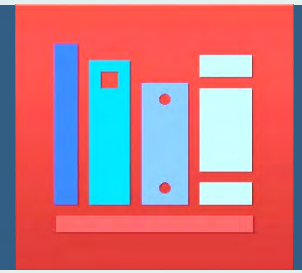
International Initiatives on Codes and Standards



- Opening Remarks by Sabrina Atack, Deputy Director, OIP

- **Session Chair:** Tex Steinfeldt, International Programs Specialist, RES/PMDA

- **Panelists/Speakers:**
  - Pekka Pyy (IAEA)
  - Sangmin Lee (NEA)

Nuclear Harmonization and Standardization Initiative (NHSI)

Industry Track

Topic 2

Common Practices on Codes & Standards

P.Pyy IAEA NENP, September 2023

NHSI Industry Track

Effective Global Deployment of **Safe and Secure** Advanced Nuclear Reactors

Harmonization of Regulatory Approaches Track

- **WG1:** Framework for information exchange
- **WG2**: International pre-licensing regulatory reviews
- **WG3:** Leveraging other regulatory reviews

SMR Regulators Forum

Harmonization and **S**tandardization of Industrial Approaches Track

- **Topic 1:** Harmonization of high-level user requirements
- **Topic 2: Common Approaches on Codes & Standards**
- **Topic 3:** Experimental Testing and Validation for Design and Safety Analysis Computer Codes
- **Topic 4:** Acceleration of nuclear infrastructure implementation for SMR

IAEA as facilitator
within and between the tracks

- Regulators
- Governments
- Technology Holders
- Operators and other end-users
- International Organisations and Associations

Topical Groups of the NHSI Industry Track

The Industry Track is divided into 4 topical groups to foster initiatives in the industry that aim to facilitate global deployment of SMRs through standardization and harmonization.

Topic 1: *Harmonization of high-level user requirements*

Scientific Secretary: Benoît Lepouzé
b.lepouze@iaea.org

Topic 2: *Common Approaches on Codes & Standards*

Scientific Secretary: Pekka Pyy
p.t.pyy@iaea.org

Topic 3: *Experimental Testing and Validation for Design and Safety Analysis Computer Codes*

Scientific Secretary: Eve-Lyne Pelletier
e.pelletier@iaea.org

Topic 4: *Acceleration of nuclear infrastructure implementation for SMRs and Microreactors*

Scientific Secretary: Michelle Scott
m.l.scott@iaea.org

TG 2 Objectives

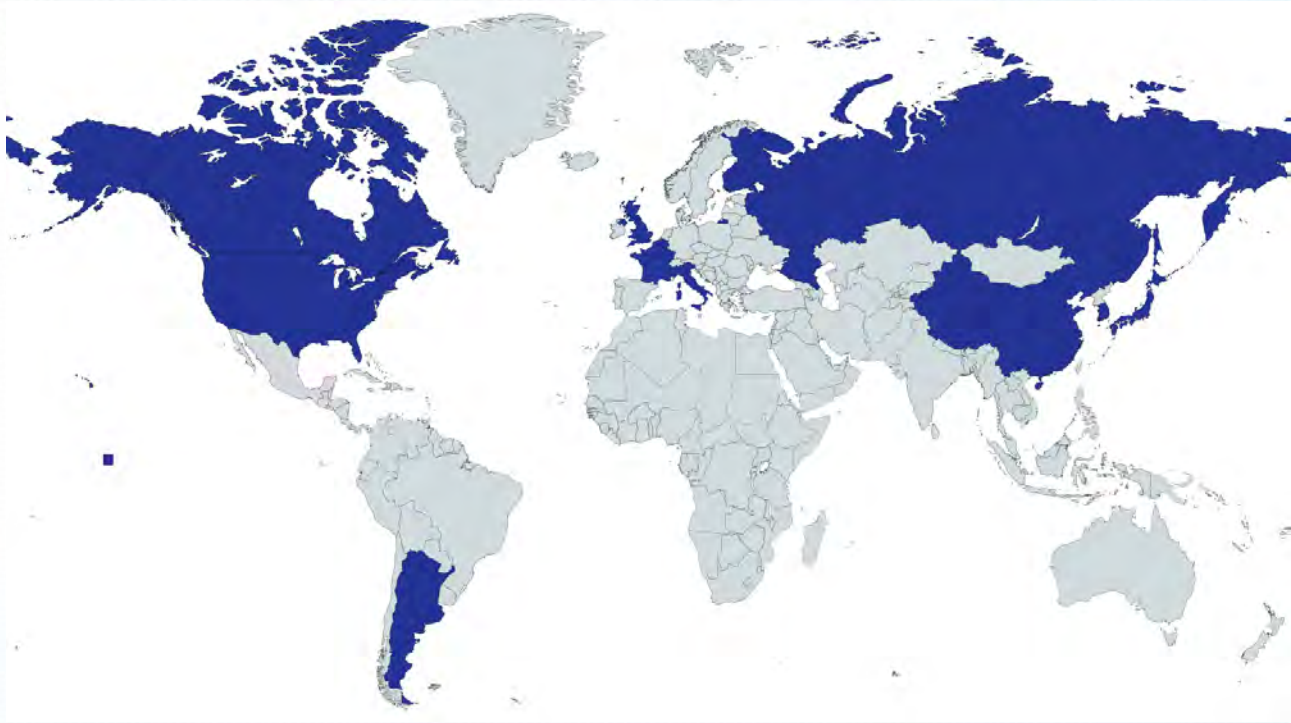
Identify similarities and differences

Understand why they exist

Share information on the findings

Develop common approaches

Harmonize where sensible



IAEA to work as harmonizer of the harmonizers

Tangible deliverables for industry uses

TG2 Members

Participants (as of September 2023)

Argentina: CNEA, NA-SA

Canada: COG

Belgium: Tractebel

China: CNNP / Hainan NP

Finland: TVO and FORTUM

France: CEA, Framatome, EdF, and BV

Italy: ANSALDO NUCLEARE

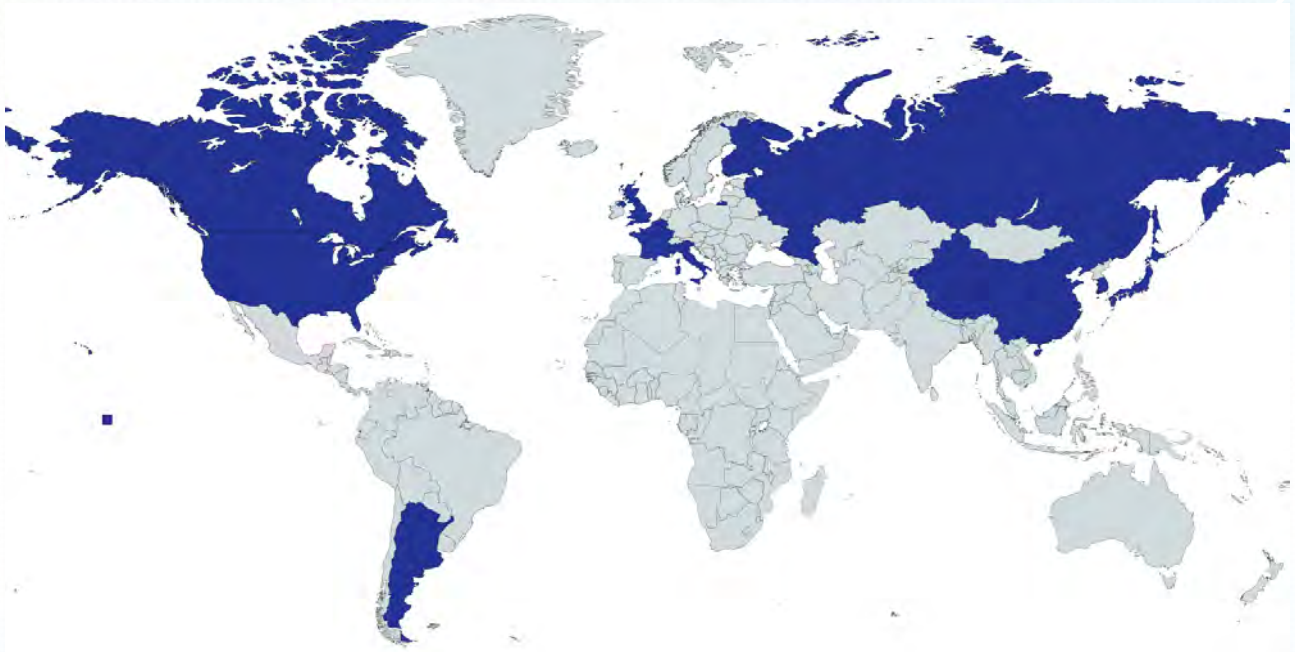
Japan: Hitachi-GE and MHI

Republic of Korea: KAERI and KEPCO

Russian Federation: Rosatom etc.

United Kingdom: Rolls-Royce SMR

United States: Westinghouse, Nucscale, Last Energy, GEH, EPRI, ASME and NEI



"The more, the merrier ...."

25 companies from 12 Member States

WNA as a strategic partner

World Nuclear Association (WNA)

Developing a Platform for Information Sharing

NHSI Topic 2 Scope

I. Codes & Standards

A. QUALITY AND MANAGEMENT SYSTEM STANDARDS USED WIDELY IN THE MEMBER STATES (APPLICABLE TO SMRS)

B. ENGINEERING STANDARDS FOR THE DESIGN AND CONSTRUCTION OF SMRS (WNA LEAD)

C. EQUIPMENT QUALIFICATION STANDARDS FOR NUCLEAR (SMRS) FACILITIES

D. C&S USED IN VARIOUS SMRS (AND THEIR PROJECTS)

E. C&S FOR ADVANCE MANUFACTURING TO BE USED FOR SMRS (AND THEIR PROJECTS)

II. Oversight & Acceptance

A. A USE OF STANDARD, PROVEN SERIALLY MANUFACTURED INDUSTRIAL GRADE ITEMS

B. NON-NUCLEAR CODES, STANDARDS, LAW AND REGULATIONS RELEVANT TO SMR DEPLOYMENT

C. OVERSIGHT ACTIVITIES REQUIRED BY CODES, STANDARDS, LAW AND REGULATIONS

Topic 2 Work in Progress

I. CODES AND STANDARDS FOR USE IN SMRS

I. A Quality and management system standards used widely in the member states

- Updating contents of the previously existing IAEA toolkit in progress

I. B Engineering standards for the design and construction of SMRs (WNA lead)

- Mechanical standard high-level benchmarking complete with six standards ► Release by the end of the year 2023 – Other disciplines to be added (I&C, civil,..)

I. C Equipment qualification standards for nuclear facilities

- Nuclear EQ standards shared in the IAEA toolkit ► A white paper considered

I. D C&S used in various SMRs (and their projects)

- Several SMR projects have shared their C&S strategies, and they have been made available to NHSI

I.E C&S for advance manufacturing (am) to be used for SMRs (and their projects)

- Discussions began with GIF, follow-up

II OVERSIGHT AND ACCEPTANCE ISSUES RELATED TO C&S

II.A Use of standard, proven serially manufactured industrial grade items (co-led by WNA)

- TECDOC ”Suitability assessment of using commercial grade items in NPP safety systems” to be issued in autumn 2023 with a white paper on using proven serial industrial products in SMRs

II.B Non-nuclear codes, standards, law and regulations relevant to SMR deployment

- Includes for example: building, fire, industrial safety & ergonomics, system of units, electricity frequencies etc. C&S outside nuclear regulation – work in progress

II.C Oversight activities required by codes, standards, law and regulations

- Material in the IAEA toolkit to be checked by participants in 2023. Problem formulation paper on serial manufacturing of long-lead nuclear items in progress

Flag symbols from the IAEA toolkit (II.C)

NHSI Industry TG2 2 Platform

MSCQ MSN Public IAEA MS expert recruitment Management & Supplychain Network of Excellence (MSN)

Home > MSCQ > NHSI TG2

Send by email Promote Published 8/29/2023

I. Codes & Standards

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C. OVERSIGHT ACTIVITIES REQUIRED BY CODES, STANDARDS, LA AND REGULATIONS

Meetings

1 December 2002

14-15 September 2023

27-28 February 2023 CM

12-14 April 2023 CM

10-11 July 2023 CM

NHSI TG2 Umbrella Sharepoint platform

Topic 2 - Way Forward

Topic 2 - Common Approaches on Codes and Standards

Phase 1– Planning and Alignment

Phase 2 – Developing Contents & Deliverables

Phase 3 – Harvesting the Fruits

Phase 4 – Long-Term Collaboration

2022 2023 2024 2025

- **Kick-off** (1-2 Dec 2022) Virtual
- Scoping and beginning to plan
- Ad-hoc planning meetings on need basis
- **First Working Meeting** ("February 2023" CM –date based on Doodle poll) Virtual

- **Workshop (12-14 April 2023), IAEA/Vienna, Hybrid**
- 18 May, NHSI Ind Track call
- **NHSI plenary, 27 June 2023**
- **10-11 July CM 2023, Hybrid**
- **14-15 Sept CM 2023, Hybrid**
- **Technical Meeting**, 11-15 December 2023 (nominations)

- **CM Spring** 2024
- **CM Summer 2024**
- **CM Autumn** 2024 (TBD), Virtual
- **Final TG2** meeting, end of 2024 (TBD) – Spin-offs

- Meetings on need basis for different Topic 2 activities

- **Platform Operation**
- Spin-off Coordinated Projects (TBD)
- Recurring meetings (TBD)
- What else (TBD)

CONTACT: Mr. Pekka PYY, P.T.Pyy@iaea.org

TG2 – Where to find the material?

IAEA Nuclear Supply Chain Management:
Management of the nuclear supply chain | IAEA
Webinars:
Nuclear Supply Chain Webinar Series | IAEA

NHSI TG2 in IAEA NUCLEUS CONNECT MSN/MSCQ:
Now restricted to TG2 Members - We will make material available to MSCQ members by the Technical Meeting on the Harmonization and Use of Industrial Codes and Standards for Small Modular Reactors in December 2023

How to become a member of NUCLEUS CONNECT MSCQ **(formerly MSN)**?
MSCQ Registration (iaea.org)

Thank you for your attention

C&S conformance approaches

1. Comply with all the legislative, regulatory and owner's requirements in the jurisdiction you are targetting ("complete fit-for-purpose tailoring")

2. Enveloping approach - develop a set of project requirements conforming with the set of most demanding requirements ("platinum grade approach")

3. Justification approach - develop a set of project requirements conforming with a set of requirements seen to comply with the levels required with reasonable assurance ("standardized design" with exemptions sought by justifying C&S with "code case" equivalences)

4. Regional approach - develop a set of project requirements conforming with a set of requirements seen to comply with the regional C&S ecosystem ("standardized design" additional few national jurisdiction tailored solutions) – may be a specific case of 3

5. Standard design approach – no changes agreed in C&S ("one fits all" as conformance with safety and other objectives is sufficiently assured on the plant design level)

...and extensive use of proven serially manufactured commercial grade items, SI units, etc.

Working Group on Codes and Standards

- Achievements and future perspective -

Sangmin Lee, NEA

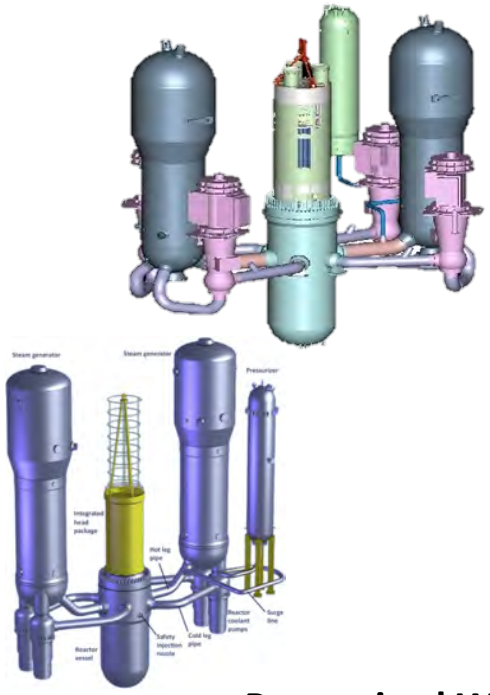
2023 NRC Standards Forum

13 September 2023

NRC Headquarters, Rockville, MD, USA

Overview (1/2)

It is very important to **prevent radiation disasters** for public safety in the use of nuclear energy. Especially, **pressure boundary components** in nuclear power plants play a key role as a **physical barrier** against the release of radioactive materials. So, they should be designed to ensure their integrity based on consensus **codes and standards**



<Pressurized Water Reactor>

<Small Modular Reactor>

[Image sources: IAEA, google]

Overview (2/2)

- Each regulatory body has its **own requirements** for ensuring the integrity of pressure boundary components
- **Codes and standards** developed by SDOs have similarities and differences between their design provisions

Typical Codes & Standards

ASME
CSA
JSME
KEPIC
PNAE
RCC
…

- **Cooperation** among regulators, designers, manufacturers, SDO, etc. was found to be essential for nuclear safety through the works of MDEP and WGCS

- SDO: Standard Development Organisation
- MDEP: Multinational Design Evaluation Program

Mandate

The mandate of the WGCS is to **facilitate and promote international co-operation, convergence and reconciliation of codes, standards and regulatory requirements** for pressure-boundary components in nuclear power plants in order to:

- Improve the effectiveness and efficiency of
  - Design review and construction oversight
  - Operating NPP oversight
- Enhance NPPs' quality and safety
- Support the ability of regulators to make decision on safety

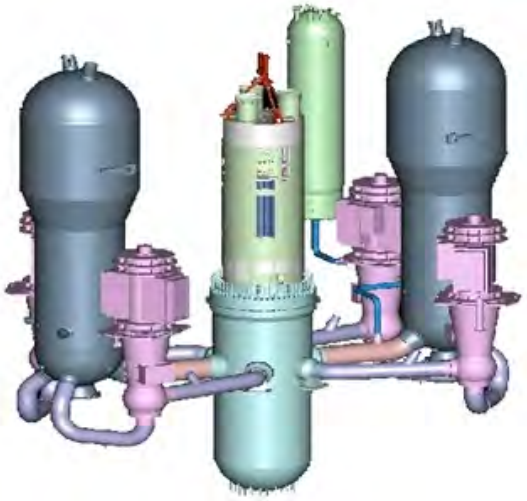
Member countries

Working Group on Codes and Standards (WGCS)

- **Chair** – Dr. Sangmin LEE (KINS, Korea)
- **Vice-Chair** – Dr. David RUDLAND (NRC, USA)
- **Technical Secretariat** - Mr. Thomas BUCKENMEYER (NEA)

Member countries (15)	Canada, Czech Republic, Finland, France, Hungary, India, Japan, Korea, Mexico, Netherland, Russia(Suspended), Spain, Sweden, UK, USA
Organisation (1)	International Atomic Energy Agency
Invitee (1)	China
Partners (2)	SDO Convergence Board, WNA CORDEL

Discussion topics



Integrity Issues

- Carbon segregation
- Hydrogen flake
- PWSCC
- Embrittlement
- SCC
- ...

Mechanical Codes & Standards

Construction stage of NPP

Safety & Seismic Classification

Design

Manufacturing

Installation

Pre-service Inspection

Operation stage of NPP

In-service Inspection

Repair & Replacement Activities

Aging Management

Obsolescence (3D Printing)

Brief meeting history

Dec. 2018 ~ 2020

- 1st WG meeting : The Bureau(Chair, Vice-Chair) was decided
- 2nd WG meeting : Three CAPS (**Aging Mgmt, ISI, Safety Classif.**) were prepared
- *43rd CNRA meeting* : *The CNRA approved three CAPS*
- 3rd WG meeting : The CAPS activities were started

2020 ~ 2022 (COVID-19)

- 4th WG meeting : Another CAPS (**Material Mfg. Technique**) was prepared
- 5th WG meeting
- *45th CRNA meeting* : *The CNRA approved another CAPS*
- 6th WG meeting
- 7th WG meeting

Virtual meeting

2022 ~ 2023

- ISI workshop : About 150 participants attended the virtual workshop
- *47th CNRA meeting* : ***The status of four*** *CAPS activities was reported in-person*
- 8th WG meeting
- 9th WG meeting : *Two reports (**ISI, Material Mfg. Technique**) were prepared for submission*
- *48th CNRA meeting* : *The CNRA approved two reports, and the AM workshop*

2023 ~

- *Aging Management (AM) workshop: About 100 participants attended in person*

Activities (1/4)

In-Service Inspection

- Lead: Mr. David RUDLAND (NRC, USA)
- Objective/Scope
  - The ISI acceptance criteria and examination frequency vary even for identical components among international codes and standards
  - It is necessary to review and compare the ISI provisions in codes and standards
- Output
  - An international ISI workshop was held in online format on 11-14 April 2022 with about 150 participants including utilities, SDOs, and regulators

    - The different requirements of ISI from international codes and standards were discussed
  - The CNRA approved the workshop proceeding in December 2022

- CNRA: Committee on Nuclear Regulatory Activities

Activities (2/4)

Qualification of Manufacturing Techniques

- Lead: Ms. Laure MONIN (ASN, France), Mr. Martin LAMB (ONR, UK)
- Objective/Scope
  - It is necessary to provide a guide for improving the process for qualifying existing and new material manufacturing techniques used for pressure boundary within codes and standards
- Output
  - A consensus position (CP) report on the qualification of material manufacturing techniques was approved by the CNRA in December 2022

    - This CP contains an example of technical processes with their critical criteria and the controls on parameters (e.g. manufacturing of large forgings)

Activities (3/4)

Safety Classification

- Lead: Mr. Suqiang XU (CNSC, Canada)
- Objective/Scope
  - To summarize classification criteria from member countries, identify potential issues, establish the best international practices, and harmonize safety classification schemes
- Output
  - A summary report on a comparison of classification methodologies of member countries and recommendations on best practices is under review
- Current Situation
  - A new Working Group on New Technology (WGNT) of the CNRA established a Task Group (TG) to complete this activity in June 2023
  - The TG is finalizing a draft of the summary report

Activities (4/4)

Aging Management

- Lead: Ms. Sasaki HARUKO (NRA, Japan)
- Objective/Scope
  - Engineering assessment of aging phenomena has drawn broad international attention in the nuclear industry
- Expected Output (supported by the WGIAGE of the CSNI)
  - A summary report on the comparison between regulatory approaches to aging mgmt and its connection to codes and standards will be finalized
  - An international workshop was held in Japan on June 28-29, 2023 with about 100 participants including utilities, SDOs, and regulators

    - The workshop proceeding will be prepared

- WGIAGE: Working Group on Integrity and Ageing of Components and Structures
- CSNI: Committee on the Safety of Nuclear Installations

Workshop on Aging Management

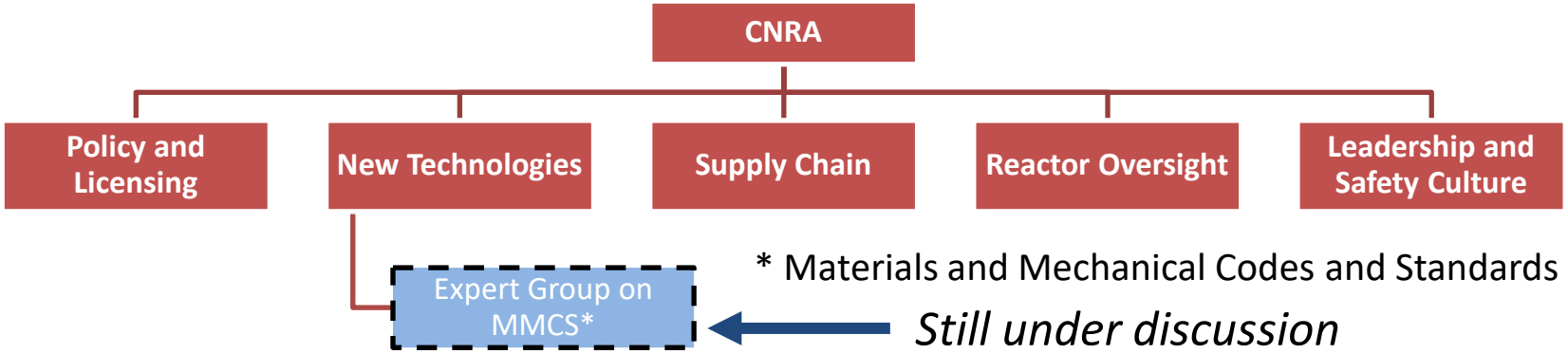
- **Date:** June 28-29, 2023
- **Location:** Hitotsubashi Hall, Chiyoda-ku, Tokyo, Japan
- **Audience:** regulators, TSOs, international organizations, licensees, etc.
- **Speakers:** regulators (WGCS members) and all stakeholders

- Session 1: Comparison of national regulatory requirements related to aging phenomena on reactor coolant pressure boundary (RCPB)
- Session 2: Discussion on industrial codes and standards on RCPB to address/prevent aging phenomena
- Session 3: OPEX related to aging phenomena on RCPB
- Session 4: Challenges of aging phenomena in C&S applied to SMRs/AMRs

- Further information: www.oecd-nea.org > events

Future perspective

- **CNRA structure beyond 2022**



- As of December 2022, WGCS activities have been closed under the new CNRA structure
- International regulators are finding a new place to continue their activities from the point of view of mechanical codes and standards (C&S)
  - The TG of the WGNT of the CNRA is taking over the activity of the WGCS regarding safety classification
  - The WGIAGE of the CSNI is partially supporting activities of C&S
- The SDOs may request the NEA to maintain discussion channels between the regulatory and industry sides for better mutual understanding of C&S

Thank you for your attention!