

Nuclear Innovations for Net Zero Opportunities and Challenges

Aline des Cloizeaux
Director of the Division of Nuclear Power

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From Why to How



Half of CO2 emission reductions will come from technologies not yet on the market

Accelerating the pace of nuclear energy deployment

Inclusivity and Holistic Approach

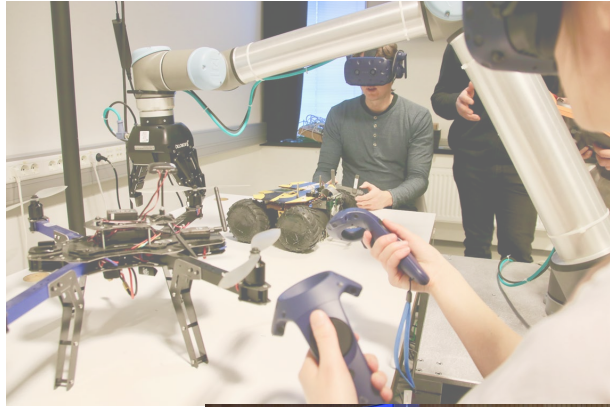
Nuclear Innovations for Net Zero



1. The role of innovative solutions to support operating plants and nuclear development
2. Innovations in reactor technology
3. Nuclear power going beyond electricity production
4. Innovation is not only about technology!



Innovative Solutions to Support operating Plants and Nuclear Development



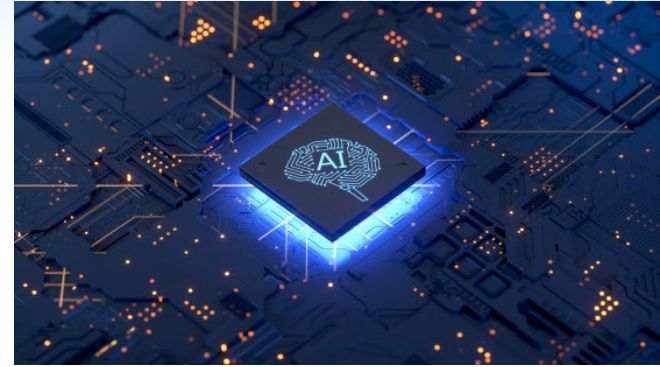
▶ IAEA International Network on Innovation to Support Operating Nuclear Power Plants (ISOP)

▶ Nuclear Harmonization and Standardization Initiative (NHSI)

Innovation at Operating NPPS

Artificial Intelligence

- Predictive maintenance
- Core design optimization
- Ongoing work related to ‘explain-ability’ and the development of regulatory frameworks.



Innovation at Operating NPPS

Advanced Manufacturing

- Alternative to ageing or non-existent supply chains
- Accelerate deployment of new technologies
- Reduced cost
- Ongoing work on qualification and engineering codes & standards



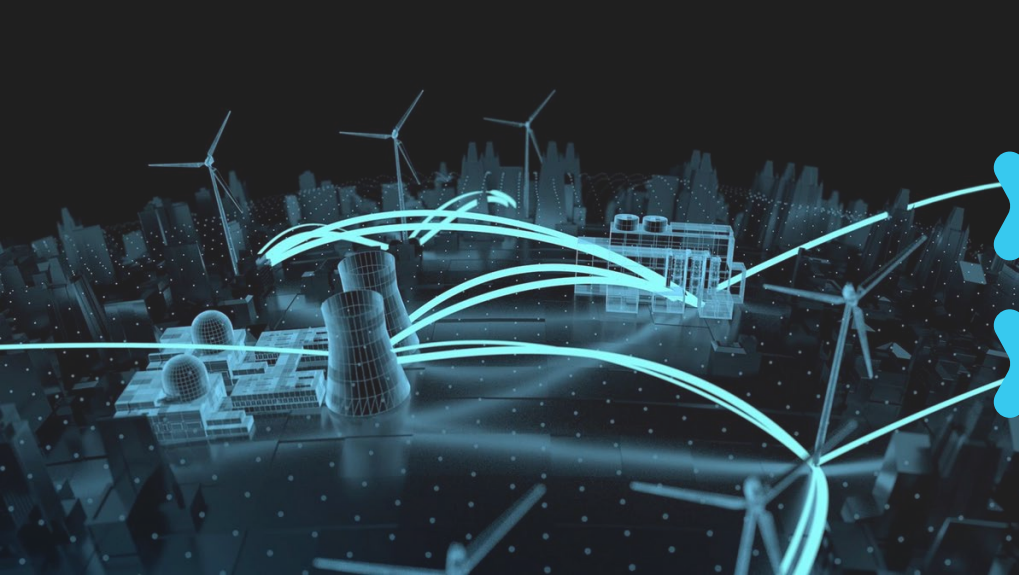
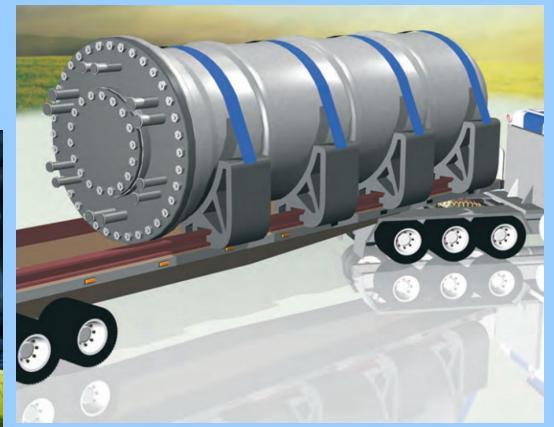
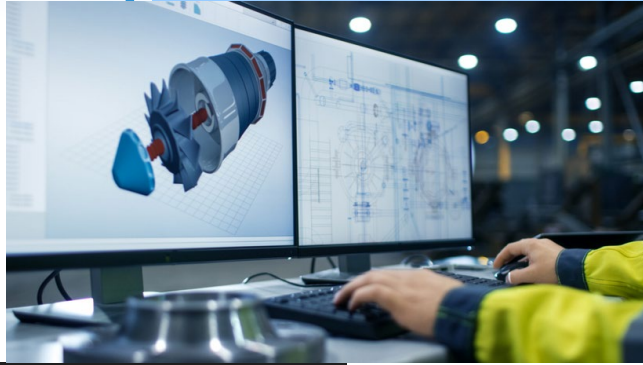
Innovation at Operating NPPS

Robotics & Drones

- Improve safety
- Reduce dose
- Gain access to isolated areas for measurements and inspections
- Off-the-shelf products and custom solutions are already being deployed at operating NPPs



New Nuclear Reactors for Energy Production

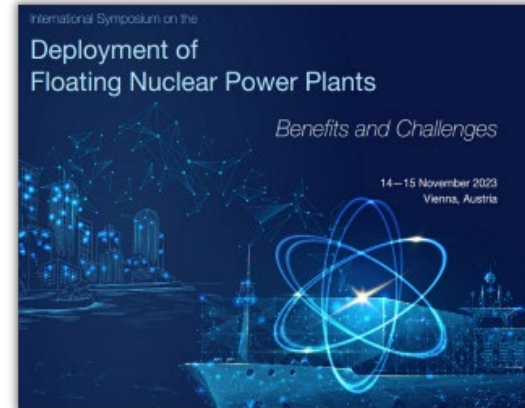


New reactor concepts

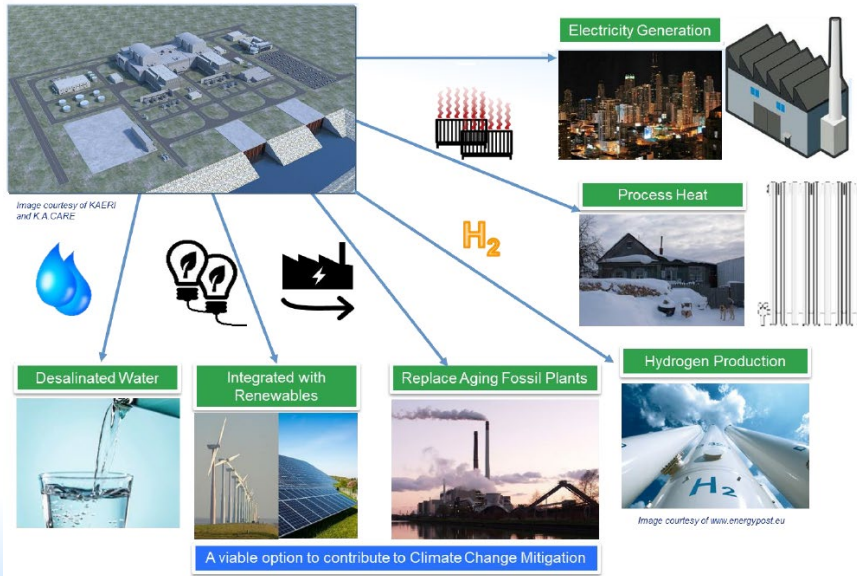
How innovative small and large reactors will shape our energy future

SMR potential game changers

- **The IAEA SMR Platform and SMR Portal (<https://smr.iaea.org>)** provides latest news, IAEA events, and publications on SMRs
- **ARIS Database** reference for advanced reactors
- Transportable NPPs
- **SMR 2024 Conference** 21-25 Oct



Nuclear Power Beyond Electricity Production

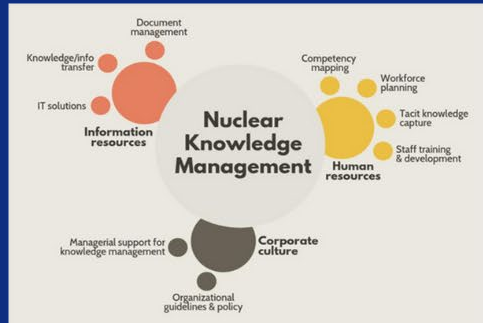


- ▶ New areas of application to avoid greenhouse gases
- ▶ Innovative concepts could contribute to a wide range of deployment options

Capacity Building


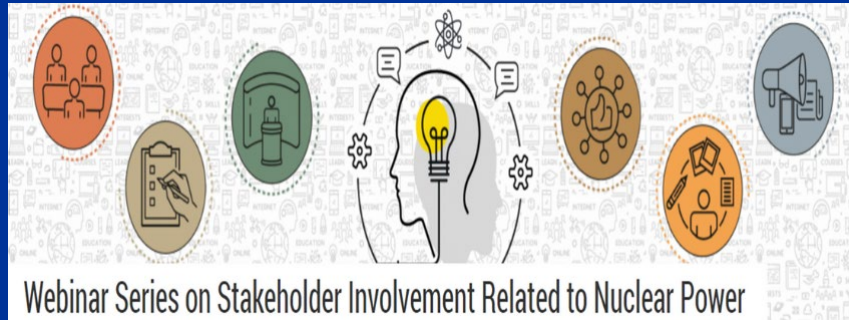


>1100 on-line training & education courses



~1800 participants from around 80 MS

Stakeholder Engagement



Looking ahead

IAEA

-  SE Conference, 26-30 May 2025
Organization to start in Q4 2023
-  SE School, November 2024
Curriculum by IAEA & external experts
(consultants' meeting in January 2024)
-  LinkedIn Network, 2023/24
Connecting professionals & amplifying messages
-  SE Advisory Service, 2024
Under development

A vertical timeline graphic titled 'Looking ahead' with the IAEA logo at the top right. It lists four future initiatives, each with a circular icon and a text box containing details. The background features a stylized landscape with green hills and blue water.

IAEA supporting countries all along their journey to nuclear power



NUCLEAR POWER INFRASTRUCTURE DEVELOPMENT

Nuclear power option included in national energy strategy

MILESTONE 1

Ready to make a knowledgeable commitment to a nuclear power programme

PHASE 1
Considerations before a decision to launch a nuclear power programme is taken

MILESTONE 2

Ready to invite bids/negotiate a contract for the first nuclear power plant

PHASE 2
Preparatory work for the contracting and construction of a nuclear power plant after a policy decision has been taken

MILESTONE 3

Ready to commission and operate the first nuclear power plant

PHASE 3
Activities to implement the first nuclear power plant

AT LEAST 10–15 YEARS

FIRST NUCLEAR POWER PLANT PROJECT

Pre-project activities

Project development

Final investment decision
Contracting
Construction

Commissioning
Operation
Decommissioning

Economics and Finance

Climate Change and Nuclear Power 2024: *Financing Nuclear Energy for Low Carbon Transitions* (CCNP 2024 in preparation)

- **Economics** of nuclear power and **de-risking** nuclear investment
- **Financing methods** for nuclear new build and long-term operations
- **Sustainable financing** methods such as green bonds, infrastructure funds, and multilateral financing arrangements
- Financing pathways for **SMRs**
- Considerations for **emerging markets and developing economies**



CCNP series

To be released at G20 Energy Ministerial/CEM – in Oct 2024,
and as input to COP 29 events and discussions

Save the dates

Upcoming events

- 18-21 June TM **Innovation for LTO** (Vienna)
- 24-27 June **Global Forum on Nuclear Innovation – GFNI-3** (Miami)
- 19-23 August TM on Deployment of **Advance Manufacturing** Solution for the Nuclear Power Industry
- September – Operators Forum on **AI (Proposed GC Side Event)**
- 21-25 October: **SMR 2024 Conference**
- Q3 – Launch **Next Generation I&C** working group (Vienna)
- 4-7 November TM on Capitalizing on **AI** Analysis (Vienna)

