Nuclear Energy Agency -NEA-

Daniel Iracane
Deputy Director-General and Chief Nuclear Officer

Meeting at the CNEN HQs, Rio de Janeiro, Brazil – 20 March 2018

The NEA Mission

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

The NEA at the Beginning

- 5 June 1947: US announcement of the Marshall Plan.
- 16 April 1948: Organisation for European Economic Co-operation (OEEC) established.
- 1 Feb. 1958: European Nuclear Energy Agency (ENEA) Statute enters into force
  - Members: Austria, Belgium, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Sweden, Switzerland, Turkey, the United Kingdom;
  - Canada and the United States are associate members.

60th anniversary

The NEA over Time

- 1959: Spain joins OEEC and ENEA.
- 1965: Japan joins ENEA as an associate member.
- 1972: Japan becomes a member, and the Agency changes its name from ENEA to Nuclear Energy Agency (NEA).
- 1970s additional countries join: Australia (1973), Canada (1975), Finland (1976), United States (1976).
- 1978: Data Bank established.
- 1990s: Korea (1993), Mexico (1994), Czech Republic, Hungary (1996), Slovak Republic (2002), Poland (2010), Slovenia (2011), Russia (2013).
- 2017: Romania and Argentina

The NEA: 33 Countries Seeking Excellence in Nuclear Safety, Technology, and Policy

33 NEA countries operate nearly 90% of the world's installed nuclear capacity

OECD and NEA Membership

OECD and NEA member
OECD member, not NEA
NEA member, not OECD

- Argentina
- Australia
- Austria
- Belgium
- Canada
- Chile
- Czech Republic
- Denmark
- Estonia
- Finland
- France
- Germany
- Greece
- Hungary
- Iceland
- Ireland
- Israel
- Italy
- Japan
- Korea
- Luxembourg
- Mexico
- Netherlands
- New Zealand
- Norway
- Poland
- Portugal
- Romania
- Russia
- Slovak Republic
- Slovenia
- Spain
- Sweden
- Switzerland
- Turkey
- United Kingdom
- United States

NEA Standing Technical Committees

The NEA's committees bring together top governmental officials and technical specialists from NEA member countries and strategic partners to solve difficult problems, establish best practices and to promote international collaboration.

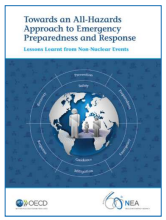
Steering Committee for Nuclear Energy

- **CSNI** Committee on the Safety of Nuclear Installations
- **CNRA** Committee on Nuclear Regulatory Activities
- **RWMC** Radioactive Waste Management Committee
- **CRPPH** Committee on Radiation Protection and Public Health
- **NLC** Nuclear Law Committee
- **NDC** Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle
- **NSC** Nuclear Science Committee
- **MBDAV** Management Board for the Development, Application and Validation of Nuclear Data and Codes

7 standing committees
72 working parties and expert groups

60 publications and reports per year

NEA publications



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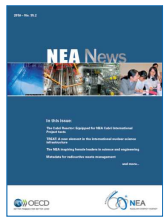

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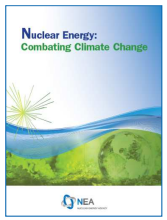

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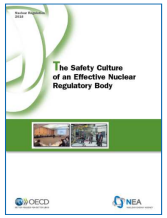

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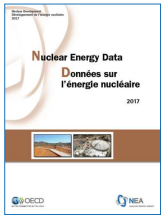

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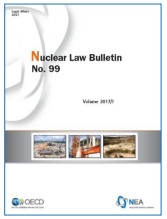

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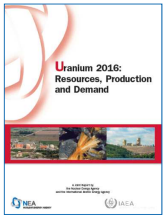

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NEA supports countries willing to work together

23 International Joint Projects
involving countries from within and beyond NEA membership

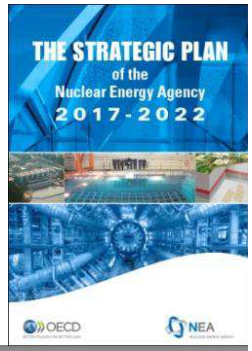
- **Nuclear safety research** and experimental data (thermal-hydraulics, fuel behaviour, severe accidents).
- **Nuclear safety databases** (fire, common-cause failures).
- **Nuclear science** (thermodynamics of advanced fuels).
- **Radioactive waste management** (thermochemical database).
- **Radiological protection** (occupational exposure).

International Initiatives
with NEA Technical Secretariat

- **Generation IV International Forum**: improve sustainability, economics, safety and reliability, proliferation resistance and physical protection.
- **Multinational Design Evaluation Programme**: initiative by national safety authorities to leverage their resources and knowledge for new reactor design reviews.
- **International Framework for Nuclear Energy Cooperation**: forum for international discussion on wide array of nuclear topics involving both developed and emerging economies.

The NEA Strategic Plan: 2017-2022

- Nuclear energy after Fukushima Daiichi NPP accident
  - affected public and political opinion, as well as certain national energy policies
  - led to the enhancement of nuclear regulation and safety
- The development of nuclear energy continues globally
  - 449 operational reactors worldwide
    60 new reactors under construction
  - …
  - Within an evolving electricity market



Thank you for your attention

All NEA publications and institutional documentation available at
www.oecd-nea.org

Creating confidence in nuclear technology

Safety, waste management, public acceptance, science…

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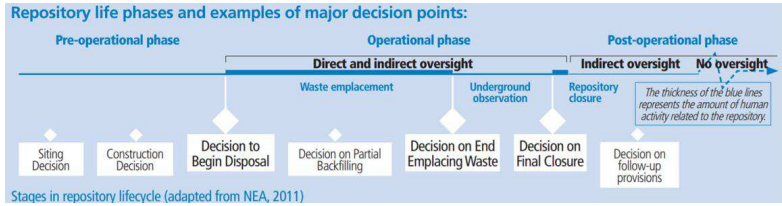
International cooperation for building confidence

- After 03/2011, intensified exchanges on best practices
- In supporting a worldwide convergence for safety

International cooperation for building confidence

- NEA recognise the strong international consensus that **Geological Disposal** is the appropriate ultimate route for handling high-level waste or spent nuclear fuel; it is technically feasible and can be made safe for current and future generations.

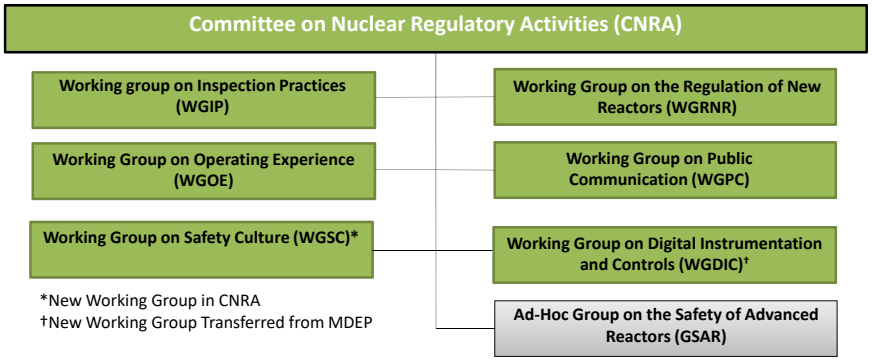


NEA Nuclear Safety Activities

Mr Ho NIEH

Head of the Division of Nuclear Safety Technology and Regulation

Strengthening Nuclear Safety Through Cooperative Regulatory Activities



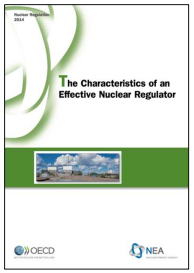
*New Working Group in CNRA
†New Working Group Transferred from MDEP

Harmonisation Improves Regulatory Practices

- NEA provides a forum for regulators to share knowledge and experience to improve the overall effectiveness of regulatory practices such as inspection and licensing
- Example: Working Group on Inspection Practices:
  - periodic benchmarking inspections
  - inspectors from NEA countries participate in an actual inspection in a host country
  - through this interaction, the inspectors "compare notes" on the inspection process and techniques.

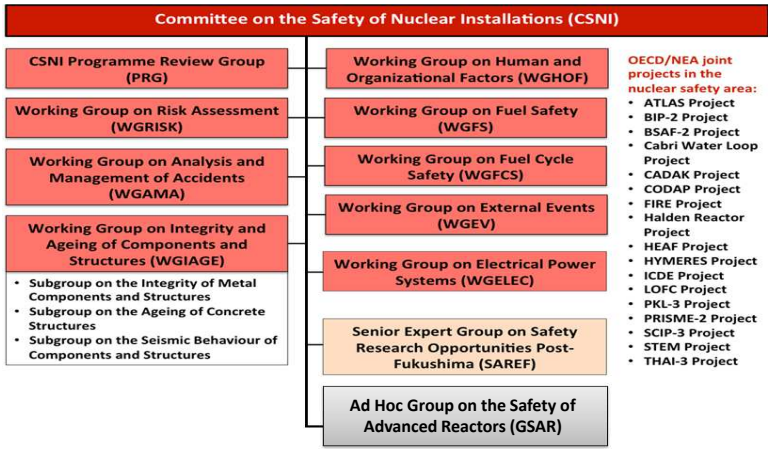
WGIP benchmarking inspection Mexico

CNRA Products and Benefits



- CNRA work activities:
  - Reports on regulatory practices and operating experience
  - Guidance on regulatory issues
  - Workshop and seminar proceedings
- Benefits of CNRA activities and reports include:
  - Forum for sharing of experience, practices and lessons
  - Identification of generic safety issues and trends
  - Practical information and consensus views to help resolve regulatory challenges
  - Harmonisation of regulatory standards, where appropriate

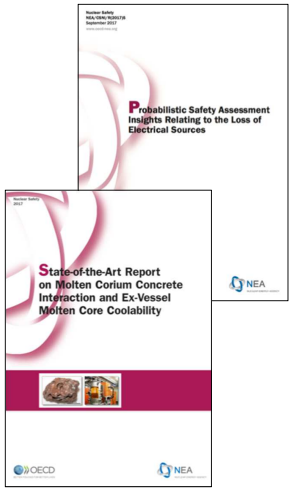
Strengthening Nuclear Safety Through Cooperative Technical Activities



CSNI Products and Benefits

- CSNI work activities produce the following:
  - Technical opinion papers and reports
  - State-of-the-art reports addressing gaps in research
  - Workshop or seminar proceedings
  - Opportunities for joint projects to close research gaps
- Benefits of CSNI activities and reports include:
  - Forum that brings together the world's leading experts in a wide variety of technical areas
  - Identification and closure of gaps in safety research
  - Technical bases to inform regulatory decisions

Examples of CSNI Technical Products



- Probabilistic Safety Assessment Insights Relating to the Loss of Electrical Sources
  - NEA/CSNI/R(2017)5
- State-of-the-Art Report on Molten-Corium-Concrete interaction and Ex-Vessel Molten-Core Coolability
  - NEA/CSNI/R(2016)15

NEA safety focus areas

- Ensuring safe long term operation of existing NPPs
- Commissioning of new nuclear power plants
- Ensuring quality in the multinational nuclear supply chain
- Applying probabilistic risk assessment effectively in regulatory applications
- Achieving effective and early engagement of the processes for innovation and regulation
  - Enabling the increased use of digital technologies
  - Supporting the timely development and safe deployment of advanced fuels and materials
  - Evolving frameworks for advanced reactor regulatory reviews

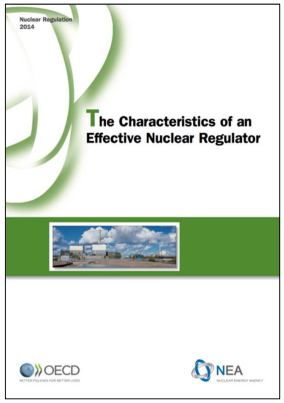
Work Scope of Human Aspects of Nuclear Safety

Public involvement in nuclear activities: *an ongoing challenge for all countries*

- In January 2017, NEA hosted over 140 senior government officials from 26 countries to discuss how to involve public stakeholders in nuclear decisions in a 3 day workshop.

- The participants represented every aspect of civilian nuclear technology.
- They engaged in intensive "roundtable" dialogue sessions to conduct in-depth discussions of the issues and to compare experiences.

CNRA "Green Book" on Effective Regulation



Principles for an effective regulator

- ✓ Safety focus and safety culture Independence
- ✓ Competence
- ✓ Openness and transparency

Attributes of an effective regulator

- ✓ Clear and consistent regulation
- ✓ Consistent and balanced decision making
- ✓ Accountability
- ✓ Strong organisational capability
- ✓ Continuous improvement, peer review and international involvement
- ✓ Efficiency
- ✓ Credibility, trust and respect

Download a copy at: https://www.oecd-nea.org/nsd/pubs/2014/7185-regulator.pdf

NEA Country-specific Safety Culture Forum

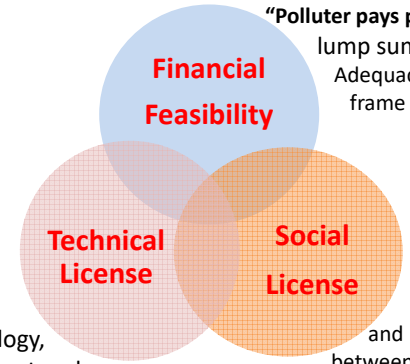
- First-of-its-kind forum to develop **practical responses to safety culture issues in a specific national context**
- Collaborating with the Swedish regulatory body (SSM) and WANO.
- Held on **23-24 January 2018** in Stockholm
- Methodology:
  - Data capturing and analysis
  - Scenario
  - Role play & discussion
  - International panel from Finland, Japan, France US and Korea
- Deliverables: A report to serve as reference point and in training:
  - analysing national influences on safety culture
  - identifying country-specific traits and practical methods to address challenges
  - roadmap to solutions

Radioactive Waste Management

Waste management stays a complex open issue

- Technology and science progressing toward geological repository as the only credible ultimate solution
  - Storage is a temporary solution
  - Postponing geological disposal is unethical
  - Unique topics related to the long timeframe
    - knowledge management, waste long term behaviour…
- Social license
  - A social co-construction is mandatory and challenging
  - Even more challenging for multinational approaches between countries sharing interest in a joint project

Waste management stays a complex open issue



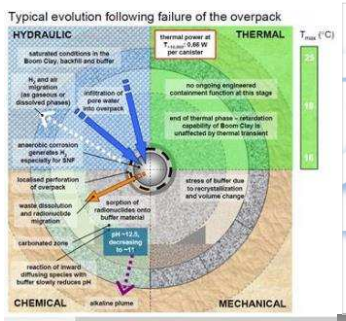
"Polluter pays principle" (taxes on electricity, lump sums, waste volume…)
Adequacy & Stability on long time frame will impact safety

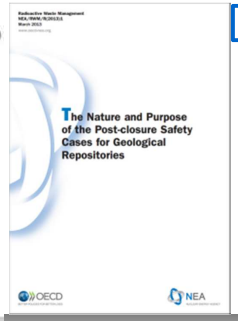
Safety based on scientific evidence
General methodology,
Generic science (host rocks; radionuclide migration…)
Engineering (barrier system, underground research laboratories…)

Perception on "safety" and "risk" are different between Experts and Public

Safety issues

- Safety case:
  - addresses as usual: design, construction, operation
  - Plus the post-closure phase that guaranties the isolation (keeping the waste and associated hazard away from the biosphere)





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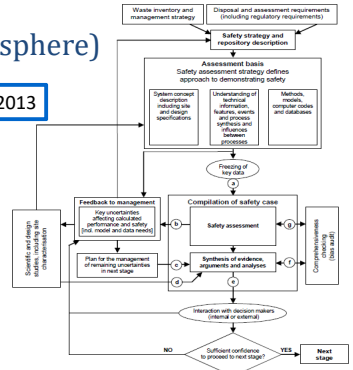
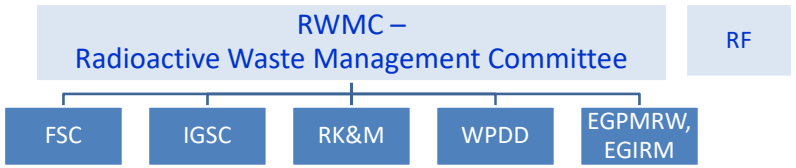


generic flowchart for a safety case

Radwaste Management and Decommissioning



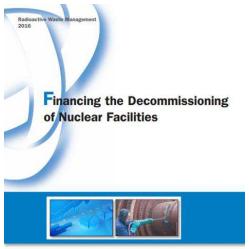
IGSC: Integration Group for the Safety Case	**RF:** Regulators' Forum
RK&M: Record, Knowledge & Memory	**FSC**: Forum on Stakeholder Confidence
EGPMRW: Predisposal Management of Radioactive Waste	**EGIRM**: Expert Group on Inventorying and Reporting Methodology
	WPDD: Working Party on Management of Materials from Decommissioning and Dismantling

NEA RWM focus areas

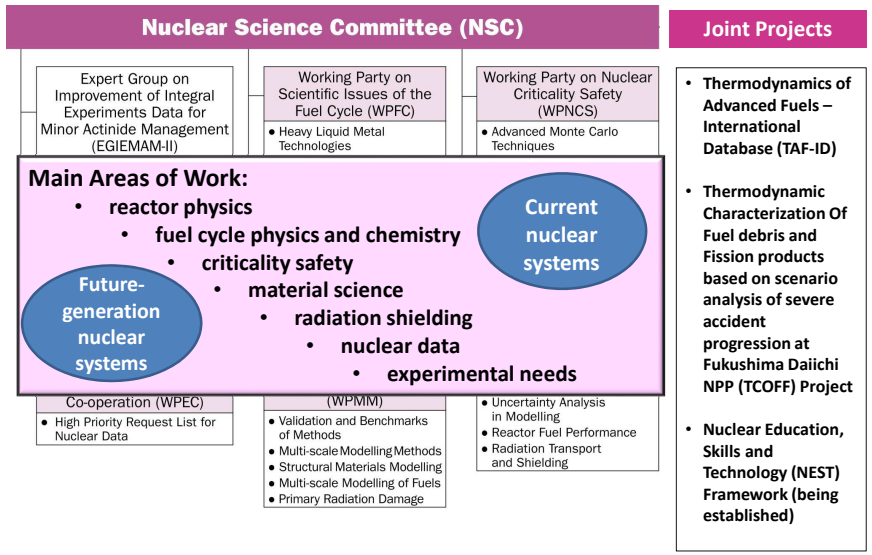
- Supporting development of geological repositories for RW with robust scientific evidence in addressing uncertainties
- Deriving best practices for achieving environmental and operational safety at RW management facilities
- Enhancing stakeholder communication and confidence in all RWM activities including siting and licensing of facilities
- Assessing economic factors influencing RWM policies and strategies.

A growing topic of interest: decommissioning and legacy management

- NEA will reinforce the analysis of technical, regulatory, societal and economical challenges in nuclear decommissioning and legacy management



Activities of the Nuclear Science Committee

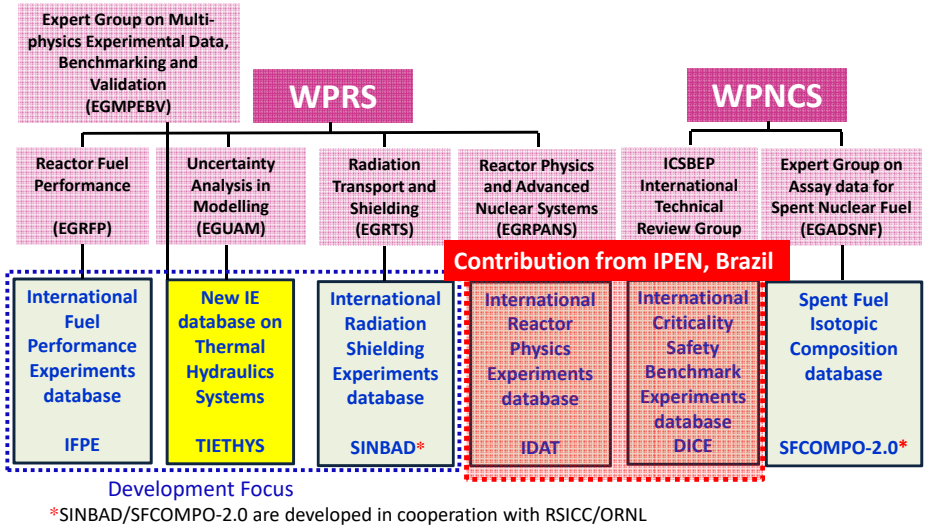


NSC Products and Benefits

NSC work activities produce the following:

- Technical papers and reports:
  - State-of-the-art reports addressing gaps in research
  - Sensitivity and uncertainty studies
  - Workshop and seminar proceedings
- Opportunities for joint projects to close research gaps
- Collections of integral experiments in Reactor physics, Criticality, Thermal-hydraulics, Spent fuel isotopic composition, Fuel performance and Shielding
- Tools assisting validation

NSC Collections of Integral Experiments



*SINBAD/SFCOMPO-2.0 are developed in cooperation with RSICC/ORNL

Collection of Reactor Physics and Critical Experiments: Contributions from Brazil

International Handbook of Evaluated Reactor Physics Benchmark Experiments (IRPhE Handbook) and its database IDAT

~150 dispaches/year to ~20 countries

- 146 experimental series performed at 50 nuclear facilities

https://www.oecd-nea.org/science/wprs/irphe/

Experiments performed at IPEN/MB0 zero-power research reactor are available in the Handbooks:

- **About 200 experimental configurations**
- **Variety of reactor physics parameters**
- **Provided by Adimir dos Santos et al**

International Handbook of Evaluated Criticality Safety Benchmark Experiments (ICSBEP Handbook) and its database DICE

~350 dispatches/year to ~25 countries

- 4916 critical, near-critical and sub-critical configurations; 231 alarm/shielding and fundamental physics experiments

https://www.oecd-nea.org/science/wpncs/icsbep/

NSC Joint Projects

Thermodynamic Characterisation of Fuel Debris and Fission Products Based on Scenario Analysis of Severe Accident Progression at the Fukushima Daiichi Nuclear Power Station (TCOFF)

- Funded by MEXT, Japan with in-kind contributions from other participants
- Participants: 16 organisations from 9 member countries and the EC
- Started in July 2017 with the objectives:
  - **improve quality/inventory of thermodynamic databases for severe accident analyses**
  - **conduct joint thermodynamic evaluations of the severe accident progression at the Fukushima Daiichi Nuclear Power Station**
- International call for proposals: several proposals from Russian and Netherlands have been selected

https://www.oecd-nea.org/science/tcoff/

Assessing ATF Properties and Technology Readiness

- Nuclear Science Committee Expert Group on Accident Tolerant Fuels for LWRs (EGATFL)
  - Chair: Kemal Pasamehmetoglu (INL, USA)
- Participants from 32 organisations from 14 countries
  - R&D, utilities, fuel vendors, academia and TSOs
- Report will be published in 2018, summarising
  - **Fuel/core materials' fundamental properties/behaviour under normal and accidental conditions and expected impact on fuel cycle facilities**
  - **Compatibility of fuel and cladding**
  - **Maturity of fabrication processes**
- **Next step: identification & prioritisation of experimental needs for ATF testing**

Enhancing Experimental Support for Advancements in Nuclear Fuels and Materials

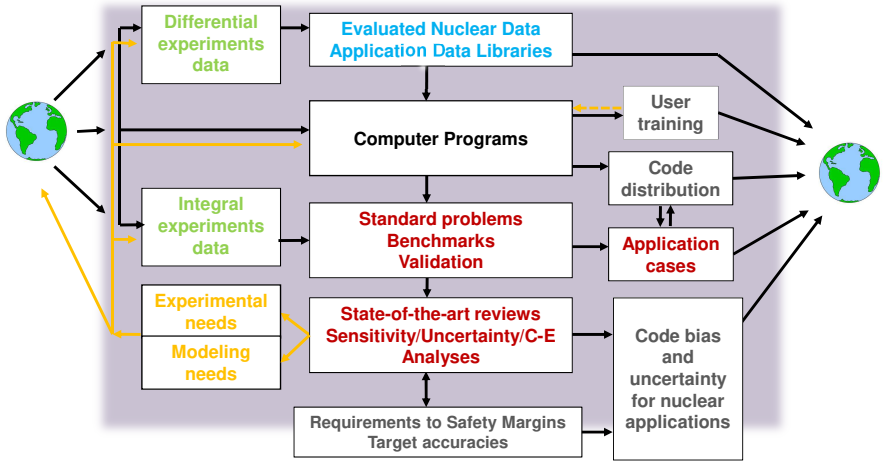
- NEA Nuclear Science Committee (NSC) initiative aiming at efficiently utilising experimental capabilities for testing of innovative fuels and materials
- Towards this goal, NSC organised a **Workshop** on 8-10 January 2018
  - High-level speakers representing utilities, fuel vendors, TSOs, regulatory bodies, research organisations and experimentalists.
  - Participants agreed on the importance of
    - Alignments for the use of material test reactors
    - International frameworks facilitating transport and disposal
    - Multi-national co-ordination of experimental programmes
  - Workshop follow-up: NEA is currently establishing a framework and collecting proposals aimed at optimally co-ordinating experimental activities

Looking Ahead

- Accompanying validation activities with focus on multi-scale and multi-physics modelling
- Enhancing knowledge management and preservation:
  - extending and improving existing collections of integral experiments on fuel performance and shielding experiments
- Supporting experimental activities for development and deployment of advanced nuclear fuels and materials
- Training, education and outreach of nuclear science products

Nuclear Science – Data Bank Knowledge 'Machine'

Experiments, Nuclear Data, Computer Programs, Verification & Validation, Feedback, Users



NEA DATA BANK products and benefits

- Data Bank member countries enjoy access to Computer Programme Services, including Codes and Databases of Experiments
  - the Codes include many of the world's cutting edge methods, with proven application for a broad range of applications
  - the Databases of Experiments are a unique collection of expertly evaluated information from the world's leading experimental facilities
- Data Bank countries nominate representatives to the Governing Bodies and Technical Groups who steer the Programme of Work
  - membership enables countries to share and exchange information on key national issues
  - priorities for the future development of Data Bank services, products and tools are decided through discussions around these issues

Activity of the Nuclear Development Committee

Nuclear Development Committee Focus Areas

- Uranium: resources, production and demand
  - Impact of uranium mining on economic dev.
- Long Term Operation of NPPs
- Reducing costs of nuclear power generation
- Projected costs of electricity generation (with IEA)
- Advanced Reactors Systems and Future Markets
- Security of supply medical radioisotopes
- Fuel cycle studies

2016-2017 publications

Thank you for your attention

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Nuclear Energy in a Global Dynamic

Nuclear Technology Development in the NEA Family

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Deputy Director-General and Chief Nuclear Officer

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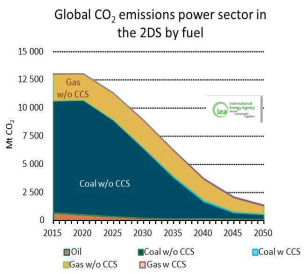
The Energy, Needs and Challenges

- No need to recall that Energy is and will stay a vital sector
  - 1.2 billion people without access to electricity
  - 2.7 billion people without clean cooking facilities
  - From 7.5 billion people today to 10 billion in 2050
  - 6.5 million premature deaths per year due to air pollution
  - two-thirds of the global greenhouse gas emissions today

The Energy, Needs and Challenges

- The power sector in the 2°C scenario:
  - A strong drop in carbon intensity
    - From 533 to 40 gCO_2/kWh by 2050
  - A sharp drop is urgent
    - By 2025, 50% of the cumulative emissions over the period 2015-2050 have been emitted
  - Beyond will require to address transport and heat generation for industry



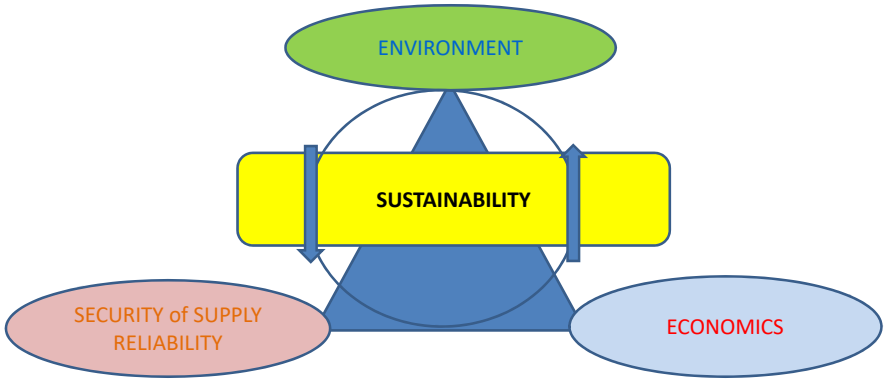
- Energy investments: 1 800 G$ = 2.4% of global GDP2015

Where/how to invest for a sustainable energy future?

Need for a Long-Term View

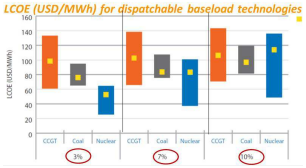
- Future of baseload generation?
- Distributed generation will overcome centralised one?
- Large nuclear generators still be optimum?
- Electricity storage technologies, when and what cost?
- Flexibility at the level of the generators or at the level of the electric system or both?
- Optimum share between nuclear and renewable?

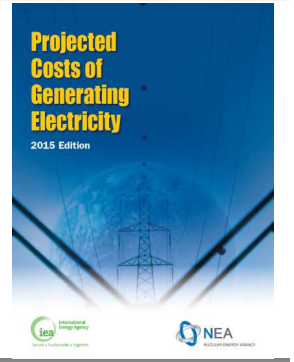
The Top Level Objectives for Energy Policy



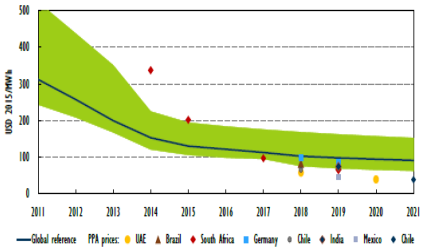
Cost of Nuclear in Perspective

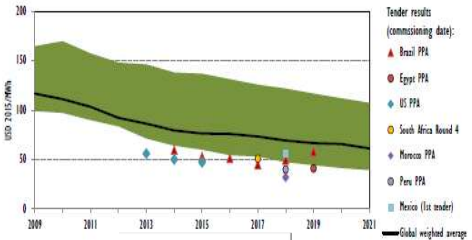
- Nuclear Levelized Cost of Electricity:
  - the lowest cost option at 3% discount rate
  - slightly lower than coal or gas at 7%
  - but is higher at 10%.
- Carbon price is essential for the competitiveness of low-carbon technologies
- Cost of renewables (in particular solar PV) has declined substantially and further cost reductions are expected.
- System costs beyond plant-level costs are becoming of more and more important.



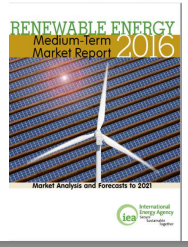


Variable renewable energy (VRE) costs decrease puts a target on the future competitiveness of nuclear



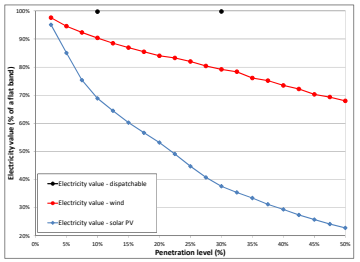


LCOE evolution for solar PV and wind between 2011 to 2021

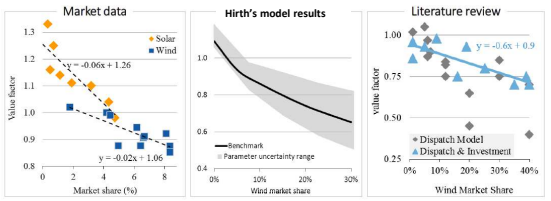


Importance of System Costs beyond Plant-Level Costs

- Value of VRE production declines with increasing penetration level due to the auto-correlation of VRE production



Source: NEA (2012)



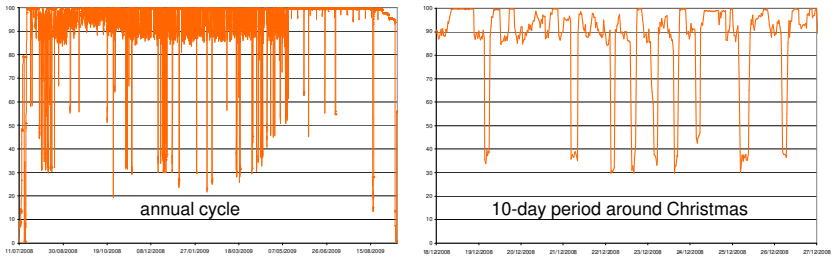
Source: Lion Hirth (2013)

- Value factor drop
  - by 50% at 30% for wind
  - by 50% at 15% for solar PV
  - by 0% for dispatchable energies

Another important system effect

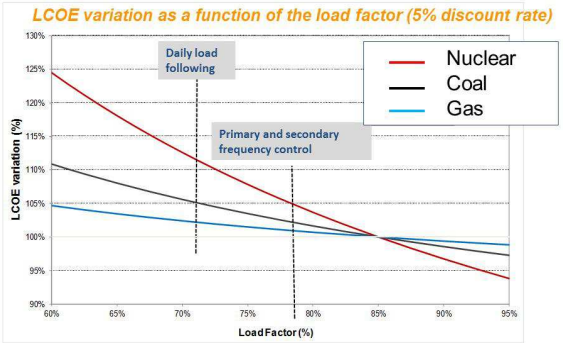
- Complete reconfiguration of the electricity generation
  - Coexistence of VRE and dispatchable energy (nuclear, …)
  - Priority given to VRE makes necessary flexibility
- Technically feasibility: example of power history of a PWR reactor:

Source: NEA (2012)



Flexibility has a significant system costs by increasing nuclear LCOE

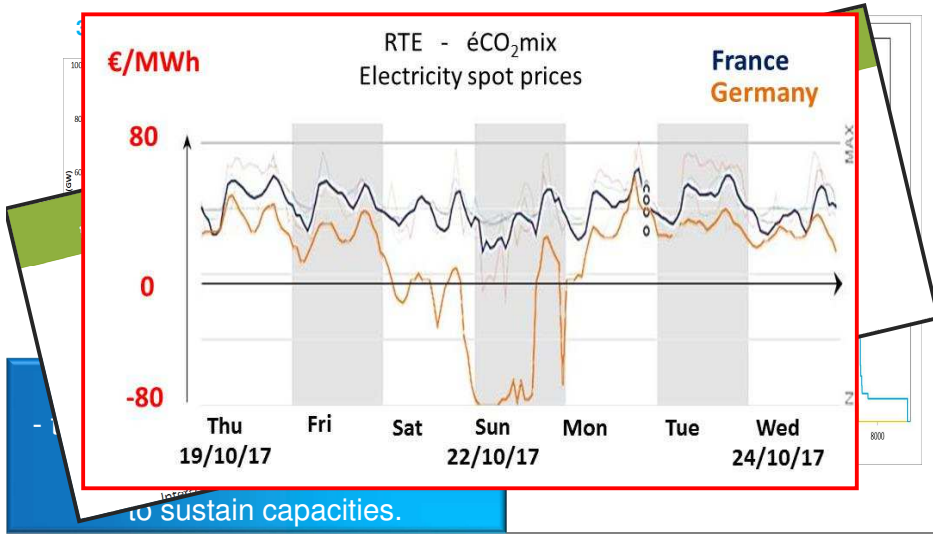
- Due to its high-investment cost, the LCOE for nuclear is sensitive to load factor variation.



Nuclear Enabler for or Victim from Variable Renewables?

- Growing/high penetration of VRE in number of countries
  - Cost of solar/wind technology ↘ but value ↘ with deployment
  - Growing needs of flexibility ↗ LCOE for capitalistic generators
- Risk of the present power market
  - Phasing out of dispatchable generators like nuclear
  - ↗ of low capital generators (gas) and ↗CO_2 in nuclear countries
  - Collapse of the investments dynamic in an unpredictable market
  - Grid stability and power quality at stake
- Nuclear
  - can mitigate these risks: CO_2-free baseload, provides the needed inertia to the grid, secure long-term capacities
  - If innovative enough to continue ↗ safety and ↘ costs

Necessary optimisation of the electricity market



To be part of the solution, nuclear technology has to innovate

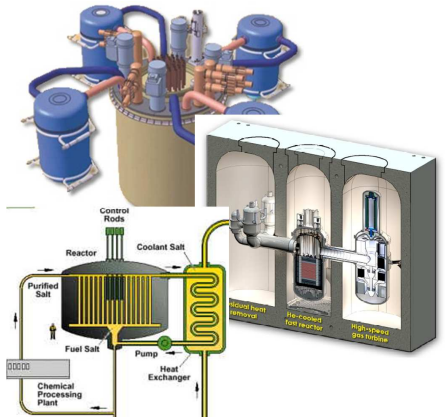
Improving cost effectiveness and flexibility

AND

Enabling further enhancements to safety at lower cost

Assuring that nuclear fits in the future global energy framework, by definition uncertain and changing.
(2015 worldwide Power investments: Renewable=288G$, Nuclear=21G$)

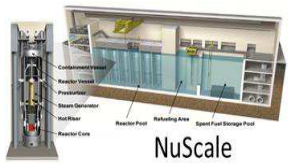
Nuclear Innovation 2050: Identifying Key Nuclear R&D Needs and Innovation Pathways

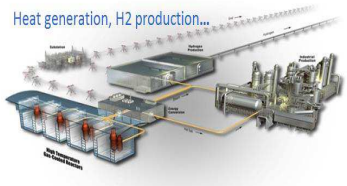


- What technologies will be needed in 10 years? 30 years? 50 years?
- What R&D is needed to make these technologies available?
- How do we regain the ability to push innovation into application?
- Is multilateral cooperation part of the solution?

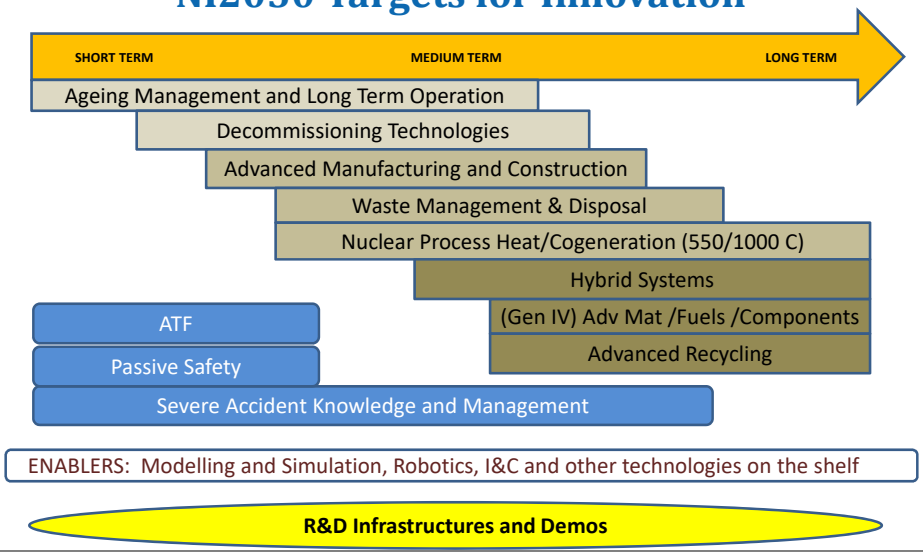
Fostering a new age of Innovation

- Through the "Nuclear Innovation 2050", NEA improves the interaction among industry, research and safety community
- To address
  - Accident tolerant fuels
  - Advanced reactors, including SMRs, passive safety
  - Digital instrumentation and control systems
  - Non-power applications
  - …

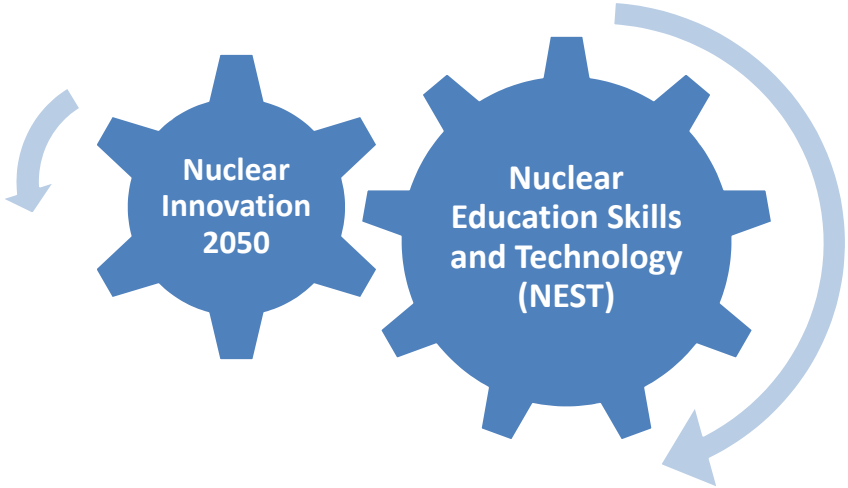




NI2050 Targets for Innovation



Innovation and Education: a Virtuous Circle



Enhancing innovation in nuclear is at stake. But, who will implement these technologies?

- Highly talented nuclear technologists were involved in nuclear research and projects in the late 1960s through the 1980s, having built their experience over decades of challenging projects.

Continued use of nuclear energy urgently needs highly-trained scientists and technologists to support present technology, to develop the technologies of the future and to manage nuclear legacies over the decades to come.

The NEST international model

Nuclear technology management, a change in the paradigm

- Technology evolution is mandatory not only to match needs BUT ALSO

  to attract and train new generations by the challenges of the today world - which in turn will make possible the innovation

- Complementary to the academic education, to the training by research,

training through innovation is NEST

Thank you for your attention

All NEA publications and institutional documentation available at
www.oecd-nea.org

NEA Joint Projects

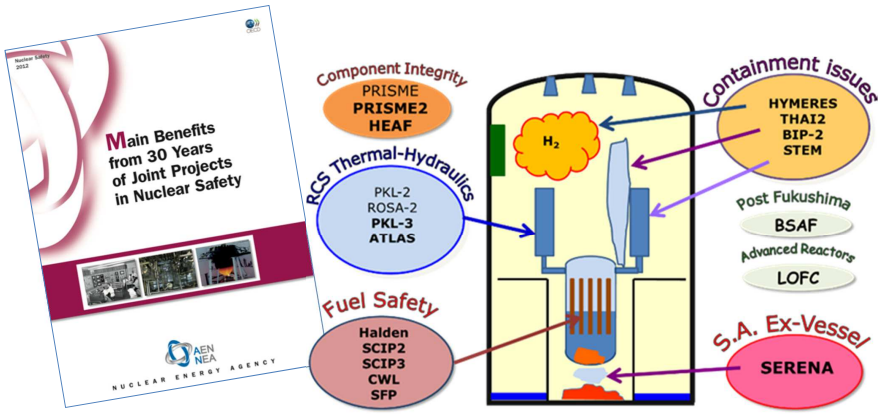
Ho Nieh
Head of the Division of Nuclear Safety Technology and Regulation

Meeting at the CNEN HQs, Rio de Janeiro, Brazil – 20 March 2018

Nuclear Safety Research "Joint Projects"

- The knowledge generated by international joint research projects are among the great achievements of the NEA.
  - Experimental research experiments and databases
  - Among interested countries on a cost-sharing basis
  - Usually related to the CSNI programme of work

Nuclear Safety Research Joint Projects



BSAF

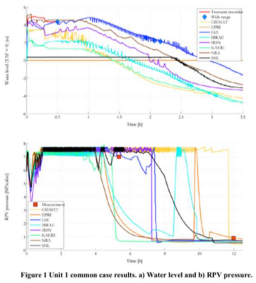


Figure 1 Unit 1 common case results. a) Water level and b) RPV pressure.

- Benchmark Study of the Accident at the Fukushima Daiichi Nuclear Power Station
- To strengthen the understanding and *modelling* of the accident at Fukushima Daiichi to support decommissioning and development of severe accident codes

- **BSAF:** the first 6 days
- **BSAF-2:** 3-weeks and fission product behaviour

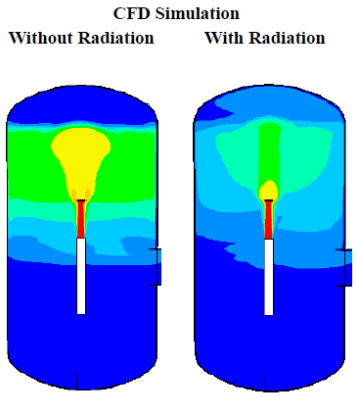
ATLAS

- Advanced Thermal-hydraulic Test Loop for Accident Simulation (ATLAS)
- Joint project providing scaled experimental data to support code development and validation
- Particular focus on behaviour in station blackout (SBO) conditions
- Tests confirmed the importance of auxiliary feedwater for decay heat removal as well as the need for further validation of passive cooling system performance.

Photograph shows the large-scale ATLAS facility at KAERI.

HYMERES

- Hydrogen Mitigation Experiments for Reactor Safety (HYMERES)
- Experimental project aimed at improving modelling of hydrogen behaviour in containment.
- Results have demonstrated the importance of various phenomena
  - e.g., modelling radiation heat transfer improves the agreement with experimental results.



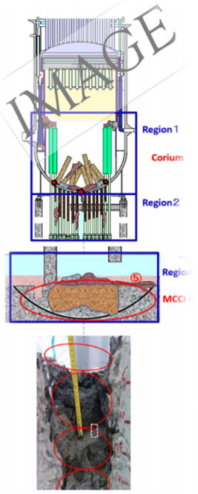
HEAF and PRISME

- Joint projects investigating fire phenomena relevant to nuclear plants.
  - HEAF (high energy arcing faults) – has demonstrated importance of electrical cabinet materials to the consequences of an arc fault.
  - PRISME (fire propagation in elementary multi-room scenarios) – has improved the understanding of heat and smoke propagation from a room with a fire to adjacent rooms

Top picture shows a medium voltage HEAF event, and bottom shows cable fire spreading in PRISME

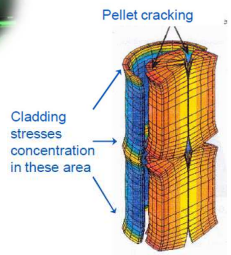
PreADES (New)

- Preparatory study on actual fuel debris analysis (PreADES)
  - Joint study on fuel debris characterization
  - Identifying needs and major issues for future fuel debris analysis
  - Planning a future international R&D framework using actual fuel debris from Fukushima Daiichi.
- Supports expanding the knowledge base of severe accidents and provides information to help the timely decommissioning of Fukushima Daiichi.



Halden Reactor Project

- Established in 1958, first and longest running NEA joint project with two main programmes:
  - Fuel & materials
  - Man, Technology and Organisation
- Has provided invaluable knowledge of nuclear fuel and materials performance under normal and accident conditions.



NEA Serviced body: MDEP

- Multinational initiative established in 2006
- Leverage resources and knowledge
- National regulatory authorities
- Primarily focused on review of new reactor designs

Key concept: MDEP will better inform the decisions of regulatory authorities through multinational co-operation, while retaining the sovereign authority of each regulator to make licensing and regulatory decisions.

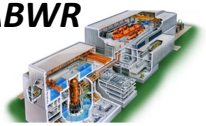
MDEP Member Countries

NEA is the Technical Secretariat

IAEA participates in MDEP generic activities.

MDEP Working Groups

ABWR



APR1400

Forum for Regulatory Authorities to disseminate information, discuss issues, understand differences and share questions for more informed and harmonized regulatory decisions

AP1000

EPR

MDEP also has issue-specific working groups dedicated to generic topics:

- ***Codes and Standards***
- ***Vendor Inspection***

VVER

The MDEP Policy Group approved the establishment of the ***HPR-1000 (Hualong One) Working Group*** in September 2017

Examples of Design-Specific Outputs

- Design-specific ***Common Positions***
  - Containment heat removal (EPR)
  - Digital instrumentation &control design (EPR)
  - Squib valve design (AP1000)
  - Fukushima lessons learned
- ***First Plant Only Test*** draft common position
  - Definition
  - Acceptance criteria

Issue Specific Working Group Outputs

- Vendor inspection co-operation
  - Technical reports and one common position on Quality Assurance
  - Multinational inspection protocol and best practices
  - Conducted over 70 vendor inspections
- Digital instrumentation and control
  - 12 common positions
  - Increased co-operation with IEC and IEEE
- Codes and standards
  - Technical reports and one common position
  - Coordination with standards development organisations

Thank you for your attention

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