparisons of those issues shared with inspectors from participating countries.

Although the discussions in the two sub-groups were different (reflecting the individual experiences of the participants and showing different emphasis of aspects of the workshop topic within the groups), both groups agreed on the CPs, as well as the justification for each, during a joint group meeting before the closing presentation given by Mr Šavli.

Below are listed CPs regarding the application of GA in optimisation of the inspection process.

Potential CP 9: *RB should establish an initial inspection programme (IP) based on GA principles to be focused on safety important SSCs and processes.*

- Qualitative or quantitative criteria can be used.
- For SSCs a safety and quality classification, derived from design basis, can be used.
- PSA results are taken into account.
- Processes that are not entirely related to plant design (e.g. management system, CAP, ageing management, modification management, safety culture) are assessed according to qualitative requirements, like expert judgement.

This is a potential commendable practice because:

- It ensures that an IP is focused on safety-relevant SSCs/processes (criterion 1).
- It optimises resources used for inspection activities (criterion 2).
- It meets criteria 4 and 5 (tool to harmonise/improve inspection practices; has been adopted by several RBs).

Potential CP 10: *RB should have in place a process for continuous optimisation of inspection programme, based on GA indicators, for example:*

- operational performance of nuclear facilities (KPI: unplanned shutdowns, TS violations, past inspection findings, reportable events, etc.);
- plant status (operation, permanent shutdown, decommissioning, plant age/AMP outputs, etc.);
- operating experience;
- research and development;
- first-of-kind activities (commissioning of new technology, organisation);
- self-assessment done by RB;
- licensee feedback regarding RB inspection.

This is a potential commendable practice because:

- it facilitates the timely consideration of safety-relevant issues in IP (criterion 1);
- it provides continuous optimisation of IP (criterion 2);
- it ensures that the IP is performance-based (meets criterion 3, innovative character);

- it meets criteria 4 and 5 (tool to harmonise/improve inspection practices; has been adopted by several RBs).

Potential CP 11: *RB should establish criteria for assessment and ranking of inspection findings taking into account GA principles*:

- availability of SSCs;
- degradation of safety functions;
- PSA results;
- impact on environment and/or personnel;
- violations of legislation, TS, etc.;
- repetitive findings;
- consideration of expert judgement.

This is a potential commendable practice because:

- It can be used for further planning of RB activities or require corrective actions, based on the importance of inspection findings (criterion 1).
- It can be used for further optimisation of the inspection programme (criterion 2).
- It meets criterion 5 (adopted by several RBs).

The observations from the discussions of group B are listed below.

Observation 6: During decommissioning it becomes more difficult for the RB to inspect dose-relevant activities, since those are planned in the short term by the operator. Hence the RB needs regular updates from the operator on the ongoing activities. In general, inspection-days are reduced for facilities in decommissioning.

Observation 7: During the design/construction/commissioning life cycle stages the inspection activities should be focused on specific activities related to different phases of those stages. Hold points and witness points should be determined to ensure that safety requirements are met.

Observation 8: RB should develop inspection programmes based on the categorisation of nuclear facilities taking into account GA principles (e.g. nuclear power plant, research reactor, waste storage).

Observation 9: Usage of GA principles should be part of the RB management system/inspectors' training programme. The following methods for training could be used:

- RB workshop discussing real examples;
- peer discussions;
- international workshops and expert exchange;
- part of initial inspector training (qualification of new inspectors).

4. Topic C: Effect of COVID-19 pandemic on inspection programmes and practices

4.1. Topic introduction

During the COVID-19 pandemic, the world faced an unprecedented global crisis. Regulatory bodies were faced with the challenge of developing comprehensive plans and actions to balance the importance of nuclear safety oversight with protecting public health, the health and safety of inspectors as well as nuclear power plant personnel.

The purpose of the workshop was to share information about methods, practices, organisational perspectives, and criteria used to adapt the inspection processes during the COVID-19 pandemic, and to identify commendable practices that member countries can use to improve the efficiency and/or effectiveness of their inspection processes both in emergent and routine practices in both the short and long term.

4.2. Discussion group members

Group 5	Group 6
Thomas Hipschman, United States* (Topic lead)	Gideon York, United Kingdom* (Topic Co-lead)
Kimberly Hazelton, Canada*	Eugene Guthrie, United States
Kazuko Sato, Japan*	Konrad Zasada, Poland
Wioletta Borzym, Poland	Piotr Leśny, Poland
Barbara Zielińska, Poland	Artur Szewczyk, Poland
Marcin Dąbrowski, Poland	Ernest Staroń, Poland
Kamila Greczyło, Poland	Agnieszka Jaworska-Sobczak, Poland
Maciej Lemiesz, Poland	

*WGIP members

4.3. Pre-workshop questionnaire

For preparation of the workshop, participants were invited to supply their national inspection approaches used according to Questionnaire C, provided in Annex B of this report.

4.4. Opening presentation

To provide the discussion group with a common basis for discussing the topic, Mr Hipschman made a presentation summarising the different responses that he had received to the pre-workshop questionnaire.

Nine countries provided responses to the pre-workshop questionnaire. Review of the answers provided the following observations:

- Seventy-eight percent of RBs reported utilising remote inspections. They reported that the remote inspections were performed on a risk-informed basis, took longer to complete and required more effort by inspectors.

- Several RBs reported that some waivers and/or derogations were granted, particularly in the areas of personnel qualification, full-scope emergency exercises and construction inspections at the manufacturer's premises.
- Training of staff was modified during the pandemic. Courses were offered virtually and had the greatest impact on new inspectors.
- Several RBs reported they performed increased oversight of control room minimum staffing requirements due to licensees increasing the length of time of operator shifts.

4.5. Group discussion summary

The group discussions were carried out in one combined group due to the numbers and experience of the participants. The group identified the following areas for in-depth discussion:

- Criteria for performing, deferring, modifying or cancelling an inspection during emergent events such as pandemics or when site access may become limited.
- Impact on training, qualification, knowledge management and onboarding of staff due to remote work.
- The performance of remote or hybrid inspections.
- Adoption of new technology and changes in the use of existing technology.
- Verification of safe operations during emergent events where access to a site may become constrained (e.g. pandemic, external hazard, or regional/national emergency).
- The specifics of the inspection programmes and application of GA during permanent shutdown, decommissioning, design, construction and commissioning of a nuclear facility.

In the section below and in the closing presentation, the discussion group Topic Leads identified potential commendable practices, together with their justification and methods of implementation.

4.6. Conclusions and closing presentation

The following potential CPs emerged from discussions during the workshop. It is important to note that these potential CPs are based on workshop discussions and have not yet been approved by the CNRA. Nevertheless, they can be utilised as a general benchmark for basic comparisons of those issues shared with inspectors from participating countries.

Below are listed CPs regarding the effect of the COVID-19 pandemic on inspection programmes and practices.

Potential CP 12: *The RB should have criteria to determine whether an inspection should be performed, deferred, modified or cancelled during emergent events where access to site may become constrained (e.g. pandemic, external hazard, or regional/national emergency).*

Items for consideration include:

- the risk significance of the inspection area;
- whether alternative means of performing the inspection exist;
- the frequency of planned inspections against the inspection area;
- whether the inspection scope can be modified while continuing to meet the inspection objectives;
- whether the inspection is planned, or in response to an abnormal condition;
- the impact that performing the inspection has on the RB resource load and capacity;
- the impact that performing the inspection has on the licensees' operations;
- the impact of removing the inspection on the RB's ability to assess the licensees' performance;
- whether the RB can ensure the protection of inspectors, licensee staff and the public;
- the RB's knowledge of licensee performance, specifically in relation to safe operations and meeting regulatory or licence conditions;
- consideration of the existing rationale or basis for performing the inspection.

This is a potential commendable practice because:

- It is safety significant for RBs to have a comprehensive plan and inspection programme to ensure nuclear safety oversight while protecting public health, the health and safety of inspectors as well as the nuclear power plant personnel (criterion 1).
- Having criteria on whether to perform an inspection during a pandemic or period of limited site access provides consistency, credibility and transparency as to whether an inspection should be performed, deferred, modified or cancelled during emergent events such as pandemics or when site access may become limited (criterion 2).
- It provides RBs with a process to determine which inspections should be performed during emergent events where access to a site may become constrained (e.g. pandemic, external hazard, or regional/national emergency). Having a process to determine whether an inspection should still be performed is a new practice that emerged from the pandemic (criterion 3).
- Several RBs have developed formal or informal processes to determine whether inspections should be performed (criterion 5).

Potential CP 13: *During emergent events where access to the site may become constrained (e.g. pandemic, external hazard, or regional/national emergency) the RB should have the means to ensure the training, qualification and competence of the inspectors that perform safety-significant inspections at nuclear power plants.*

Items for consideration:

- Some types of training are suitable for online and remote training, but the ability to learn and comprehend the training may be limited by the method of delivery.

- The future impact of remote training, in terms of the retention of information and the resultant inspectors' expertise, is not yet known.
- Remote training can be more efficient and flexible in terms of delivery and is often undertaken at a lower cost.
- Remote training can be performed at a suitable time for the staff involved and allows for customisation using focused interactions with the instructor.
- Consider changing the formal qualification process to account for short-term impacts on both working practices and access to technology.
- Knowledge management is an important part of bringing on new staff and maintaining the proficiency of the inspection staff, and specific thought should be given to the most effective means by which this is delivered.
- Mentoring, coaching, pairing of inspection staff, and objective evaluation of inspection staff are important aspects of ensuring that inspection activities have a positive impact on safety.
- Non-technical regulatory skills (judgement, team management, delivery of team and licensee interactions) are important to the success of inspections and may be more difficult to train in a virtual environment.

This is a potential commendable practice because:

- During emergent events such as pandemics, having a knowledgeable, trained and qualified team of inspection staff within the RB will ensure the continuity of their important oversight roles so that safety-significant issues are appropriately identified and corrected (criterion 1).
- Particularly during times of a pandemic, continuing training, qualification and knowledge management of the inspection staff is essential to an RB performing its regulatory duties (criterion 2).
- While the conduct of training in person, and the use of mentors, peers and management visits is preferred, the adoption of remote or online training provided a flexible and innovative method of performing training (criterion 3).
- Having a strong training, qualification and knowledge management programme is relevant to improving inspection practices and has been adopted by several RBs. (criterion 5).

Potential CP 14: *During emergent events where access to a site may become constrained (e.g. pandemic, external hazard, or regional/national emergency) RBs should consider adopting the use of new technology or changing the use of existing technology to ensure the continuity of their oversight roles while performing remote or hybrid inspections.*

Items for consideration:

- The increased use of new technology for communication and co-ordination of activities was reported extensively and universally by RBs.
- Expanded use of existing communication technology was reported by all RBs.
- RBs were increasingly aware of the need to consider the impact of cybersecurity when using communication technology.
- The use of electronic documentation and certification was greatly expanded.

- Many RBs accelerated the electronic sharing of data.
- On occasion, RBs experienced incompatibility of devices and applications, which was a temporary barrier or required a workaround.
- Many RBs accelerated plans to deliver increased use of electronics and computer applications.
- Emergency Management Response was enhanced using digital connectivity. First responders were better supported, in terms of information accessibility, and provided needed flexibility when deploying.
- Many RBs with licensee co-operation expanded the use of cameras and video and made them remotely accessible to their inspection staff.
- Many RBs experienced challenges in the use of video, including bandwidth connectivity or security concerns.
- Most RBs received greater volumes of data, including increased access to licensee data and real-time operating parameters.
- RBs had to consider the financial impact of increased adoption of technology.

This is a potential commendable practice because:

- During emergent events where access to sites may become constrained (e.g. pandemic, external hazard, or regional/national emergency), the adoption and increased use of technology allowed the RBs to effectively continue their safety oversight role remotely (criterion 1).
- During emergent events where access to sites may become constrained (e.g. pandemic, external hazard, or regional/national emergency), the adoption and increased use of technology facilitated the RBs' remote inspections (criterion 2).
- During emergent events where access to sites may become constrained (e.g. pandemic, external hazard, or regional/national emergency), many RBs adopted the use of innovative technology (e.g. cameras and data sharing) (criteria 3 and 5).

Potential CP 15: *During emergent events where access to sites may become constrained (e.g. pandemic, external hazard, or regional/national emergency), RBs should ensure that inspections achieve an appropriate balance between remote and on-site inspection delivery, thus ensuring that each inspection is conducted in as efficient and effective a manner as possible. In planning each inspection, the RB should consider the relative impacts of remote and on-site inspection.*

- The positive impact of site-based inspections is recognised by RBs, as the information obtained through on-site presence is generally of greater quality.
- While it is recognised that on-site inspection is preferred, the use of remote or hybrid inspection can enhance an RB's inspection efforts.
- Situational awareness is enhanced through on-site presence. Wider site situational awareness, including performance of the licensee and condition of plant, is not available to the RB during the remote element of an inspection. This should be a consideration when deciding on the extent to which remote inspection is included in planning.

- RBs used remote interactions with the licensee for inspection planning, scoping and to focus on documentation reviews, while utilising on-site inspections for key elements of information capture in support of regulatory judgements.
- The balance between remote and on-site inspections can be informed by the extent of confidence and trust the RB has in the licensee.
- There is a benefit to remote inspection, as it delivers resource management efficiencies for the RB and has a potentially reduced impact on the licensee's operations during the inspection.
- The need to manage information safely (physical and cyber security) is a consideration when determining the degree to which inspection activities can be conducted remotely.
- Allowing RB staff to support inspections remotely can have a positive impact on the ability to access specialist support for that inspection.
- The RB should plan the remote and on-site elements of an inspection so that these elements inform and support each other.
- Including a remote element within the delivery of an inspection can lead to that inspection taking significantly longer to deliver.

This is a potential commendable practice because:

- A failure to deliver inspections effectively could lead to a failure on the part of the RB to identify areas of non-compliance. Failing to identify non-compliance could result in the issue not being resolved by the licensee in a timely manner. Failure on the part of the licensee to act in a timely manner could lead to a potentially safety-significant situation (criterion 1).
- Optimising the approach to delivery of inspections, using remote and/or on-site techniques where appropriate, will support the work of the RB by improving both its efficiency and its effectiveness (criterion 2).
- Considering the use of remote inspection techniques is an innovative approach to the delivery of regulatory inspections (criterion 3).
- A significant number of RBs have delivered planned inspections through a combination of remote and on-site inspection techniques, an approach stimulated by the COVID-19 global health emergency (GHE) (criterion 5).

Potential CP 16: *The RB should ensure that, during emergent events where access to sites may become constrained (e.g. pandemic, external hazard, or regional/national emergency), consideration is given to how they would retain confidence in the safe operation of activities at that site. In planning the approach taken, the RB should consider what aspects of those activities have greatest safety implication.*

- The availability of sufficient qualified licensee staff is critical to safe operations, and the RB should confirm that the licensee has ensured that they can support safety-critical tasks with sufficient resource, and that there is adequate resilience to the provision of such resource.
- The RB should consider if the regular, frequent and proactive provision of safety-related information from the licensee to the RB can help ensure that the RB retains confidence that the licensee is controlling operations safely at the site.

- The RB should consider the benefit of asking the licensee to consider how they would continue to ensure safe operations should the situation worsen in any significant aspect.
- The RB should consider placing a priority on those aspects of licensee operation that will have an immediate impact on safe operations (conservative decision making, adequate supervision and oversight, and effective situational awareness on site), and thereafter considering those aspects that are likely to change at a slower rate (plant condition, procedural adequacy).
- In evaluating the safe operations at a site, the RB should consider the robustness of the internal and external event reporting culture of the licensee, as well as the scope and intent of mandatory reporting to the RB.
- The RB should identify any opportunities for observation of the licensee's activities, as opposed to specific and direct inspection or intervention.
- The RB should consider what waivers and derogations have been applied by the licensee, and if any safety-related limits and conditions have been modified because of the scenario.
- The RB should consider all potential sources of relevant information, as the RB's confidence that the licensee is operating safely will increase with an increase in the range of evidence and in the diversity of sources from which that evidence comes.
- The RB should recognise the context within which the licensee is temporarily operating and seek to take account of this when setting their expectations for the verification of safe operations.
- The RB should take account of any existing structured process that the licensee has in respect of managing waivers, derogations and changes in the safety-related operating limits and conditions on site.
- The RB should consider the potential wider supply chain impacts on the licensee resulting from the scenario and ensure that the licensee has taken account of any latent impacts that are not immediately evident.

This is a potential commendable practice because:

- The RB must be able to independently verify that the licensee can operate safely during any scenario where access to a site is significantly constrained (e.g. pandemic, external hazard, or regional/national emergency) (criterion 1).
- Confirming that a licensee can operate safely is a central purpose of all RB, and this information supports RBs in their determination of how best to achieve that during any scenario where access to a site is significantly constrained (e.g. pandemic, external hazard, or regional/national emergency) (criterion 2).
- Several RB have recently undertaken targeted activities to confirm that licensees were able to operate safely during a scenario where access to a site was significantly constrained (criterion 5).

The observations from the discussions of group C are listed below.

Observation 10: RBs should consider that lessons are still being learnt from the pandemic experience, and they may be new opportunities to enhance their organisations during routine and emergent conditions.

5. General workshop conclusions

Overall discussions between the participants both in group sessions and throughout the workshop were extensive. Participants exchanged ideas and practices regarding regulatory inspection activities on challenges related to nuclear power plant ageing management, a graded approach to optimising the inspection process, and the effects of the COVID-19 pandemic on inspection programmes and practices. These ideas can be expected to provide improved expertise when applied.

The WGIP members agreed that: "The workshops held by the NEA Working Groups continue to provide a unique opportunity for participants and inspection managers of nuclear power plants to meet and share and exchange information."

The previous chapters include the conclusions and CPs that evolved from the various group discussions. CPs are extracts from the topics that were discussed by the workshop participants and were thought to be references for member countries. These are neither international standards nor guidelines, but potentially useful references when a country seeks to improve its inspection practices. Each country should determine its own inspection practices while considering its historical, social and cultural backgrounds.

In finalising the CPs, the WGIP met in November 2022 to review and update the CPs. Annex C provides the updated CPs that were submitted to the CNRA for review in December 2022.

Reference

IAEA (2018), "Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants", IAEA Specific Safety Guide No. SSG-48, www.iaea.org/publications/12240.

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Annex B: Questionnaires

Questionnaire A:

Inspection challenges related to nuclear power plant ageing management

COUNTRY: ……

NOTES

Only one response per country is required. If more than one person from your country is participating, please co-ordinate the responses accordingly.

Submittals should be sent by e-mail to the NEA Secretariat by 5 November 2021.

FOREWORD

Ageing management is relevant for many countries because of the long-term operation and/or lifetime extension of their nuclear power plants. Additionally, in many countries, a change of staff (licensee/vendor/RB) due to many retirements is ongoing.

This task builds on results of previous workshops on inspection practices:

- Czechia (1998): Regulatory inspection activities related to older operating NPPs. [NEA/CNRA/R(99)2]
- Switzerland (2012): Experience from inspection of ageing and equipment qualification, competency of operators. [NEA/CNRA/R(2012)6]

The objectives of the upcoming workshop's ageing management topic are some technical and non-technical aspects, that were either briefly covered or not covered previously, and that are worth further consideration. These aspects include inspection challenges related to:

- newly discovered ageing effects;
- decreasing safety margins due to ageing SSCs that cannot be replaced;
- the ageing of civil structures and related components;
- concealed or inaccessible SSCs; and
- the obsolescence of knowledge.

It should also be mentioned that the European Nuclear Safety Regulator's Group (ENSREG) conducted a so-called Topical Peer Review in 2017 and 2018:

- ENSREG 1st Topical Peer Review Report "Ageing Management", October 2018 www.ensreg.eu/eu-topical-peer-review

This activity dealt mainly with the review of the licensee's ageing management provisions against international standards (WENRA Safety Reference Levels, IAEA Safety Standards), whereas the upcoming workshop focuses on the inspection practices in the field of ageing management.

The following questionnaire aims at an understanding of the national inspection practices and the related more general settings.

QUESTIONNAIRE

Note: For the following set of questions, the term "systems, structures and components (SSCs)" always refers to items important to safety in the sense of the IAEA Safety Glossary (2018 Edition). The term "ageing" refers to physical ageing, i.e. the process in which the physical characteristics of SSCs gradually deteriorate with time or use owing to physical degradation or chemical or biological processes.

1. GENERAL ASPECTS OF AGEING MANAGEMENT INSPECTIONS

1.1 Please describe briefly your licensees' approach to manage the effects of ageing of SSCs (i.e. activities related to the understanding, prevention, detection, monitoring and mitigation of ageing effects on the SSCs). Do your licensees have an ageing management programme in place that systematically co-ordinates existing individual programmes such as engineering, maintenance, surveillance, equipment qualification, in-service inspection, safety analysis or other relevant plant programmes? If yes, please give a brief description.

1.2 Does your regulatory framework contain requirements, guidance or compliance criteria related to the RB's inspections of ageing management? If yes, please give a brief description.

1.3 How does your RB verify that the licensee's ageing management activities are in compliance with the regulatory requirements and licence conditions (e.g. by on-site inspections, review of ageing management reports, approval of ageing management programmes)? Please describe briefly the most relevant activities (e.g. frequency, scope and methods of on-site inspections), and if internal or external specialists are involved.

1.4 Does your RB verify that the licensee's ageing management procedures are systematically implemented in the licensee's management system? If yes, please give some details what is being checked (e.g. the organisational entity that is responsible/accountable for the ageing management programme, the allocation of resources, the organisation of interdisciplinary co-operation within the management system) and the methods used for verifications (e.g. review of documents, interviews).

1.5 How does your RB verify the effectiveness of the licensee's ageing management programme (e.g. inspections, review of licensee's reports and performance indicators, by your RB's own safety evaluations/safety performance indicators)?

2. NEWLY DISCOVERED AGEING EFFECTS

2.1 If a new ageing effect is discovered (e.g. through feedback of operation experience or research), how is this taken into account by the licensee?

2.2 How does your RB learn about new ageing effects, and how does the RB verify that they are addressed adequately by the licensee?

2.3 How does your RB ensure that its inspectors do not overlook early signs of emerging new ageing effects or slowly evolving negative trends (e.g. specific training of inspectors, help from RB specialists, hiring of technical experts)?

3. DECREASING SAFETY MARGINS DUE TO AGEING OF SSCs THAT CANNOT BE REPLACED

3.1 How does your RB address the issue of decreasing safety margins associated with SSCs that cannot be replaced in relation to continued operation?

3.2 What is the role of your RB inspectors in verifying that the safety margins of such SSCs are still sufficient?

4. AGEING OF CIVIL STRUCTURES AND RELATED COMPONENTS

4.1 Do the ageing management activities of the licensee and the inspection activities of the RB include the ageing of civil structures and related components important to safety (e.g. buildings, concrete structures, structural anchorages, fire barriers such as walls/doors/dampers)? If yes, please give a brief description.

4.2 How does your RB inspect the ageing management of civil structures and related components? Does your RB employ or hire internal or external specialists in this field?

4.3 Has your RB established acceptance criteria for the ageing of civil structures and related components? If yes, please give some examples and describe how your RB inspects this.

4.4 How does your RB consider the ageing of civil structures that are not classified as important to safety by the licensee, but that could have a negative impact on SSCs important to safety in case of failure (e.g. water leakage from the degradation of buildings onto electrical panels)? Please give examples, if applicable.

5. CONCEALED OR INACCESSIBLE SSCs

5.1 How does your RB verify that concealed or inaccessible SSCs (e.g. pipework, cables, concrete structures and related components) are adequately taken into account by the licensee's management programme (e.g. specific inspection/maintenance techniques, adequate sampling of SSCs that are hard to reach, consideration of specific environmental conditions)?

5.2 How does your RB verify that the licensee has an adequate understanding of the location and configuration of concealed or inaccessible SSCs (original drawings, original plant information, lifetime records, etc.)?

6. OBSOLESCENCE OF KNOWLEDGE

6.1 How does your RB verify/ensure that the competence and know-how of the personnel of the licensee/vendor/contractor or the RB itself is maintained and kept up to date, in particular in view of change in staff or in view of the evolution of requirements, codes and standards (e.g. knowledge management, human resources plan)?

7. Are there any other specific topics you would like to discuss at the workshop?

Questionnaire B:

Graded approach to optimise the inspection process

COUNTRY: ……

NOTES

Only one response per country is required. If more than one person from your country is participating, please co-ordinate the responses accordingly.

Submittals should be sent by e-mail to the NEA Secretariat by 5 November 2021.

FOREWORD

The inspection process (conduct of inspection, evaluation of findings, requesting of corrective actions, enforcement actions, etc.) of a regulatory body (RB) has to cover all the functional areas (operation, maintenance, quality assurance, etc.) of nuclear power plants. However, one method to improve the effectiveness of the inspection process and its associated activities is to grade the areas inspected in accordance with different criteria (e.g. safety importance, operating experience, age of systems, structures and components, plant specific features, deterministic and probabilistic safety analysis) with the purpose to focus on safety-significant areas.

The purpose of the workshop is to share information about methods, practices, organisational perspectives and criteria used to apply a graded approach (GA) to optimise the inspection process and to identify commendable practices that member countries can use to improve the efficiency and/or effectiveness of their inspection process.

QUESTIONNAIRE

For the preparation of the workshop, participants are invited to supply their national inspection approaches used according to the following questionnaire:

1. Is a GA incorporated into legislative documents or regulations?
   - If yes, describe how.

2. Does your RB take into account a GA in its inspection programme for nuclear facilities? If yes, describe how by answering the following questions:
   - Is a GA used in the initial development of the inspection programme? If yes, what elements of a GA are applied (e.g. probabilistic/deterministic approach, operation experience, ageing)?
   - How is a GA taken into account when inspecting different nuclear facilities (nuclear power plants, research reactors, spent fuel storage facilities, fuel fabrication facilities, etc.)?
   - Describe how a GA is used for defining specific inspection programmes in different stages of the nuclear power plant life cycle that are inspected by your RB (i.e. siting, design, construction, commissioning, operation, and decommissioning)?
   - Describe how a GA is used to select inspection topics (systems, structures and components or activity to inspect), scopes, frequencies, types of inspections, etc.?

3. Does your RB have procedures to use a GA in different phases of the inspection process [e.g. planning (e.g. resources, scope, duration, methods, etc.), preparation, conduction, evaluation of findings]?
   - If yes, list the phases for which a GA is used and describe how.

4. Does your RB use a GA to conduct unplanned, unannounced and reactive inspections?
   - If yes, describe how.

5. Does your RB use a GA for the following areas:
   - significance of inspection findings;
   - assessment of licensee corrective actions; and
   - applying enforcement?
   - If yes, describe how.

6. Please describe other aspects of the inspection process not mentioned in the previous questions where your RB uses a GA.

7. Does your RB have a process in place to evaluate and optimise the existing inspection process and practices based on a GA?
   - If yes, describe this process.
   - Provide some examples.

8. Are there any other specific topics you would like to discuss at the workshop?

QUESTIONNAIRE C:

The effects of COVID-19 pandemic on inspection programmes and practices

COUNTRY: ……

NOTES

Only one response per country is required. If more than one person from your country is participating, please co-ordinate the responses accordingly.

Submittals should be sent by e-mail to the NEA Secretariat by 5 November 2021.

FOREWORD

During the COVID-19 Pandemic, the world faced an unprecedented global crisis. Regulatory Bodies were challenged to develop comprehensive plans and actions to balance the importance of nuclear safety oversight while protecting the public health, the health and safety of inspectors as well as of nuclear power plant personnel.

The purpose of the workshop is to share information about methods, practices, organisational perspectives and criteria used to adapt the inspection processes during the COVID-19 Pandemic, and to identify commendable practices that member countries can use to improve the efficiency and/or effectiveness of their inspection processes both in emergent[1] and routine practices in both a limited period of activity as well as long-term changes that might be made to Regulatory Body Inspection Programmes.

QUESTIONNAIRE

For the preparation of the workshop, participants are invited to share their national inspection approaches used according to the following questionnaire:

1. If your RB performed remote inspections during the pandemic, please describe how your inspections were performed.

   1.1 Please describe any lessons learnt from how remote inspections were performed.

2. As a result of the Coronavirus pandemic, please describe how your regulatory body adopted new or innovative technology (e.g. increased remote oversight, improved access to licensee information, use of cameras).
3. Please describe any long-term changes to your inspection practices that your RB is considering, including changes for routine or emergent inspection activities.
4. How did your RB protect the health and safety of inspectors and licensee staff, such as control room operators, during the planning of inspections as well as when performing onsite inspection activities?

   4.1 What criteria was used to assess whether the inspection could be deferred, modified, or cancelled?

5. How did your RB inspection activities verify that the nuclear power plants continued to be operated safely and in accordance with their licences?
6. Describe any other changes you made to your inspection activities including inspection procedures

[1] Emergent – describing an issue or event that is emerging or suddenly coming into existence, or unforeseen, and demands a response or a course of action (such as occurred during the COVID-19 pandemic).

as a result of the Coronavirus pandemic.

7. How is your RB planning to recover its inspection programme from the Coronavirus pandemic?
   7.1 Please describe how you are managing any derogations or waivers granted to Licensees.
   7.2 What actions has your RB taken in order to understand the long-term impact of the pandemic on licensees (e.g. long-term impact of reduced staffing on-site, impact of not undertaking emergency training).
8. How has the training and qualification of your inspection staff been affected by the COVID-19 pandemic?
9. Is there anything else you'd like to discuss?

Annex C: Updated potential commendable practices

Topic A – Inspection challenges related to nuclear power plant ageing management (Simone, Mahtab)

CP 1: The regulatory body (RB) should implement requirements concerning ageing management programmes for nuclear power plants in the regulatory framework and should perform inspections to verify their implementation.

- If ageing management requirements are implemented in the regulatory framework, this enables the RB to verify their implementation, e.g. on the occasion of licensing, periodic safety reviews (PSRs) or long-term operation (LTO) assessments (depending on the country's individual approach concerning the legal basis and the licensing basis).
- The IAEA Specific Safety Guide No. SSG-48 "Ageing management and development of a programme for long term operation of nuclear power plants" can serve as a useful source for the development of a regulatory framework.

This is a potential commendable practice because:

- An ageing management programme generally enhances the safety performance of the considered systems, structures and components (SSCs), because the degradation of SSCs and their safety functions can be prevented or mitigated (criterion 1).
- If the requirements on ageing management that apply during the different phases of a nuclear power plant's lifetime are clearly addressed in the regulatory framework, RB inspectors have a common ground for their oversight activities in the field of ageing management (criteria 2 and 4).
- Several RBs have requirements pertaining to ageing management programmes in their regulatory frameworks (and consequently into the licensing basis, PSR, or LTO) (criterion 5).

CP 2: The regulatory body should perform both structures, systems, and components (SSCs)-based and programme-based oversight activities on the licensee's ageing management programme.

Examples for SSC-based oversight activities are:

- review and assessment of non-destructive testing results (e.g. indications in steam generator tubes);
- review and assessment of ageing effect calculation results (e.g. the fatigue of a material, depending on the loads that affected the structure or component during its operating history);
- witnessing on-site in-service inspections/functional testing of systems (e.g. testing of diesel generators) or reviewing reports on the results of such activities;

Examples for programme-based oversight activities are:

- review and assessment of the documents that describe the licensee's processes/approach from the ageing management programme (e.g. documents submitted by the licensee when seeking approval of long-term operation);
- on-site inspections of ageing management processes on the level of the management system (e.g. discussions with the licensee about roles, procedures, responsibilities, co-operation of different parts of the organisation, outcome and improvement of the ageing management programme);
- inspections on the operating experience process of the licensee.

This is a potential commendable practice because:

- The combination of results of SSC-based and programme-based oversight activities can provide a clear picture to the regulatory body as to whether the ageing management (AM) processes and procedures are being systematically implemented and if they are effective (criterion 1).
- The CP provides a common understanding for RBs because it shows the value of pursuing different approaches to ageing management oversight at the same time. As a result, the combination of approaches also leads to a harmonisation of different inspection practices (criteria 2 and 4).
- The CP has been adopted by several RBs (criterion 5).

CP 3: Resident/site inspectors should co-operate closely with SSC or ageing management specialists (from the RB, TSO or research organisation) to optimise the RB's capability to notice early signs of ageing or slowly evolving trends.

For example, close co-operation could be achieved by:

- conducting team inspections with teams that include resident/site inspectors and specialists;
- discussing inspection results with each other frequently (e.g. using videoconferences between the resident/site inspectors and headquarters);
- using the combined specialists' and resident/site inspectors' experience for the planning or improvement of the RB's future inspection plans.

This is a potential commendable practice because:

- The co-operation of site inspectors and specialists can improve safety through the combination of the site inspectors' ability to identify deviations from previous plant conditions and the ability of specialists to independently assess whether those deviations are safety significant (criterion 1).
- Close co-operation can improve the capability of the RB's insights about the nuclear power plant's ageing status and therefore make its work more effective (criterion 2).
- The examples for types of co-operation given above have been adopted by several RBs (criterion 5).

CP 4: The RB should make provisions to be regularly informed about the results of the licensee's evaluations of ageing phenomena that are safety-significant (updates should not just occur during PSR) and should include this information within its inspection scope.

- Licensees usually make predictions for safety-significant structures and components e.g. using a design load catalogue and using certain assumptions on environmental conditions. Then they periodically validate their predictions under consideration of the load cycles that actually occurred and measurement results at critical locations.
- Typical examples for ageing effects that are monitored closely are the cumulative usage factor (CUF) in the area of low cycle fatigue, radiation embrittlement or corrosion issues.
- The licensee can report results in several ways, for example by sending annual reports to the RB.

This is a potential commendable practice because:

- By following the licensee's results on the ageing status of safety-significant structures and components the RB improves its knowledge on potentially critical safety issues (criterion 1).
- The frequent review of the licensee's ageing management evaluations keeps the RB (and/or its TSO) up to date with the complex issues that are involved. In this way, if major ageing problems occur, the

RB is well prepared to review and assess the licensee's proposals to corrective actions in a timely and competent manner (criterion 2).

- There are several RBs that have imposed regular reporting requirements on the licensee either through the regulatory framework or by corresponding licence conditions (criterion 5).

CP 5: For new reactor builds, the RB's oversight activities should inspect the licensee's ageing management programmes at the design and construction stage.

- This ensures that the basis/programme for ageing management (particularly design and construction) is suitable and sufficient for later operating phases of the facility.
- Ageing management approaches are embedded on a proactive basis to prevent unexpected events/anomalies/delays.
- The RB should inspect to verify that ageing management practices have been implemented prior to construction, e.g. construction plans, outputs from testing activities.
- See also Observation 3.

This is a potential commendable practice because:

- Proactive implementation of ageing management approaches will support the SSCs fulfilling their safety function/design feature throughout the design life and prevent erosion of the safety margin (criterion 1).
- Inclusion of the CP within the regulatory framework will facilitate a systematic and consistent approach to ageing management (criterion 2).

To be made into an observation: CP 6: RB should establish a multidisciplinary internal working group/knowledge sharing forum within their regulatory framework for ageing-related issues.

- The forum should consider maintenance strategies, operational experience, anomalies/event reporting and other relevant findings. These requirements can also be incorporated within an existing forum, if one exists.
- The forum supports effective ageing management regulatory oversight processes.
- The forum helps identify any interfacing issues between different SSCs.
- RBs should consider the size, age and complexities of their nuclear facilities when implementing this CP.

This is a potential commendable practice because:

- It facilitates identification of ageing management related risks and potential gaps in the licensee's arrangements/procedures (criterion 1).
- It ensures that the RBs oversight activities associated with ageing management are effective and comprehensive (criteria 1 and 2).
- It facilitates a consistent and well-informed regulatory oversight approach through improved knowledge retention and transfer (criteria 1, 2 and 4).

To be made into an observation: CP 7: RB should have processes in place to ensure the RB, as well as licensees, have effective knowledge transfer mechanisms to fulfil their mandates and core business requirements.

- Operational experience programmes are a key component of knowledge management.
- Effective succession planning will support continuous organisational capability and capacity to deliver their respective mandates.
- Participation in codes and standard committees, and other relevant domestic and international platforms (including e.g. peer reviews, benchmarking), can promote the sharing of up-to-date knowledge and experience for RB and Licensee Staff.
- Self-assessments against relevant technical competencies can identify the required training and development needs for staff.
- Tools, including inspection guides and/or checklists, provide a knowledge transfer mechanism for requirements for RB inspectors.

This is a potential commendable practice because:

- Failure to maintain organisational memory could leave hazards unrevealed (criterion 1).
- More effective knowledge transfer results in competent staff and better safety outcomes (criteria 1 and 2).
- RB staff must have sufficient knowledge to identify deficiencies proactively and prevent undesired events (criteria 1 and 2).

CP 8: The RB (and/or TSO) should consider assigning inspections and other oversight tasks related to PSR and LTO to teams that are composed of newer staff and experienced staff to enhance knowledge transfer between generations.

This is a potential commendable practice because:

- For nuclear power plants that are operated during a long period, a successful knowledge transfer between generations is a safety-relevant issue (criterion 1).
- These oversight activities in the fields of PSR and LTO are closely related to the knowledge on the how and why of the design and the actual state of the nuclear power plant, therefore they can serve as good opportunities to facilitate the RB’s task of knowledge transfer (criterion 2).

Topic B – Graded approach to optimise the inspection process (Sebastjan, Miroslav)

CP 1: RB should establish an inspection programme (IP) based on GA principles to focus on safety-important SSCs and processes as well as other areas warranting increased regulatory attention (e.g. areas of poor or declining licensee performance).

- Qualitative and/or quantitative graded approach criteria can be used, for example:
  - For SSCs, a safety and quality classification, derived from design basis.
  - PSA results.
  - Processes that are not entirely related to plant design (e.g. management system, CAP, ageing management, modification management, safety culture…) are assessed according to qualitative requirements, like expert judgement.

This is a potential commendable practice because:

- It ensures that inspection programmes (IP) are focused on safety-relevant SSCs/processes (criterion 1).
- It optimises resources used for inspection activities (criterion 2).
- It can be used as a tool to harmonise inspection programmes for comparable nuclear facilities and to improve the effectiveness and efficiency of existing inspection processes (criterion 4).
- It has been adopted by several RBs (criterion 5).

CP 2: The RB should have in place a process for continuous optimisation of its inspection programme-based on GA indicators, for example:

- Operational performance of nuclear facilities (KPI: unplanned shutdowns, TS violations, past inspection findings, reportable events…);
- Plant status (operation, permanent shutdown, decommissioning, plant age/AMP outputs…);
- OPEX;
- R&D;
- First-of-a-kind activities (commissioning of new reactor technology or a new or reorganised licensee organisation);
- Self-assessment by RB;
- Licensee feedback regarding RB oversight.

This is a potential commendable practice because:

- It provides assurance that safety-relevant issues are placed into the IP in a timely manner (criterion 1).
- It provides continuous optimisation of IP (criterion 2).
- It ensures that inspection programme is performance based (criterion 3, innovative character).
- It continuously improves the efficiency and effectiveness of inspection processes (criterion 4).
- It has been adopted by several regulatory bodies (criterion 5).

CP3: The RB should establish criteria for assessment and ranking of inspection findings using a GA to

account for their significance. These include:

- Availability of SSCs;
- Degradation of safety functions;
- PSA results;
- Impact to environment and/or personnel;
- Violations of legislations and/or technical specifications (TSs)…;
- Repetitive findings;
- Consideration of expert judgement;
- Willfullness/intent of licensee.

This is a potential commendable practice because:

- It can be used for the planning of follow-up RB activities and/or the requirement of corrective actions, based on the significance of inspection findings (criterion 1).
- It can be used for further optimisation of inspection programmes (criterion 2).
- It meets criterion 5 (adopted by several RBs).

Topic C – Effects of the COVID-19 pandemic on inspection programmes and practices

CP 1: The RB should have criteria to determine whether an inspection should be performed, deferred, modified or cancelled during emergent events where access to the site may become constrained (e.g. pandemic, external hazard, or regional/national emergency).

Items for consideration:

- Risk significance of the inspection area.
- Whether alternative means of performing the inspection exist.
- Frequency of planned inspection against the inspection area.
- Whether the inspection scope can be modified while continuing to meet the inspection objectives.
- Whether the inspection is planned or in response to an abnormal condition.
- The impact, on RB resource load and capacity, of performing the inspection.
- The impact on the licensees' operations of performing the inspection.
- The impact of removing the inspection on the RB's ability to assess the licensees' performance,
- The ability of the RB to ensure the protection of inspectors, licensee staff and the public.
- The RB's knowledge of licensee performance, specifically in relation to safe operations and meeting regulatory or licence conditions.
- Consideration of the existing rationale or basis for performing the inspection.

This is a potential commendable practice because:

- It is safety-significant for RBs to have a comprehensive plan and inspection programme to ensure nuclear safety oversight while protecting the public health, the health and safety of inspectors as well as nuclear power plant personnel (criterion 1).
- Having criteria on whether to perform an inspection during a pandemic or period of limited site access provides consistency, credibility and transparency as to whether an inspection should be performed, deferred, modified or cancelled (criterion 2).
- It provides RBs with a process to determine which inspections should be performed during emergent events where access to sites may become constrained (e.g. pandemic, external hazard, or regional/national emergency). Having a process to determine whether an inspection should still be performed is a new practice that resulted due to the pandemic (criterion 3).
- Several RBs have developed either formal or informal processes to determine whether inspections should be performed (criterion 5).

CP 2: During emergent events where access to the site may become constrained (e.g. pandemic, external hazard, or regional/national emergency) the RB should have a means to ensure the training, qualification and competence of the inspectors that perform safety-significant inspections at nuclear power plants.

Items for consideration:

- Some types of training are suitable for online and remote training, but the ability to learn and comprehend the training may be limited by the method of delivery.
- The future impact of online training, in terms of the retention of information and the resultant

inspectors' expertise, is not yet known.

- Remote training can be more efficient and flexible in terms of delivery and is often undertaken at a lower cost.
- Remote training can be performed at a suitable time for the staff involved and allows for customisation through the use of focused interactions with the instructor.
- Consider changing the formal qualification process to account for short-term impacts on both working practices and access to technology.
- Knowledge management is an important part of bringing on new staff and maintaining the proficiency of the inspection staff, and specific thought should be given to the most effective means by which this is delivered.
- Mentoring, coaching, pairing of inspection staff, and objective evaluation of inspection staff are important aspects of ensuring that inspection activities have a positive impact on safety and may be more difficult to achieve in an online environment.
- Non-technical regulatory skills (judgement, team management, delivery of team and licensee interactions) are important to the success of inspections and may be more difficult to train in a online environment.

This is a potential commendable practice because:

- During emergent events such as pandemics, having a knowledgeable, trained and qualified team of inspection staff within the RB will ensure the continuity of their important oversight roles so that safety-significant issues are appropriately identified and corrected (criterion 1).
- Particularly during a pandemic, continuing training, qualification and knowledge management of the inspection staff is essential to an RB performing its regulatory duties (criterion 2).
- While the training in person and the use of mentors, peers and management visits is preferred, the adoption of remote or online training provided a flexible and innovative method of training (criterion 3).
- Having a strong training, qualification and knowledge management programme is relevant to improving inspection practices and has been adopted by several RBs (criterion 5).

CP 3: During emergent events where access to a site may become constrained (e.g. pandemic, external hazard, or regional/national emergency) RBs should consider adopting the use of new technology or changing the use of existing technology to ensure the continuity of their oversight roles while performing remote or hybrid inspections.

Relevant experiences from RBs identified include:

- The increased use of technology for communication and co-ordination of activities was reported by RBs in detail.
- Expanded use of existing communication technology was reported by all RBs.
- RBs were increasingly aware of the need to consider the impact of cybersecurity when using communication technology.
- The use of electronic documentation and certification was greatly expanded.
- Many RBs accelerated the electronic sharing of data.
- On occasion, RBs experienced incompatibility of devices and applications, which was a temporary

barrier, or required a workaround

- Many RBs accelerated plans to deliver increased use of electronics and computer applications.
- Emergency Management Response was enhanced by the use of digital connectivity. First responders were better supported in terms of information accessibility, and provided needed flexibility when deploying.
- Many RBs with licensee co-operation expanded the use of cameras and video and made them remotely accessible to their inspection staff.
- Many RBs experienced challenges in the use of video, including bandwidth connectivity or security concerns.
- Most RBs received greater volumes of data, including increased access to licensee data and real-time operating parameters.
- RBs had to consider the financial impact of increased adoption of technology.

This is a potential commendable practice because:

- During emergent events where access to a site may become constrained (e.g. pandemic, external hazard, or regional/national emergency), the adoption and increased use of technology will allow the RBs to successfully continue their safety oversight role remotely (criterion 1).
- During emergent events where access to a site may become constrained (e.g. pandemic, external hazard, or regional/national emergency), the adoption and increased use of technology will enhance the RB's ability to perform remote inspections (criterion 2).
- During emergent events where access to a site may become constrained (e.g. pandemic, external hazard, or regional/national emergency), many RBs adopted the use of innovative technology (e.g. cameras and data sharing) (criteria 3 and 5).

CP 4: During emergent events where access to the site may become constrained (e.g. pandemic, external hazard, or regional/national emergency), RBs should ensure that inspections achieve an appropriate balance between remote and on-site inspection delivery, thus ensuring that each inspection is conducted in as efficient and effective a manner as possible. In planning each inspection, the RB should consider the relative impacts of remote and on-site inspection.

- The positive impact of site-based inspections is recognised by RBs, as on-site presence generally yields higher quality information.
- While it is recognised that on-site inspection is preferred, the use of remote or hybrid inspection can enhance an RB's inspection efforts.
- Situational awareness is enhanced through on-site presence. Wider site situational awareness, including performance of the licensee and condition of plant, is not available to the RB during the remote element of an inspection. This should be a consideration when deciding on the extent to which remote inspection is included in planning.
- RBs used remote interactions with the licensee for inspection planning, scoping and focusing on documentation reviews, while utilising on-site inspections for key elements of information capture in support of regulatory judgements.
- The balance between remote and on-site inspections can be informed by the extent of confidence and trust the RB has in the licensee.
- There is a benefit to remote inspection, as it delivers resource management efficiencies for the RB

and has a potentially reduced impact on the licensee's operations during the inspection.

- The need to manage information safely (physical and cybersecurity) is a consideration when determining the degree to which inspection activities can be conducted remotely.
- Allowing RB staff to support inspections remotely can have a positive impact on the ability to access specialist support for that inspection.
- The RB should plan the remote and on-site elements of an inspection so that these elements inform and support each other.
- Including a remote element within the delivery of an inspection can lead to that inspection taking significantly longer to deliver.

This is a potential commendable practice because:

- A failure to deliver inspections effectively could lead to a failure on the part of the RB to identify areas of non-compliance. Failing to identify non-compliance could result in the issue not being resolved by the licensee in a timely manner. Failure, on the part of the licensee, to act in a timely manner could lead to a potentially safety-significant situation (criterion 1).
- Optimising the approach to delivery of inspections, using remote and/or on-site techniques where appropriate, will support the work of the RB by improving both its efficiency and its effectiveness (criterion 2).
- Considering the use of remote inspection techniques is an innovative approach to the delivery of regulatory inspections (criterion 3).
- A significant number of RBs have delivered planned inspections through a combination of remote and on-site inspection techniques, an approach stimulated by the COVID-19 global health emergency (GHE) (criterion 5).

CP 5: The RB should ensure that, during emergent events where access to a site may become constrained (e.g. pandemic, external hazard, or regional/national emergency), consideration is given to how they would retain confidence in the safe operation of activities at that site. In planning the approach taken, the RB should consider what aspects of those activities have the greatest safety implication.

- The availability of sufficient qualified licensee staff is critical to safe operations, and the RB should confirm that the licensee has ensured that they can support safety-critical tasks with sufficient resources, and that there is adequate resilience to the provision of such resources.
- The RB should consider whether the regular and frequent provision of safety-related information, proactively from the licensee to the RB, can help ensure that the RB retains confidence that the licensee is controlling operations safely at the site.
- The RB should consider the benefit of asking the licensee to consider how they would continue to ensure safe operations should the situation worsen in any significant aspect.
- The RB should consider placing a priority on those aspects of licensee operation that will have an immediate impact on safe operations (conservative decision making, adequate supervision and oversight, and effective situational awareness on site), and thereafter considering those aspects that are likely to change at a slower rate (plant condition, procedural adequacy).
- In evaluating the safe operations at a site, the RB should consider the robustness of the internal and external event reporting culture of the licensee, as well as the scope and intent of mandatory reporting to the RB.
- The RB should identify any opportunities for observation of the licensee's activities, as opposed to

specific and direct inspection or intervention.

- The RB should consider what waivers and derogations have been applied by the licensee, and if any safety-related limits and conditions have been modified because of the scenario.
- The RB should consider all potential sources of relevant information, as the RB's confidence that the licensee is operating safely will increase with an increase in the range of evidence and in the diversity of sources from which that evidence comes.
- The RB should recognise the context within which the licensee is temporarily operating and seek to take account of this when setting their expectations for the verification of safe operations.
- The RB should take account of any existing structured process that the licensee has in respect of managing waivers, derogations, and changes in the safety-related operating limits and conditions on site.
- The RB should consider the potential wider supply chain impacts on the licensee resulting from the scenario and ensure that the licensee has taken account of any latent impacts that are not immediately evident.

This is a potential commendable practice because:

- The RB must be able to independently verify that the licensee can operate safely during any scenario where access to site is significantly constrained (e.g. pandemic, external hazard, or regional/national emergency) (criterion 1).
- Confirming that a licensee can operate safely is a central purpose of all RBs, and this information supports RBs in their determination of how best to achieve that during any scenario where access to a site is significantly constrained (e.g. pandemic, external hazard, or regional/national emergency) (criterion 2).
- Several RBs have undertaken targeted activities to confirm that licensees are able to operate safely during a scenario where access to a site is significantly constrained (criterion 5).