COP 28 Update & Role of Nuclear Energy. Nuclear Projects Of Romania

"Romania's Role in Ensuring Energy Security of Europe" Conference. Decarbonization Policies in South East Europe – Between Climate Change and War

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COP 28 Update & the Role of Nuclear Energy

- **February 28th, 2023**, the **EU Nuclear Alliance** sent a clear signal to recognize the role of nuclear in decarbonization and security of supply.
- The Alliance includes 12 EU MS: Bulgaria, Croatia, Czech Republic, Finland, France, Hungary, the Netherlands, Poland, **Romania**, Slovakia, Slovenia and Sweden
- **30 Nov-13 Dec 2023**, the international support for nuclear power was materialized in **COP28**, held in Dubai,), called by some "*The Nuclear COP*“ (quoting ANS), marked a significant shift in global energy discussions, with the signing of the declaration on **tripling nuclear power production by 2050**.

Source: GOOGLE

COP 28 & nuclear energy

COP 28 Insights: Emphasized nuclear energy, especially Small Modular Reactors (SMRs), as key to achieving net-zero emissions. Highlighted for flexibility and compatibility with renewable sources, marking a pivotal shift towards sustainable energy.

Clean Energy Champion: Recognized as a low-carbon solution, nuclear power stands out for its minimal greenhouse emissions compared to fossil fuels. The Net Zero Nuclear Industry Pledge, supported by 120 companies across 25 countries, aims to triple nuclear capacity by 2050 for a greener planet. SNN joined the Pledge.

Enhancing Energy Security: Offers a reliable alternative to unstable fossil fuel markets, promoting energy independence and national security amidst geopolitical tensions.

Economic and Social Benefits: Drives economic growth, innovation, and high-skilled job creation, supporting global economic stability and local economies.

Safety and Sustainability Advances: Showcases advancements in waste management and safety, addressing public concerns and demonstrating a commitment to environmental protection.

Global Collaboration for Progress: Stresses the importance of international partnerships in overcoming technical and regulatory challenges, fostering a unified approach to nuclear energy development.

Alignment with SDGs: Supports United Nations' Sustainable Development Goals by providing clean, affordable, and reliable energy, contributing to climate action, economic growth, and sustainable communities.

Public Perception and Integration with Renewables: Initiates efforts to improve nuclear energy's public image and demonstrates its role in complementing renewable sources for a balanced and stable energy supply.

Policy and Investment Need: Calls for supportive policies and investments to facilitate the growth of nuclear technology, ensuring a cleaner, sustainable energy future.

Following COP 28: the Role of Nuclear Energy

- The press release of the **EU Nuclear Alliance** from **March 4th, 2024** contemplated the following topics:
  - Dialogue and a closer cooperation have been created among the participants with the European Commission
  - The launch of the **SMR Industrial Alliance** by the European Commission on 22 March 2024, Brussels

- The first **Nuclear Summit at the Head of State and Government level**, to be hosted in Brussels on March 21, 2024, organized by Belgium and the IAEA, is a first of a kind event which will bring to the attention not only the importance of, nuclear in the energy mix but also aspects related to financing new technologies

Main EU topics on nuclear energy considered by Romania (1)

Three main topics are important for Romania:

1. **A level playing field for low-carbon technologies including in terms of financing**.

   - **The inclusion of nuclear in the Taxonomy is positive,** but after 2 years we have to know how this works.
   - **Financing nuclear projects** (especially FoK projects such as SMRs) requires a long term commitment from the Government and the involved stakeholders. Accessing EU funding remains a challenge.

- Timely investments are needed in **LTO projects** as well as **new build** and **innovative** projects.
- A **reconfiguration of EU financing instruments**, having a more **inclusive approach** for nuclear financing in existing tools: **InvestEU, Just Transition Fund and REPower EU funds.**

Main EU topics on nuclear energy considered by Romania (2)

2. The industrial agenda for the EU and the development of the European supply chain

- **NZIA** is a good start and **it is a positive signal for the nuclear industry**, many Member states are encouraging the European nuclear industry to expand, increase production, learn how to produce components for new technologies such as SMRs and AMRs
- On, we do see the need for **an integrated approach on the competitiveness at EU level**, a stocktaking of capabilities, of supply chain and shortages to better prepare for the future.
- **International cooperation** remains important with trustworthy partners **in order to achieve** economies of scale, faster R&D and resource allocation, security of supply for fuel production, as well as uranium
- Romania is interested to **further develop its own nuclear fuel cycle**
- In Europe, we need to start planning for the **increase demand for enriched fuel** for SMRs and of (HALEU) High-assay low-enriched uranium (in the range of 5% to 20% of the U-235 isotope).

Main EU topics on nuclear energy considered by Romania (3)

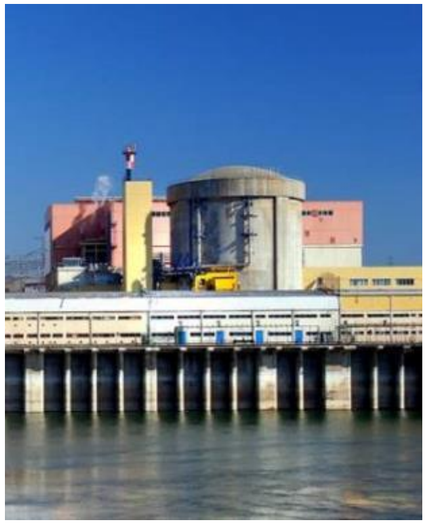
3. Small Modular Reactors (SMRs)

- Romnia is already preparing to join the **EU SMR industrial alliance** on different levels.
- **The focus should be on facilitating the deployment of first reactors** which will serve as proof of concept and help ramp up market demand and therefore, economies of scale.
- To be successful and contribute to the projects going on in different countries, we believe it should include different mature SMR designs.
- **Early cooperation** between technology vendors and industry is critical to avoid any future supply risks and achieving a standardized mass production (the key element).

The **National Energy and Climate Plan of Romania** includes the continuation of our nuclear projects in Cernavoda, the deployment of SMRs as well as the acceleration of innovative technologies such as AMRs by the Nuclear Research Institute from Pitesti, Arges county, in cooperation with our friends from ANSALDO.

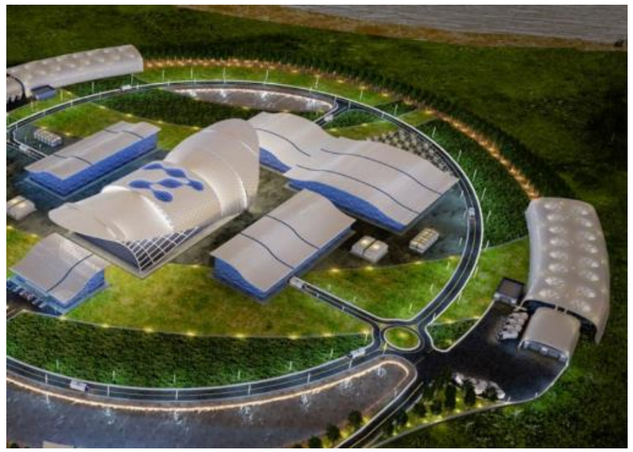
MAIN PROJECTS OF NUCLEARELECTRICA

Refurbishment / Life Extension of Unit 1*



Two new CANDU Units around 2031*

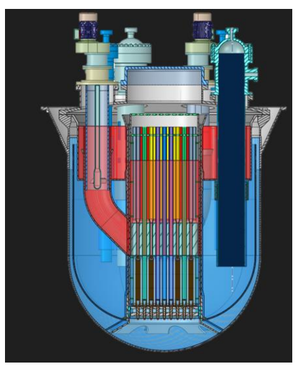
SMR Development*



Tritium Removal Facility (CTRF)

Integrated Front End Nuclear Fuel Cycle

ALFRED / ICN Pitesti (R&D)



NUCLEAR FUEL CYCLE - DRIVER OF ENERGY SECURITY OF SUPPLY

LEGEND 1

URANIUM

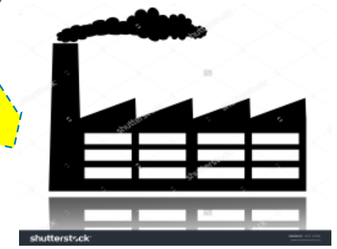
Low-Midlle Spent Waste

High Level Waste

Uranium concentrate IMPORT

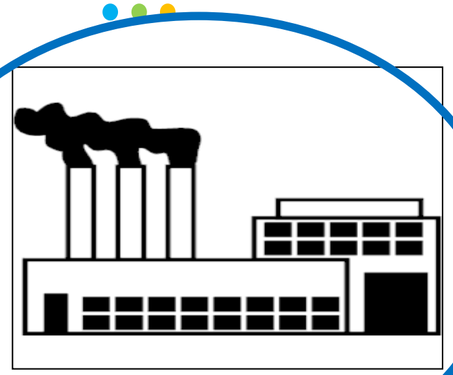
U3O8 IMPORT Option

URANIUM MINING Concessed to SNN (not operational yet)



U3O8

U3O8



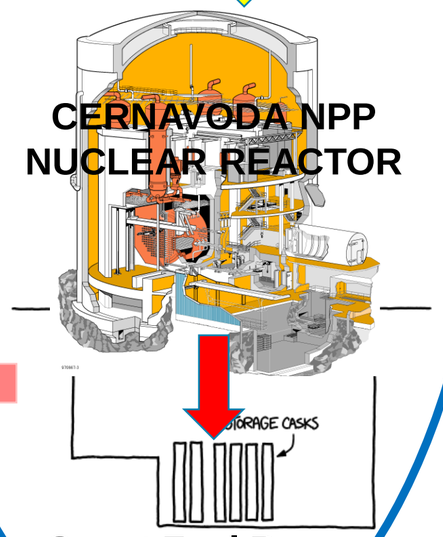
U20

UO2

UO2 IMPORT Option

Nuclear Fuel Plant (FCN)

Fuel Bundles



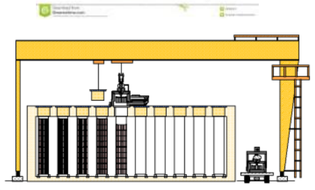
CERNAVODA NPP NUCLEAR REACTOR

Spent Fuel Bay

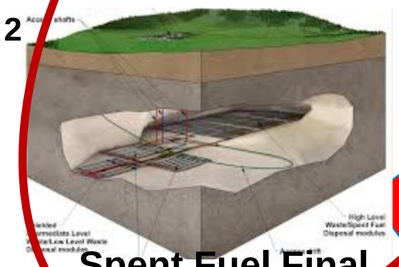
DECOM ANDR –SNN

L&M Waste Disposal

Depozit Intermed. Slab si Mediu Active (CNE)



IDSF Storage



Spent Fuel Final Disposal

LEGEND 2

SNN

ANDR

CNU

Heavy Water Management Center

REFURBISHMENT OF CERNAVODA UNIT 1

Source: Embassy of Canada to Romania, Bulgaria & Moldova

Phase 1 — finalized
Final Investment Decision approved on February 23rd, 2022

Phase 2 — Ongoing Project implementation (EPC contract, licensing, COM Opinion, FID).

- In **February 2023**, it was signed the first contract with Candu Energy, SNC-Lavalin, for engineering services
- On **October 11, 2023**, KHNP joined the CANDU Energy - ANSALDO NUCLEARE EPC Consortium
- The **signing of the three-way contract** between the **Canadian Commercial Corporation**, **Candu Energy Inc.** and **Societatea Nationala Nuclearelectrica SA** to support the work to extend the life of the Unit 1 on November 28, 2023

Phase 3 — Effective development of the refurbishment project – from the end 2026 to the beginning 2029.

CTRF PROJECT

source World Nuclear News, 27 June 2023

CTRF technology for **extracting the tritium from the heavy water**, significantly reducing the radioactive emissions to the environment and of the professionally exposed personnel.

On June 27, 2023, Nuclearelectrica and Korea Hydro & Nuclear Power (KHNP) signed the **Engineering, Procurement and Construction** (EPC) contract for the completion of Europe's first Tritium Removal Facility (CTRF) at Cernavoda NPP.

- Using a Romanian innovative technology, developed by the Romanian National and Development Institute for Cryogenic and Isotopic Technologies (ICSI), Cernavoda Tritium Removal Facility (CTRF) will be the **world's third and Europe's first Tritium Removal Facility**
- CTRF represents an opportunity for **contribution to global tritium supply for fusion,**

CERNAVODA UNITS 3 & 4 (1)

source Google Maps

Preparatory Stage:

- Energonuclear S.A., the project company, signed the first contract with Candu Energy, SNC-Lavalin, Design Authority and CANDU Technology original equipment manufacturer (OEM)
- **Candu Energy** will provide **engineering services -** updating of technical reports, support for Project licensing and the Notification of the Cernavoda 3 & $ investment project to the European Commission (e.g. licensing basis documents, updating the Safety Design Guides, updating the list of safety related design changes etc.).

CERNAVODA UNITS 3 & 4 (2)

Source: Nuclearelectrica

22 August 2022: Shareholders approved the Preliminary Investment Decision for Cernavoda 3 & 4 Project

- According with the Strategy, is expected as Unit 3 to be operational by 2030 and Unit 4 by 2031
- Unit 2 represents the reference project for Units 3 and 4, plus subsequent changes and improvements.
- The project will benefit from the experience of CANDU technology evolution
- Romanian engineering and industry will be part of this effort

CERNAVODA UNITS 3 & 4 FINANCING (3)

Source: Nuclearelectrica

November 2022, at COP27, **US Exim Bank** announced the issuance of two Letters of Interest for the financing of US sourced pre-project technical services in connection to the Cernavoda Units 3 & 4 Project of **more than 3 billion dollars**.

June 2023, Romanian State and SNN signed the Support Agreement for Units 3 & 4 Project

Source: Nuclear Engineering Int'l

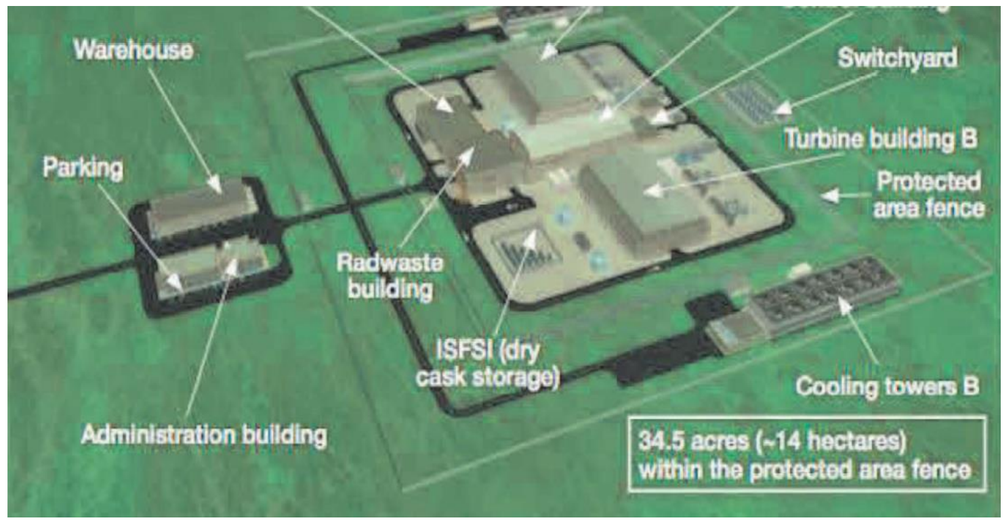
CERNAVODA UNITS 3 & 4 FINANCING (4)

September 2023, Canada's decision to support with **3 billion Canadian dollars** the development of the project of Units 3 and 4 at CNE Cernavoda

February 2024, Italian group SACE, Ansaldo Nucleare and Romania's Nuclearelectrica have signed a MoU relating to the life extension of Cernavoda Unit 1 and the development of Units 3 and 4. The agreement aims to structure a financing line backed by SACE for up to **EUR2 billion**

NuScale VOYGR™ in România (1)

- NuScale VOYGR™- 6: 6 x 77 MWe (462 MWe)
- RO Power, a company owned by Nova Power & Gas (50%) and Nuclearelectrica (50%), is the developer of the project,
- New shareholders are interested to join the Project
- Front End Engineering is ongoing, focusing on licensing
- The modular concept ensures greater flexibility and an excellent partnership with renewable sources, as well as for H2 production

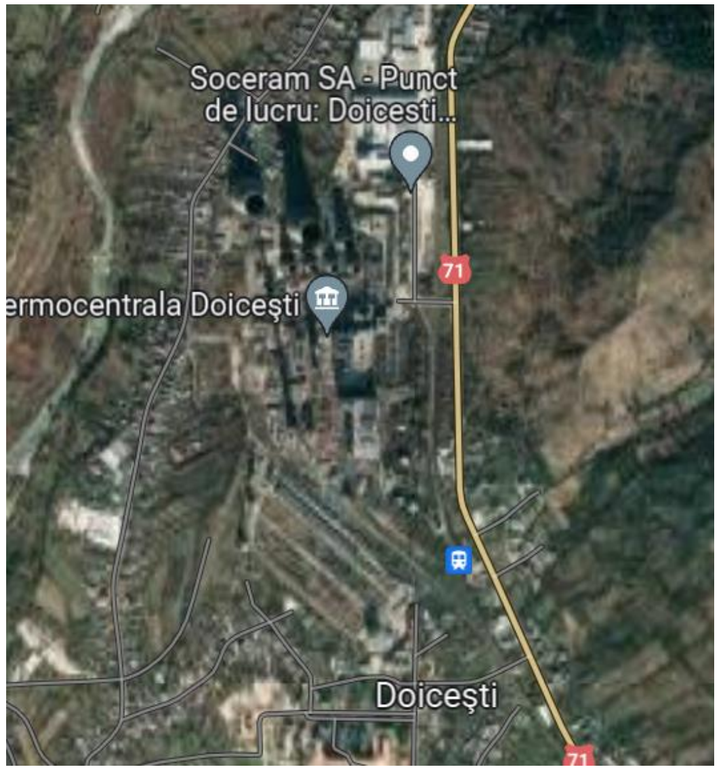


Sursa: NuScale

- May 2023 – the official inauguration of the NuScale E2 educational simulator at the Polytechica University of Bucharest, as a regional training center

Sursa: Nuclearelectrica

NuScale VOYGR™ în România (2)

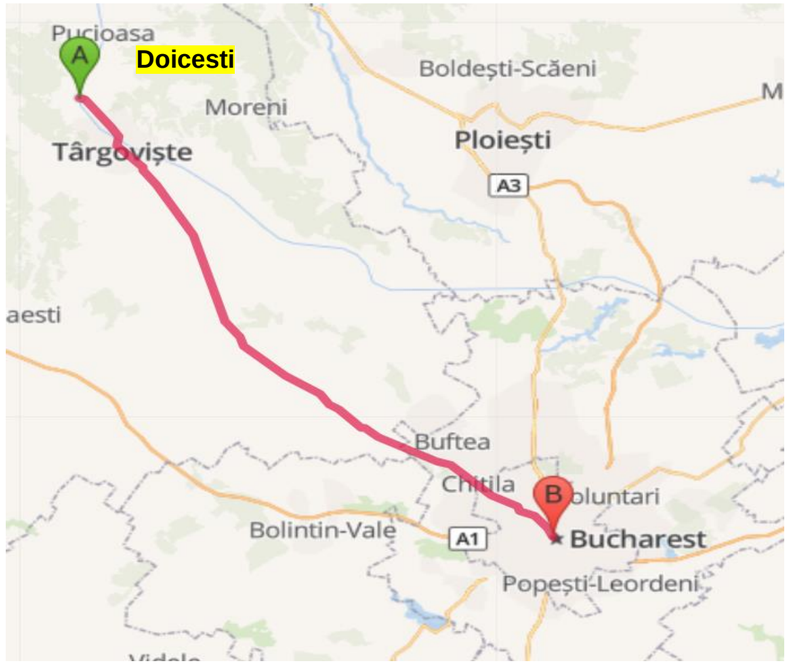


source Google Maps

- The licensing process will comply on Romanian/ EU standards, regulations, and procedures
- A former coal power plant site, at Doicești, Dambovita County, with about 4,500 inhabitants, 90 km NW of Bucharest, was selected as the preferred site for NuScale
- Ongoing detailed engineering and site studies fto support the site licensing documentation

Socio-Economic Impact

- ~ 200 permanent jobs
- 1500 site construction-erections jobs
- 2300 fabrication jobs (not all of them in Romania)
- 4 millions tons of CO2 avoided yearly



FINANCING

- G7 Summit, Hiroshima – it was announced that two US financial institutions have issued letters of interest for the potential loading of up to USD 4 billion for the SMR project to be developed in Romania.

- It also expressed "*the support of the US and the support of Japan, as well as South Korea and the United Arab Emirates"* up to 275 US for the SMR project to be implemented in Romania.

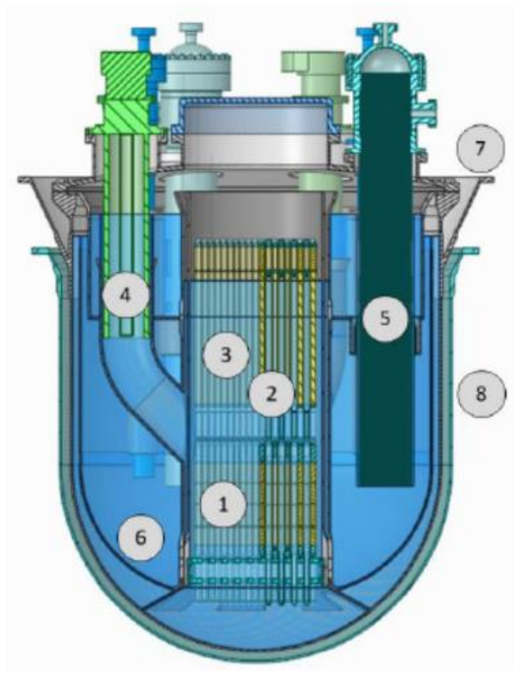
GENERATION IV ADVANCED LEAD FAST REACTOR EUROPEAN DEMONSTRATOR (ALFRED)

Gen. IV ALFRED

- Nuclearelectrica and the FALCON Consortium (ANSALDO ENERGIA- Nuclear Research Institute Pitesti, RO – ENEA Italy) signed a Memorandum of Understanding regarding cooperation for the development of the Generation IV reactor, ALFRED, on **October 3, 2019**
  - The purpose of the MoU is to establish a collaboration framework between the two parties regarding the pre-project works and the research and development activities to be implemented in order to develop the ALFRED project.

- SNN and the FALCON Consortium agreed on:
  - the exchange of information and data regarding the technology of fast neutron reactors, using molten lead as a cooling agent,
  - the coordination of research activities,
  - the contribution in kind depending on the expertise and capabilities of each party, studies and analyses. carried out independently by each party with the aim of optimizing them,
  - planning the necessary framework to prepare the demonstration activities.

- The PRO ALFRED project is financed by the Ministry of Research and Innovation



Thank you!