The NEA: *Addressing Global Nuclear Challenges in an Era of Change*

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ATOMEXPO 2019

Introduction to the NEA Round Table:
Preparing for the Future: Innovations and Education

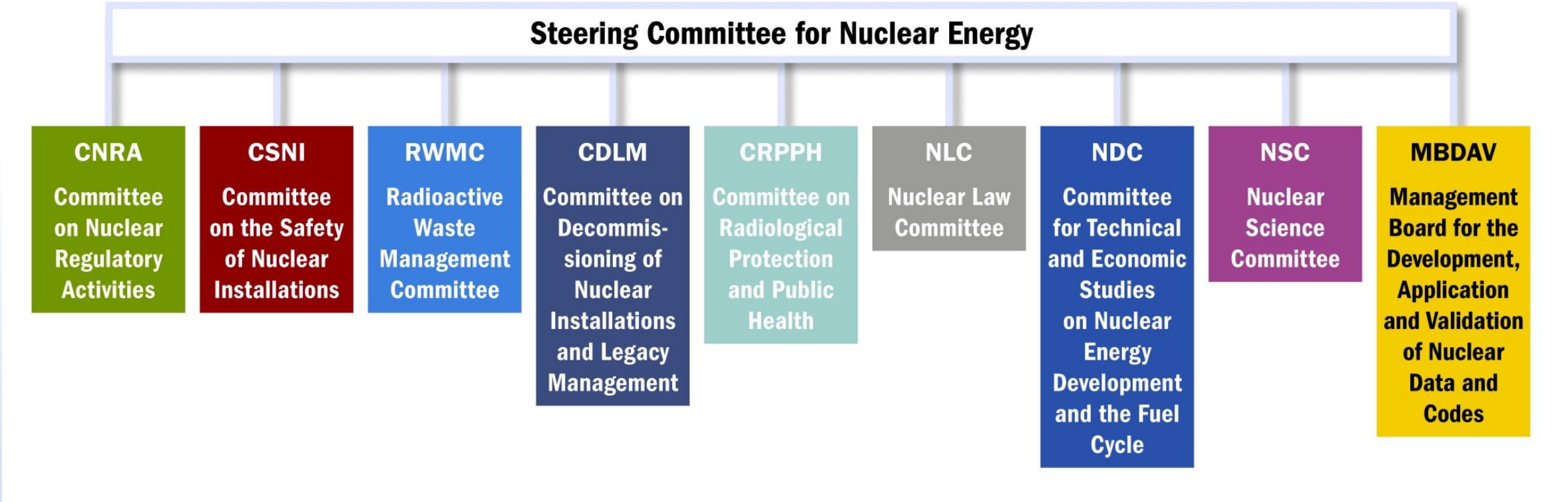
Sotchi, 15 April 2019

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

- 33 member countries + strategic partners (e.g., China and India)
- 7 standing committees and 72 working parties and expert groups
- The NEA Data Bank - providing nuclear data, code, and verification services
- Growing global relationships with industry and universities.

NEA countries operate about 86% of the world's installed nuclear capacity

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.

NEA Nuclear Science Activities

Nuclear Science Committee (NSC)

Expert Group on Multi-physics Experimental Data, Benchmarks and Validation (EGMPEBV)

Working Party on International Nuclear Data Evaluation Co-operation (WPEC)

- High Priority Request List for Nuclear Data
- Recommended Definition of a General Nuclear Database Structure

Working Party on Scientific Issues of the Fuel Cycle (WPFC)

- Liquid Metal Technology
- Fuel Recycling Chemistry
- Advanced Fuel Cycle Scenarios
- Innovative Structural Materials
- Innovative Fuels

Working Party on Multi-scale Modelling of Fuels and Structural Materials for Nuclear Systems (WPMM)

- Multi-scale Modelling Methods
- Structural Materials Modelling
- Multi-scale Modelling of Fuels

Working Party on Nuclear Criticality Safety (WPNCS)

- International Criticality Safety Benchmarks Evaluation Project
- International Assay Data of Spent Nuclear Fuel Database

Working Party on Scientific Issues of Reactor Systems (WPRS)

- International Reactor Physics Experiments
- Reactor Physics and Advanced Nuclear Systems
- Uncertainty Analysis in Modelling
- Reactor Fuel Performance
- Radiation Transport and Shielding

NEA joint project in the nuclear science area:

- Thermodynamics of Advanced Fuels – International Database (TAF-ID) Project
- Thermodynamic Characterisation of Fuel Debris and Fission Products Based on Scenario Analysis of Severe Accident Progression at Fukushima Daiichi Nuclear Power Station (TCOFF) Project
- Nuclear Education, Skills and Technology Framework (NEST)

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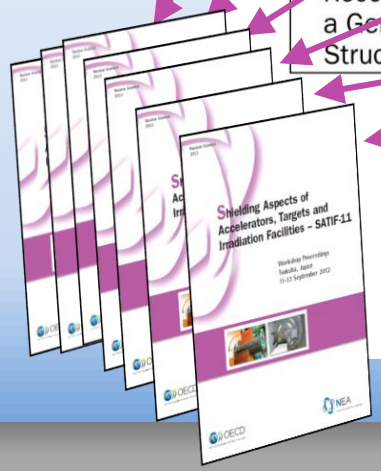

Nuclear Science Work Areas
- ***State-of-the-art reviews***
- ***Benchmark studies***
- ***Sensitivity & Uncertainty Analyses***
- ***Workshop/Seminar/Conference proceedings***

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Major NEA Separately Funded Activities

NEA Serviced Organisations

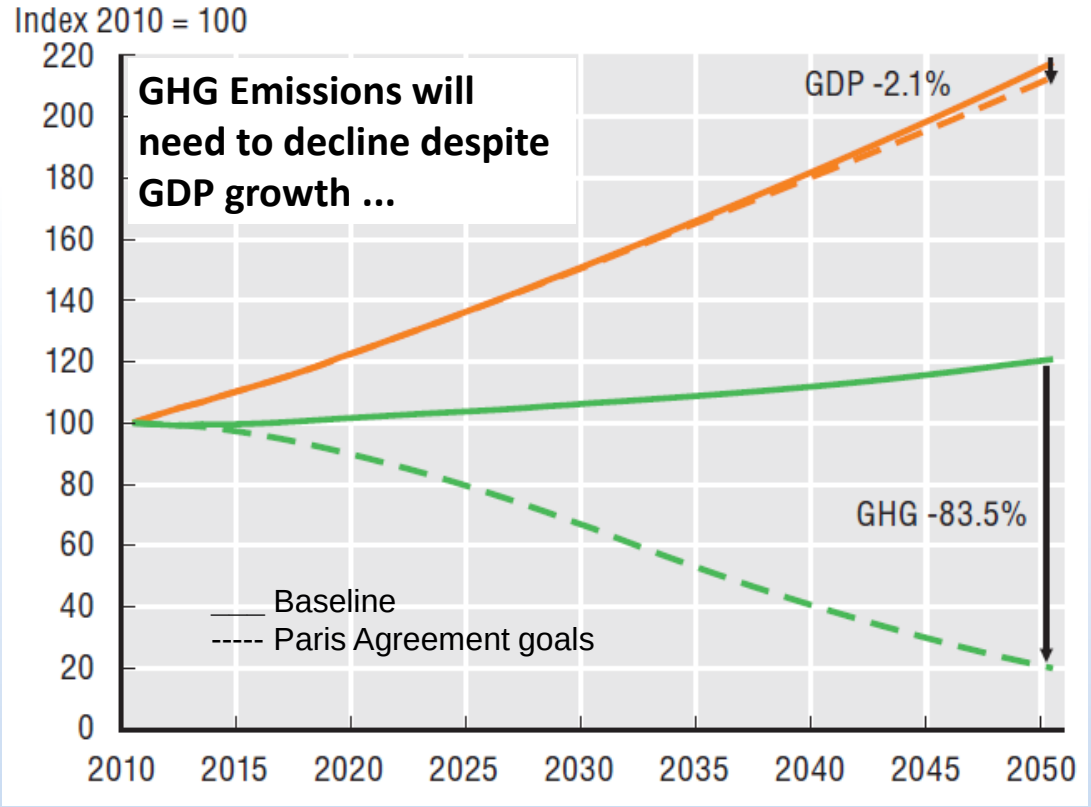
- **Generation IV International Forum (GIF)**
  with the goal to improve sustainability (including effective fuel utilisation and minimisation of waste), economics, safety and reliability, proliferation resistance and physical protection.
- **Multinational Design Evaluation Programme (MDEP)**
  initiative by national safety authorities to leverage their resources and knowledge for new reactor design reviews.
- **International Framework for Nuclear Energy Cooperation (IFNEC)**
  forum for international discussion on wide array of nuclear topics involving both developed and emerging economies.

23 Major Joint Projects

(Involving countries from within and beyond NEA membership)

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

Paris Agreement Implies a 50 gCO2/kWh Target

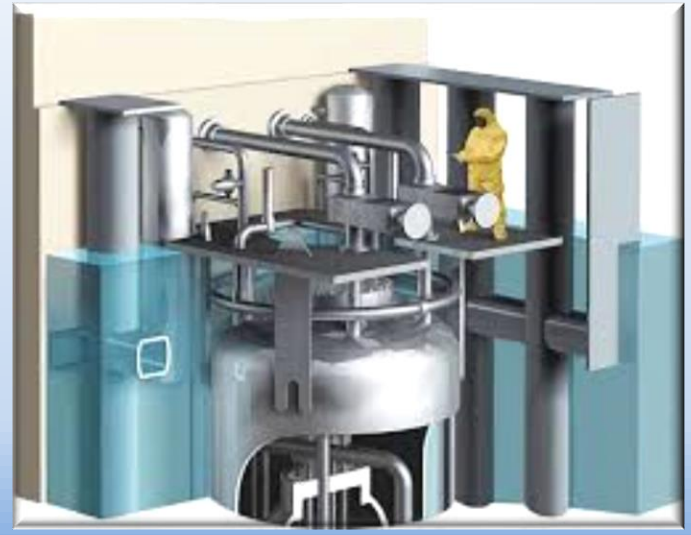


- Paris Agreement is intended to hold “increase in global average temperature to well below 2°C”.
- Current emission intensity is **570 gCO2/kWh** - target is **50 gCO2/kWh**
- Electricity contributes 40% of global CO2 emissions and will play key role. Annual emissions from electricity will need to decline 73% (global) and 85% (OECD countries).

Source: OECD Environmental Outlook

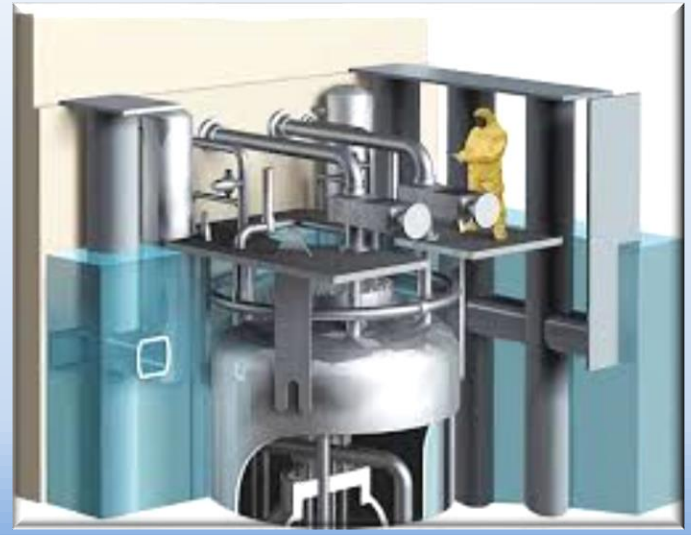
Key Observations (1)

- Large deployment of VRE will occur around the world and provide important benefits.
- The contribution of VRE in each country will depend on the cost of available resources – low cost for VREs can offset system costs and allow greater deployment.
- However, significant questions remain as to whether VRE penetration above 40-50% is realistic without major technological development.



Key Observations (2)

- According to Eurostat, CO_2 emissions in the EU increased **1.8 percent in 2017** despite a 25 percent increase in wind power and 6 percent growth in solar.
- While electricity production receives most focus, around 20% of all , CO_2 emissions originate from industrial processes.
- Nuclear energy can play a large role in the future of both electricity and industrial heat – if it can adapt to future markets.

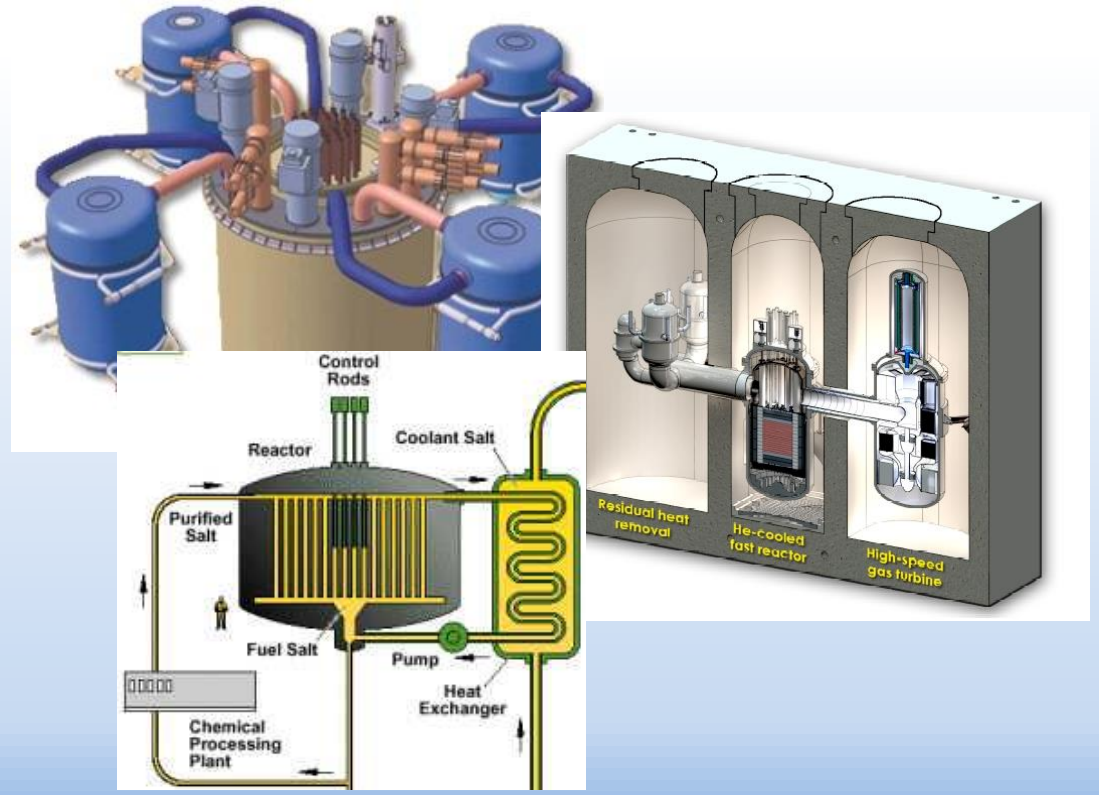


Innovation is Needed to Assure the Long-Term Role of Nuclear Energy

- **Improving cost effectiveness and flexibility**
- **Enabling further enhancements to safety at lower cost**
- **Assuring a sustainable, long-term fuel cycle while addressing policymaker concerns about nuclear proliferation**
- **Resolving questions about nuclear waste and environmental impacts**
- **In general: It is necessary to assure that nuclear fits in the future, as yet uncertain, global energy framework.**

But the global capacity to develop and deploy nuclear energy technology innovations is contracting at a time of greatest need

Nuclear Innovation 2050:
Pursuing Global Agreement on the Nuclear R&D Needs for the Future



- What technologies will be needed in 10 years? 30 years? 50 years?
- What R&D is needed to make these technologies available?
- Is the global community doing the R&D needed to prepare for the future?
- Can we cooperate to do more?

Who Will Implement the Needed Technologies?

- The global current talent base in nuclear technology has been built over several decades.
- The most experienced core of nuclear technologists were involved in nuclear research and projects in the late 1960s thru the 1980s.
- **A very large portion of that generation is nearing retirement**

The world needs new, highly-trained nuclear scientists and technologists to support the continued use of nuclear energy, to develop the technologies of the future, and to manage nuclear legacies over the decades to come.

The NEA Nuclear Education, Skills and Technology Framework (NEST)

- **Now being developed to energize young engineers and scientists to pursue careers in nuclear technology by:**
  - Establishing a multinational framework between interested countries (10 thus far) to maintain & build skills capabilities
  - Establishing international links between universities, academia, research institutes and industry
  - Attracting technologists from other disciplines to address nuclear technology issues
  - Solving real-world problems

Thank you for your attention

More information @ **www.oecd-nea.org**

All NEA reports are available for download free of charge.

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