IAEA
International Atomic Energy Agency

Workshop on Non-Electric and Hybrid Applications of Nuclear Energy (NEaNH) Task Force

Francesco Ganda,
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26 April, 2024

Introduction on the IAEA

Organization of the Secretariat:

- Director General
- Director General's Office
- Secretariat of the Policy-Making Organs
- Offices of Legal Affairs; Public Information and Communication; and Internal Oversight Services, and
- 6 Departments:

Nuclear Energy	Nuclear Sciences and Applications	Nuclear Safety and Security
Safeguards	Technical Cooperation	Management

IAEA Project on Non-Electric Applications
H_2 prod., Desalination, District heating, Ind. use of heat

E&T, knowledge transfer

- TC projects
- Training workshops

R&D

- Coordinated Research Projects (CRPs)
- Collaborating Centres

Events

- Technical Meetings
- Research Coordination Meetings
- Consultancy Meetings
- Webinars
- Conferences
- TWG-ND meeting

Tools & Toolkits

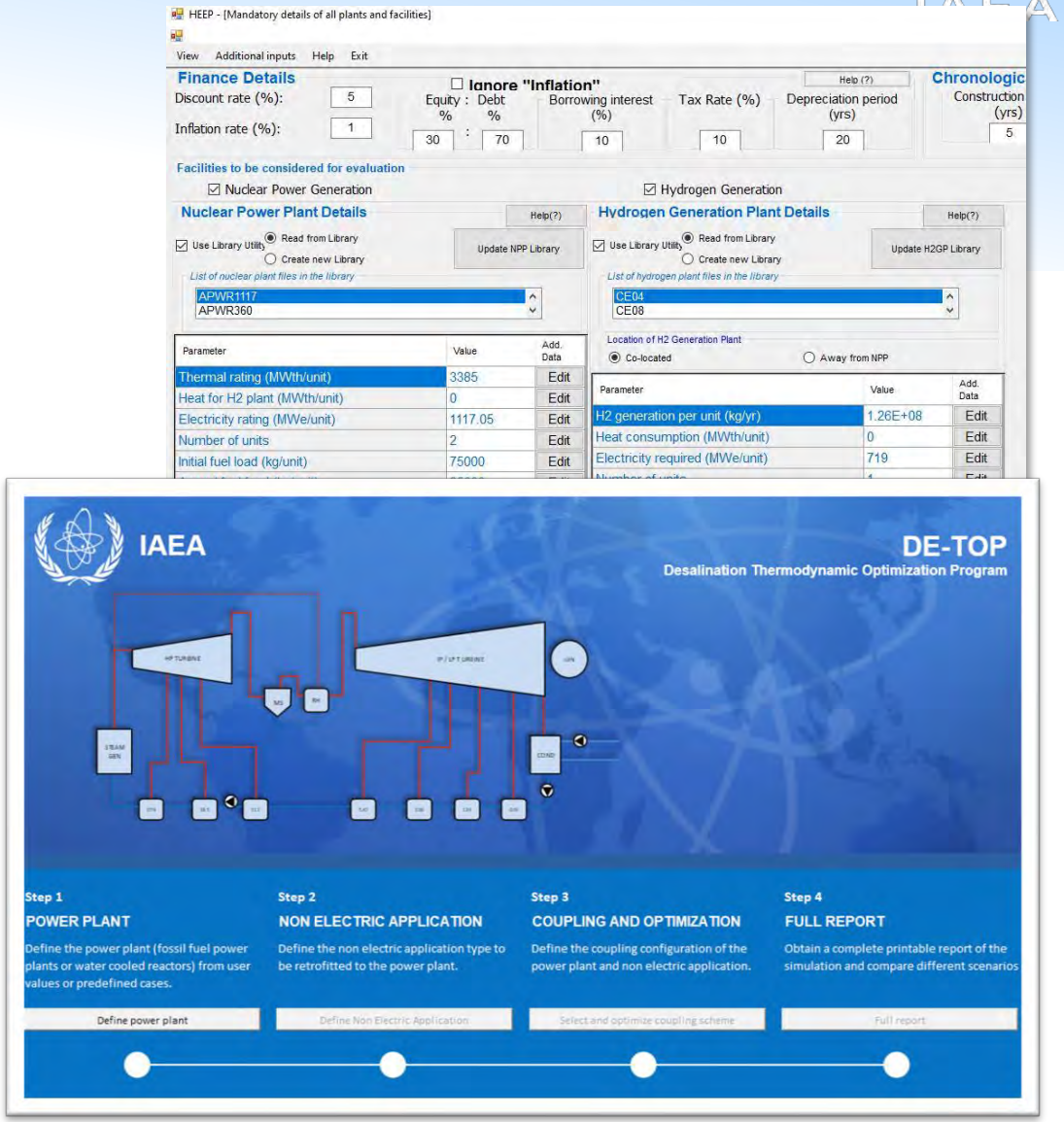
- HEEP
- DEEP
- DE-TOP
- WAMP
- Hydrogen Toolkit
- Desalination Toolkit
- FRAMES

Publications

- Technical Documents
- Nuc. Energy Series Documents
- Meeting Reports
- Peer-Reviewed Journal Publications
- Conference Papers

IAEA cogeneration tools and toolkits

- HEEP: Techno-economic assessments of hydrogen generation options.
  New version released on the IAEA website since Nov 2021 (improved GUI and sensitivities studies)
- DEEP: Techno-economic assessments of desalination options.
- DE-TOP: Thermodynamic coupling for cogeneration.
- WAMP: Water management at nuclear plants
- HydCalc: Hydrogen production cost calculator with nuclear and other technologies.
- Toolkit on nuclear hydrogen.
- Toolkit on nuclear desalination.
- FRAMES: Integrated assessment of energy systems, including for H_2 production.



IAEA cogeneration future projects, CRPs

The Roadmap Initiative

- Completed the set of meetings for input from experts and MS in 2022.
- Publication (Nuclear Energy Series) in final stages of release.

New Coordinated Research Project (CRP)

- **Role of Nuclear Cogeneration for sustainable development**
- First Research Coordination Meeting – November 2023 (11 participants) https://www.iaea.org/projects/crp/i35008
- For nuclear cogeneration, with a focus on advanced nuclear hydrogen production, on advanced desalination using nuclear energy, district heating and industrial uses of nuclear heat.

Completed Coordinated Research Project Dedicated to Nuclear Hydrogen

- 2018-2022 - **Assessing Technical and Economic Aspects of Nuclear Hydrogen Production for Near-Term Deployment**.

High Temperature Processes for Nuclear Hydrogen Production

- **Advances on high temperature water splitting processes with emphasis on HTSE for near term deployment of Nuclear hydrogen** (CM & TM in 2023).
- Thermal processes are a key competitive advantage for nuclear energy among the low-carbon options;
- Focus on both High Temperature Steam Electrolysis and Thermochemical Processes.
- Will start working on the manuscript soon, incorporating into update of the 2012 NES.

IAEA cogeneration meetings and events

- IAEA GC65 side event:
  Innovations in the Production and Use of Nuclear Hydrogen for a Clean Energy Transition,
  September 21, 2021.

- TM *"Developing a Roadmap for the Commercial Deployment of Nuclear Hydrogen Production"* (jointly organized with PESS, April 5-7, 2022) - CM (September 19-23).

- *International Workshop on the Role of Low Carbon Hydrogen for a Net Zero Energy System* – June 22-24, Aix-en-Provence, France, CEA + IEA (H2 TCP) + IAEA, PESS + NPTDS.

- World Hydrogen Energy Conference, Istanbul, Turkey, 26-30, 2022, organized in cooperation with the IAEA.

- IAEA Scientific Forum – September 2023.

- *Advances in High Temperature Processes for Hydrogen Production with Nuclear Energy* – CM & TM in 2023.

- CM & TM - Advances in Desalination Technologies and Uses for Optimal Coupling with Nuclear Plants, Including SMRs

- TM on cogeneration (including hydrogen) scheduled for December 2024 (Vienna).

IAEA hydrogen-related publications

- TECDOC - *Hydrogen as an Energy Carrier and its production by Nuclear Power,* (1999)
- NES - *Hydrogen Production using Nuclear Power,* (2012)
- TECDOC - *Examining the Techno-economics of Nuclear Hydrogen Production and Benchmark Analysis of the IAEA HEEP Software* (2018).
- NES - *Vendor and user requirements and responsibilities in nuclear cogeneration projects,* (2023).

Upcoming

- NES - *Roadmap for the Commercial Deployment of Nuclear Hydrogen Production (in publication)*.
- TECDOC - *Outcomes of the CRP Assessing Technical and Economic Aspects of Nuclear Hydrogen Production for Near-Term Deployment* (in publication).
- NES - *Nuclear cogeneration towards climate change mitigation and sustainable development goals,* (in preparation).

In early stage

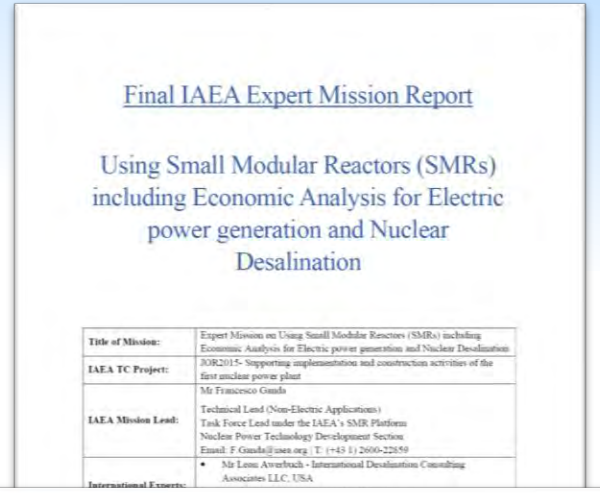
- NES - Advances in High Temperature Processes for Hydrogen Production with Nuclear Energy – Update of NES - Hydrogen Production using Nuclear Power (expected 2024-2025)

Engagement with outside entities for IAEA project on non-electric applications

- H2-VAL (NEA/OECD) – IAEA nominated representative
- IEA H2-TCP Task 44: Hydrogen from Nuclear Energy
- GIF – NEaNH Task Force - IAEA nominated representative
- Collaborating centre with Ontario Tech University
- UNECE – UN European Commission on Energy – H2 Task Force, IAEA nominated representative
- TANDEM Project - IAEA nominated representative & part of the 4-people Scientific Advisory Committee (SAC) committee
- Nuclear Hydrogen Initiative – Technology Working Group
- IDRA (International Desalination & Water Reuse Association) – (Possibly) Special Track on nuclear desalination
- SNETP (Sustainable Nuclear Energy Technology Platform) – Nuclear Cogeneration Industrial Initiative - NC2I (Practical Arrangement with IAEA)

Other major activities of IAEA non-electric applications project

- Support to Member States upon specific request
  - Conducted a 1-week workshop on Nuclear Desalination using SMR for the Country of Jordan in Nov 2022;
  - Completed an Expert Mission on Nuclear Desalination using SMRs for the Country of Jordan in October 2023, through the IAEA SMR platform.
- Engagement with specific industrial sectors for decarbonization
  - Oil/gas: June 2023 initial meeting
  - Attended zero carbon steel event in Stockholm in Oct 2023
  - Planned large technical meeting on techno/economics in Dec 2024
- Incorporate heat models in FRAMES for non-electric applications
  - Unit Commitment /Capacity Expansion optimization tool, utilized for study on decarbonizing the UK using hydrogen (with URENCO/Aurora Energy Res) 2021
  - To support modelling of large systems with heat demand (district heating, desalination, H2 production with/without heat, direct heat for industry etc.)
  - Testing/validation under way (May 2023 and most recently new activity started in March 2024).


Final IAEA Expert Mission Report

Using Small Modular Reactors (SMRs) including Economic Analysis for Electric power generation and Nuclear Desalination

Title of Mission:	Expert Mission on Using Small Modular Reactors (SMRs) including Economic Analysis for Electric power generation and Nuclear Desalination
IAEA TC Project:	JOR2015- Supporting implementation and construction activities of the first nuclear power plant
IAEA Mission Lead:	Mr Francesco Gonda Technical Lead (Non-Electric Applications) Task Force Lead under the IAEA's SMR Platform Nuclear Power Technology Development Section Email: F.Gonda@iaea.org ; T: (+43 1) 2600-22859
International Experts:	• Mr Leon Awerbuch - International Desalination Consulting Associates LLC, USA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04 Oct 2023
Lucy Ashton, IAEA Department of Nuclear Energy

The 5 MW Jordan Research and Training Reactor, which received its operating license in 2017, is an example of the progress Jordan is making on nuclear science and technology. (Photo: D. Calma/IAEA)

Related stories

SMR Platform: New Web Portal Facilitates Technical Support

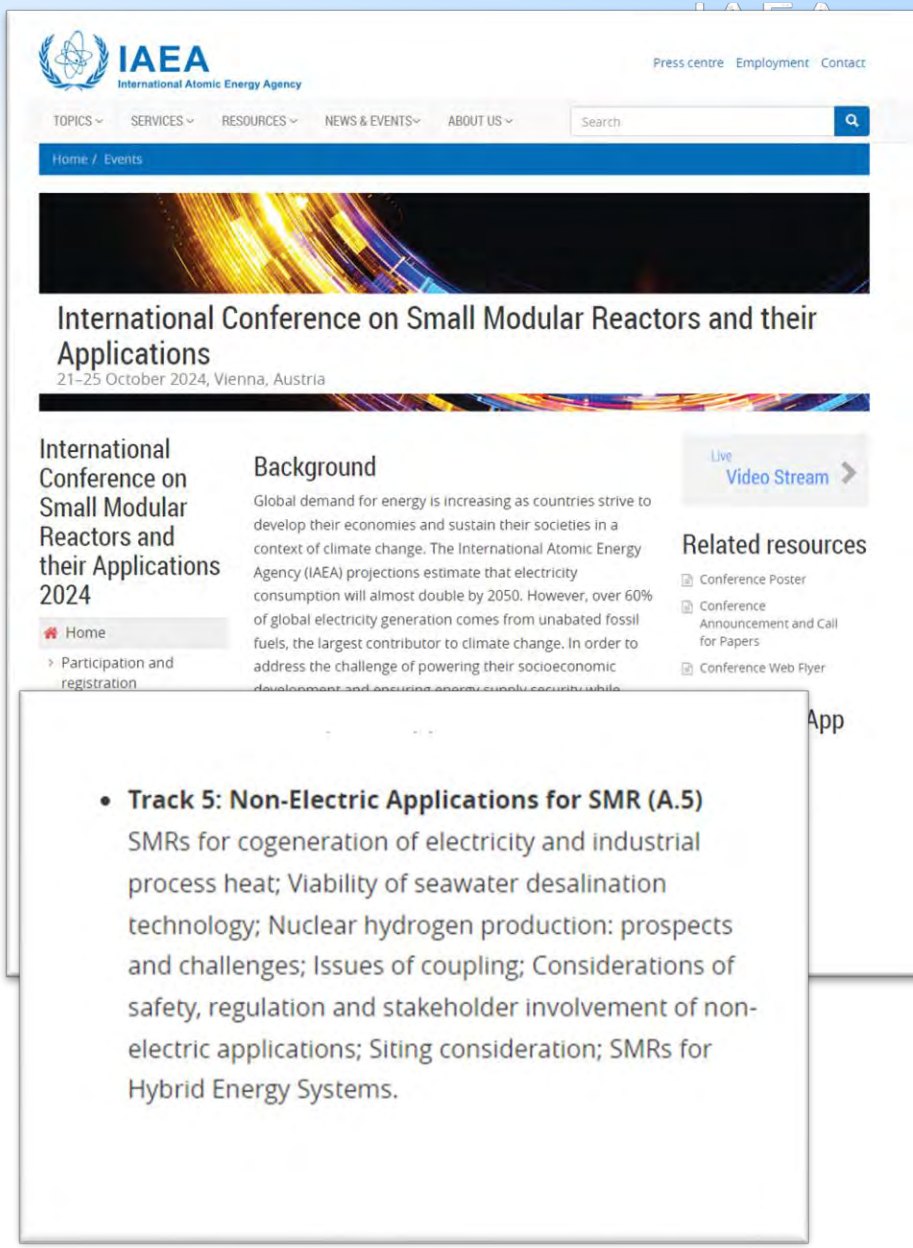
What are Small Modular Reactors (SMRs)?

Successful Techniques to Cut Nuclear Construction Times Showcased at IAEA General Conference

IAEA SMR Platform Event Showcases Tools to Assess Reactor Technologies for National Needs

Other major activities of IAEA non-electric applications project

- Safety of cogeneration, including H2 and industrial heat
  - Kick-off consultancy meeting in July 2023; 2nd consultancy planned for October 2024 - TM and publication in 2025
- Milestone for cogeneration
  - Requested by SAGNE and by several MS - Kick-off CM in Q4 2024 or Q1 2025
- IAEA SMR Conference – October 21-25, 2024
  - Lead Task 5 for non-electric applications for SMR (A.5) – Abstract review in progress with 5 external reviewers
- Technical Working Group on Nuclear Desalination (TWG-ND)
- *Interregional Training Course on Specific Design Considerations of Nuclear Cogeneration Projects using SMRs/MRs*, 16-20 October, Moscow.
- Advances in Desalination Technologies and Uses for Optimal Coupling with Nuclear Plants, Including Small Modular Reactors
  - CM & TM in 2023 – Publication in progress



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Thank you

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