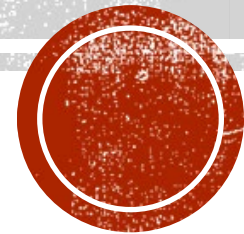




INTERNATIONAL PLATFORMS FOR DEVELOPMENT OF SMALL MODULAR REACTOR (SMR) PROJECTS

Assoc. Prof. Svetoslav Spassov, PhD. Director "Nuclear Security Support Center", University of national & world economy, Bulgaria, member of IAEA Nuclear Harmonization and Standardization Initiative (NHSI) Nuclear Security and Regulation of SMRs Working group, representing Bulgaria

Nikola Petrov, PhD student at the Department of National and Regional Security





INTRODUCTION TO SMRs



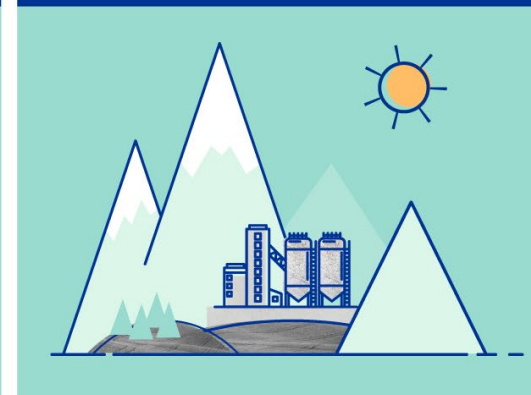
LARGE, CONVENTIONAL REACTOR
700+ MW(e)



SMALL MODULAR REACTOR
Up to 300 MW(e)



MICROREACTOR
Up to ~10 MW(e)





SMR TYPES

Light Water Reactors (LWRs)

- Includes Pressurized Water Reactors (PWRs) and Boiling Water Reactors (BWRs), using water as a coolant and graphite as a neutron moderator.

Liquid Metal Reactors (LMRs)

- Utilize liquid metal as a coolant, with major subtypes including Sodium-Cooled Fast Reactors (SFRs) and Lead-Cooled Fast Reactors (LFRs).

Molten Salt Reactors (MSRs)

- Use a liquid mixture of salts as both fuel and coolant, allowing for efficient fuel processing and reduced nuclear waste.

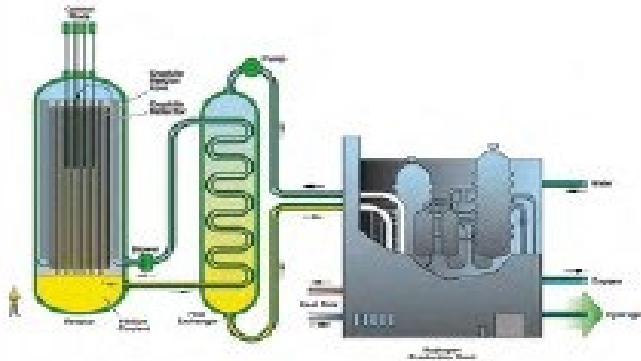
Gas-Cooled Reactors (GCRs)

- Includes High-Temperature Gas-Cooled Reactors (HTGRs), Very High-Temperature Reactors (VHTRs), and Pebble Bed Reactors (PBRs), known for their high efficiency and flexibility.

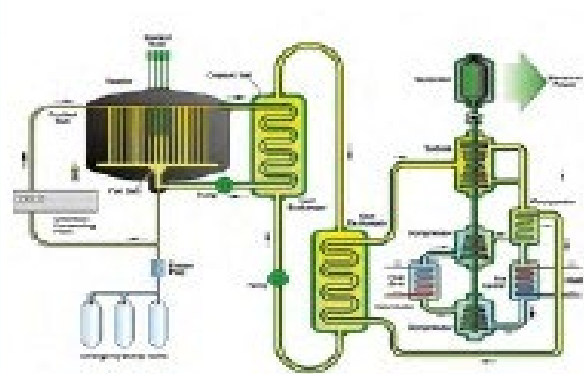


SMR TYPES

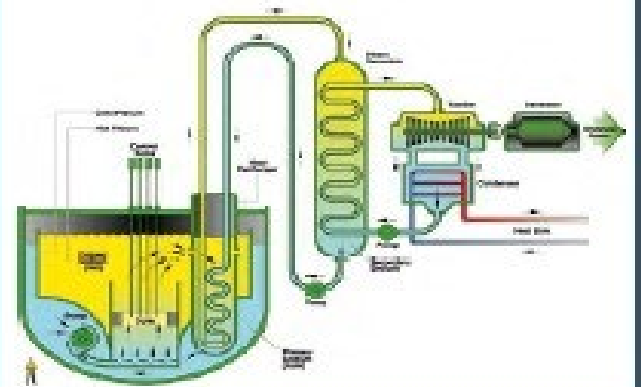
Very high temperature reactors



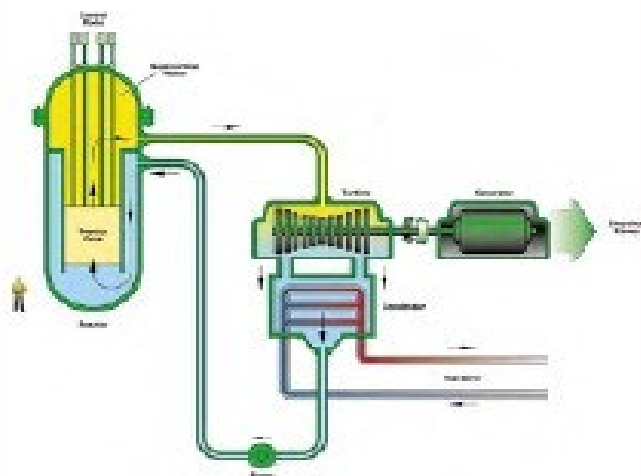
Molten salt reactors



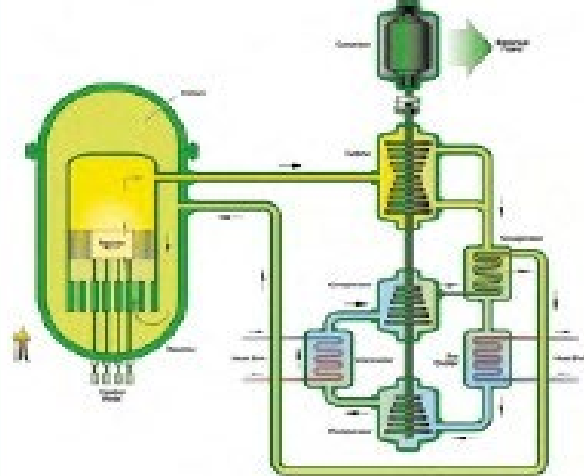
Sodium-cooled fast reactors



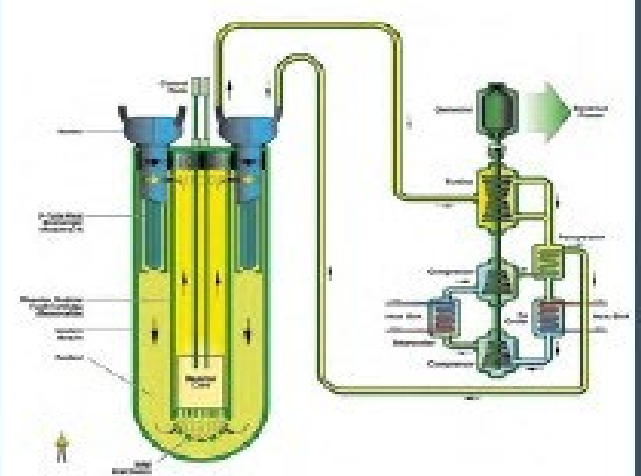
Supercritical water-cooled reactors



Gas-cooled fast reactor



Lead-cooled fast reactor





SMR BENEFITS

Main advantages of SMRs over other electricity production capacities:

- Flexibility of production capacity.
- Lower capital costs than conventional Nuclear Power Plants.
- Possibility of construction near industrial centers or megacities.
- Possibility of working with renewable sources.





ECONOMIC POTENTIAL OF SMRs

- Job Creation
- Flexibility
- Export Opportunities- like “know-how”, technology, expertise and etc.
- Support for Industrial Decarbonization: SMRs are a new opportunity to achieve climate neutrality without constraining the industrial system.





THE IAEA SMR TECHNOLOGY ASSESSMENT

- Globally, over 80 SMR designs are being developed across 18 countries. The U.S., UK, Canada, Japan, and South Korea are actively working on their designs. The energy crisis, has highlighted the importance of EU energy independence, reinforcing Europe's ambition to lead in innovative technologies like SMRs.
- IAEA SMR Platform: Launched to support countries in SMR development, deployment, licensing, and oversight. It serves as a centralized hub for information, helping countries like Brazil and Jordan assess SMR technologies.
- RTA Toolkit: The IAEA's Reactor Technology Assessment (RTA) toolkit is crucial in evaluating SMR feasibility, focusing on energy security, sustainability, and economic viability.





EU ROLE ON SMR

- The EU is backing SMR research and development through the Euratom Research and Training Program (2021-2025). This initiative focuses on nuclear safety, security, safeguards, radiation protection, and radioactive waste management, with a strong emphasis on enhancing nuclear-related skills.
- To support the timely deployment of the first SMR projects by the early 2030s and strengthen Europe's position in the global market, the Commission established the European SMR Industrial Alliance in February 2024.
- EU Involvement: Focuses on harmonizing and standardizing regulatory frameworks for SMRs across member states, ensuring safety, security, and environmental compliance.





EUROPEAN SMR ALLIANCE

- The European Industrial Alliance on Small Modular Reactors seeks to fast-track the development, demonstration and deployment of SMRs in Europe by the early 2030s.
- Alliance Objectives: The main focus is on strengthening the nuclear supply chain and fostering collaboration among stakeholders to support and accelerate SMR projects in Europe.
- Main goal: to ensure the first SMR is operational in Europe by the early 2030s.





EUROPEAN INDUSTRIAL ALLIANCE ON SMRS

Nuclear Security Support Center, UNWE is member of European Industrial Alliance on SMRs.

Alliance have the following working groups to achieve it's goals:

- Industrial Applications
- Technology and R&D&I
- Supply chain
- Skills
- Public Engagement
- Nuclear Safety and Safeguards
- Fuel cycle and waste management
- Financing





INTERNATIONAL PROJECT FOR SMRs DEPLOYMENT

- The OECD Nuclear Energy Agency (NEA) is actively involved in advancing SMR technology across its member countries, including USA, Canada and The United Kingdom.
- Project Phoenix focused on partnerships with key European and Eurasian countries that are interested in replacing retired or soon-to-be-retired coal plants with new nuclear energy generation capacity from SMRs.
- Nuclear Expediting the Energy Transition (NEXT) is a subprogram that offers technical assistance to eligible partner nations through the U.S Department of State's Foundational Infrastructure for Responsible Use of Small Modular Reactor Technology (FIRST) initiative.





ACTIVE SMR PROJECTS

- Department of State – Supports nuclear implementation plans through programs like FIRST, NEXT and Phoenix.
- Last year we have FIRST meeting in Sofia for the project "Engaging stakeholders on the role of small modular reactors (SMRs) in decarbonization strategies".
- The program included thematic discussions and panels, including "Review of Small Modular Reactors and Possibilities for Their Adaptation",





PROJECT “FIRST”



Mr. Samandov, Deputy Minister of Energy, Mr. Wautlet from Department of USA and Mr. Spassov, director of “Nuclear Security Support Center”, (left to right)



Mr. Spassov, Mr. Samandov and Mr. Dimitrov, rector of UNWE (left to right)





THANK YOU FOR YOUR ATTENTION!

