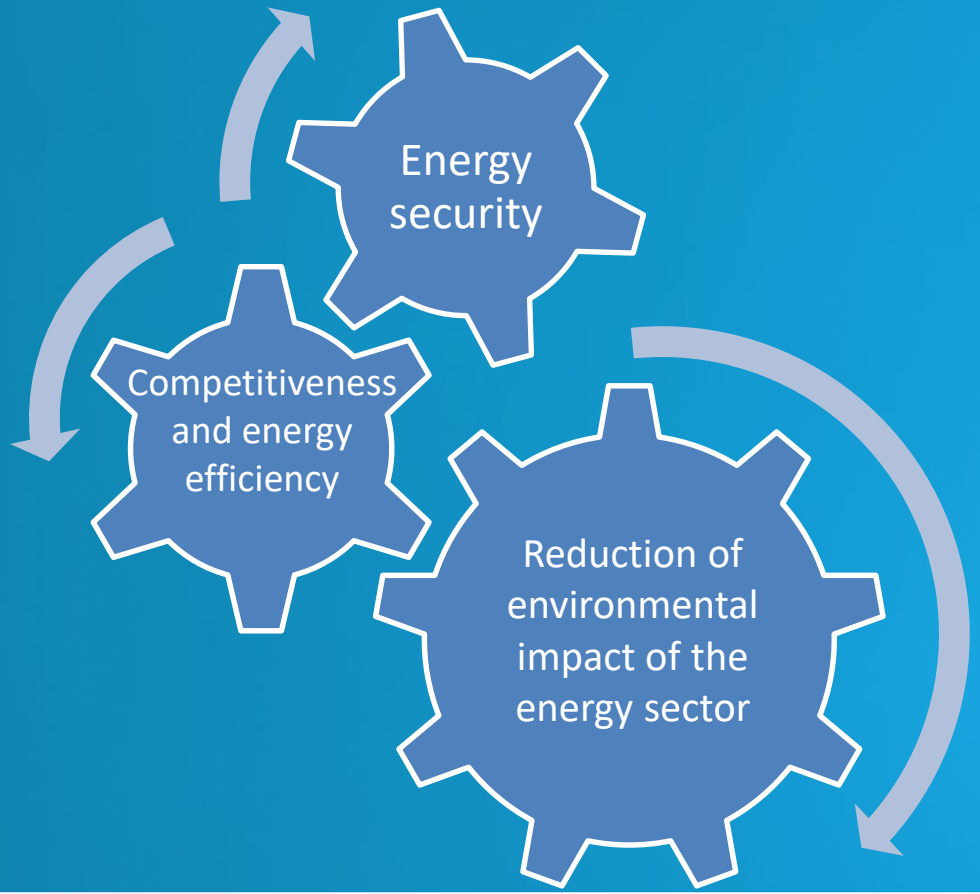
Innovation and Clean Energy Systems

Case of Poland – a developing nuclear power country's transition to a clean energy economy

Zbigniew Kubacki

Deputy Director
Nuclear Energy Department
Ministry of Energy, Poland



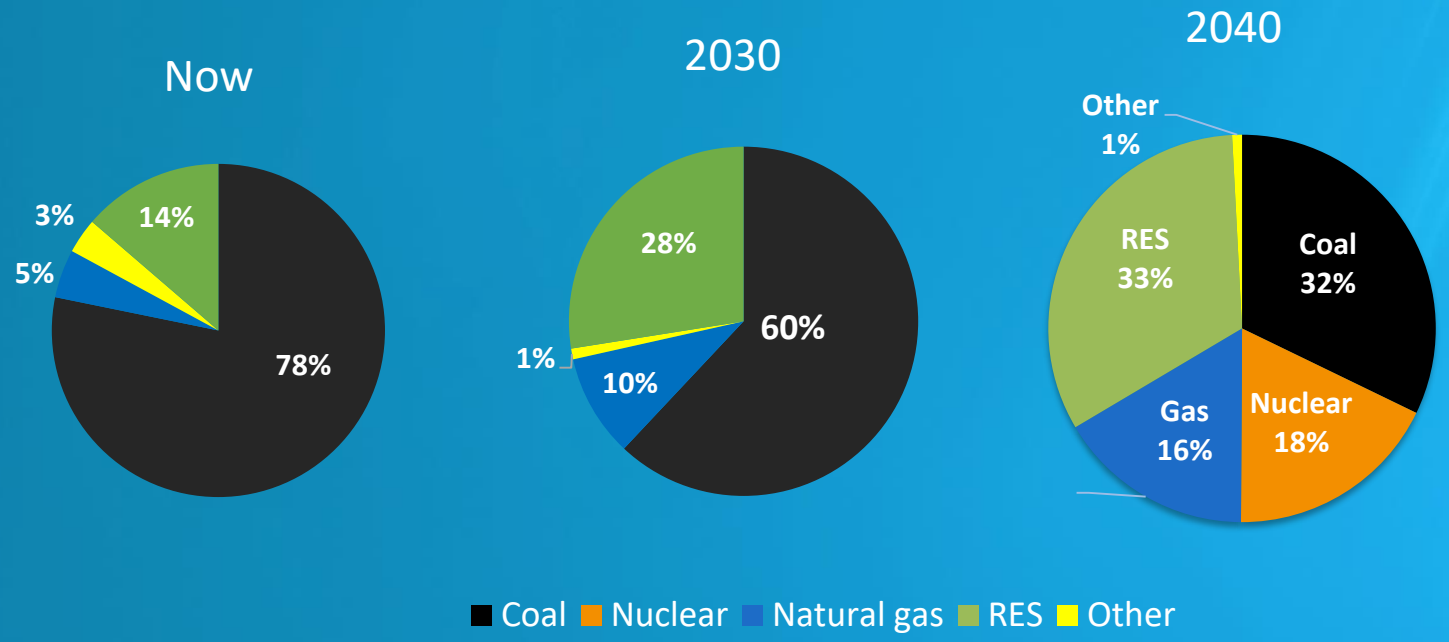
THE OBJECTIVE OF THE POLISH ENERGY POLICY IS:

To provide energy security, while ensuring competitiveness of the economy, energy efficiency and reduction of enironmental impact of energy sector and with optimum use of Poland's domestic energy resources

Strategic directions of energy policy of Poland until 2040

- Optimal use of domestic Energy resources
- Diversification of natural gas and oil supply and development of infrastructure
- Development of heating and cogeneration
- Development of renewable energy sources
- Development of energy markets
- Improving energy efficiency
- Development of power capacity and tranmission infrastructure
- Launch of nuclear energy

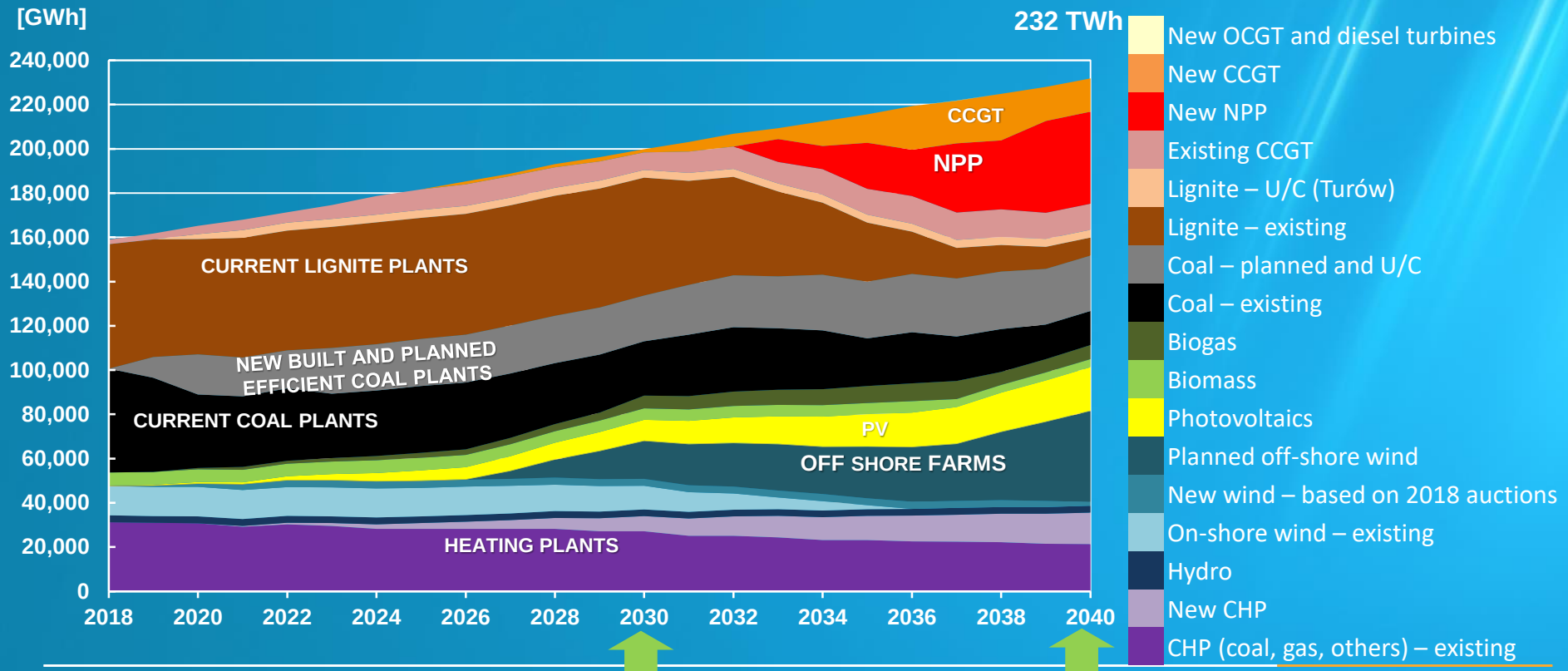
Current and projected electricity generation structure



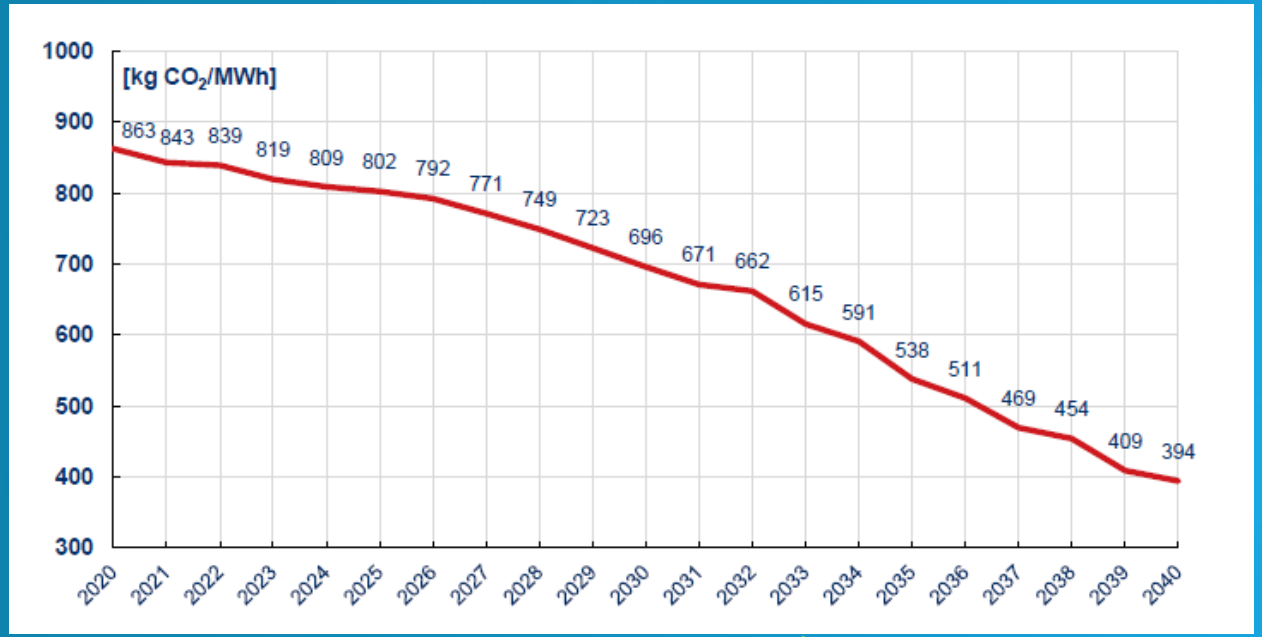
- ✓ decline of coal consumption by 2040
- ✓ 1.0-1.5 GW by NPP till 2033 and 6-9 GW in 2043

Source: PEP 2040

Structure of energy generation in Poland until 2040



Average emission intensity of electricity production by 2040



Significant reduction of emmissions caused by:

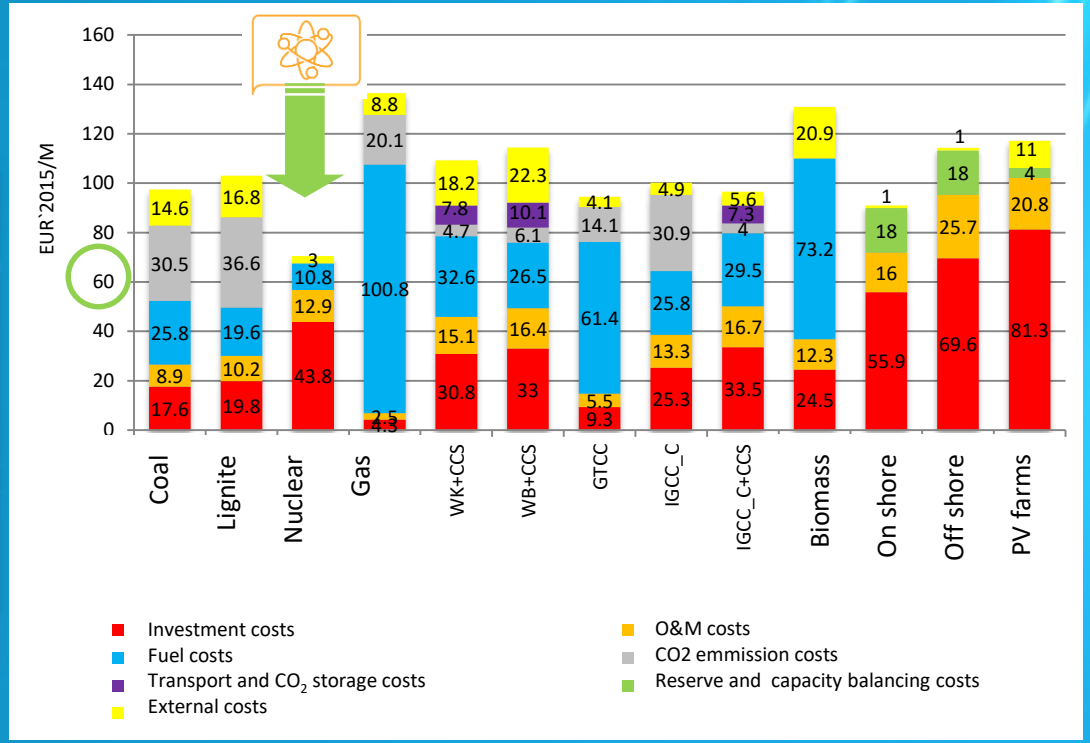
1. **nuclear power plants introduction**
2. **RES implementation**
3. **higher share of gas turbines**
4. **closing of exploited coal power plants**

Nuclear power implementation

Eco-friendly, secure and efficient energy for many years

1. First nuclear instalation around 1-1.5 GW untill 2033
2. 6 nuclear blocks till 2043 (target 6-9 GW)
3. Ensuring formal and legal conditions
4. Ensuring construction and operation financing
5. Training of NPP personnel
6. Proper nuclear supervision
7. Evaluation of possibilities for perspective small/modular nuclear technologies (HTR, SMR) deployment

Projected electricity generation costs by different technologies



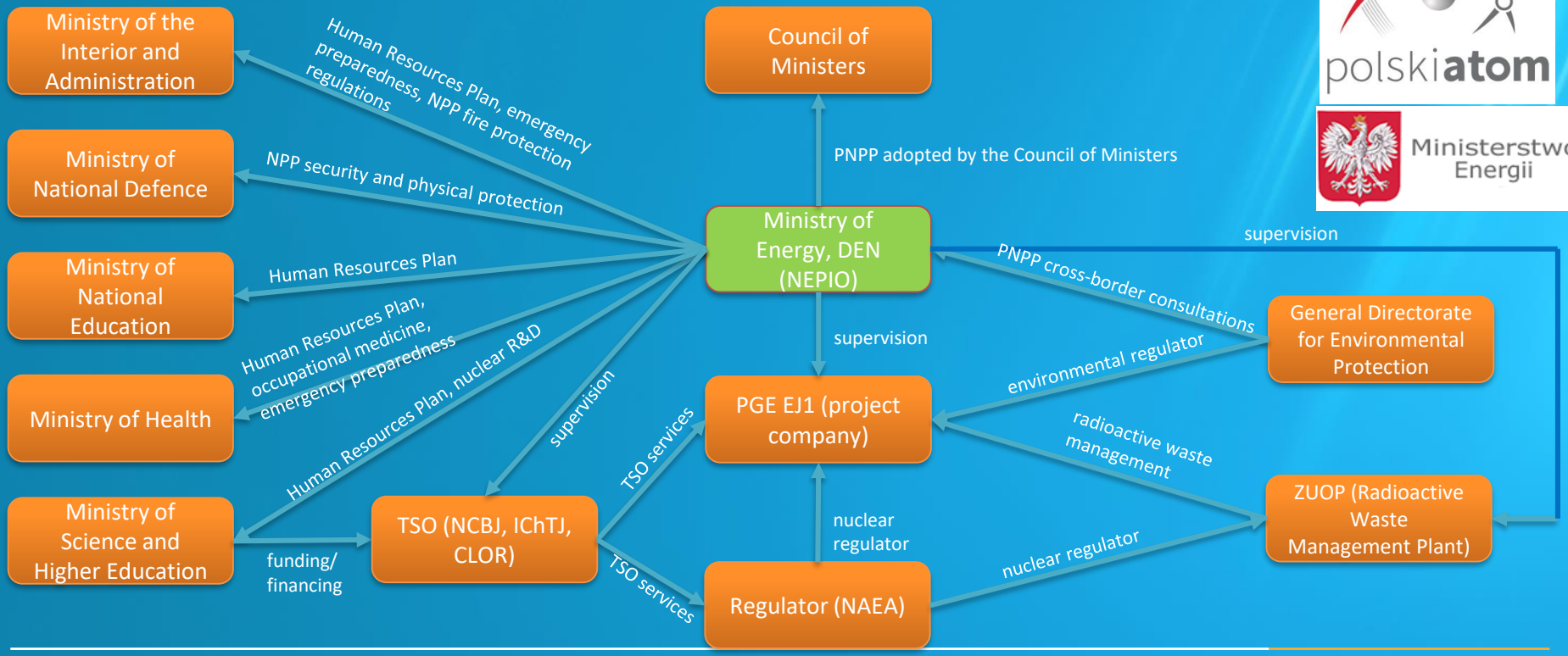
Note: LCOE

Polish Nuclear Power Programme

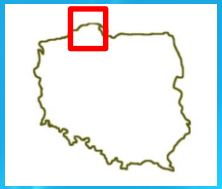
- PNPP was approved on January 28th 2014 by the Council of Ministers.
- Its key goals resulting from the Energy Policy for Poland until 2030:
  - ✓ assuring long-term **security of electricity supply**
  - ✓ maintaining **stable electricity prices** at levels acceptable by the national economy and society
  - ✓ **reducing emissions** of CO_2 and other air pollutants
- 2 NPPs planned with total installed capacity: 6000 – 9000 MWe
- Current status:

  The update of the PNPP prepared by the MoE is awaiting GoP approval.

Institutional Structure of the PNPP



Site and environmental evaluations



Locations:

Lubiatowo-Kopalino

Żarnowiec

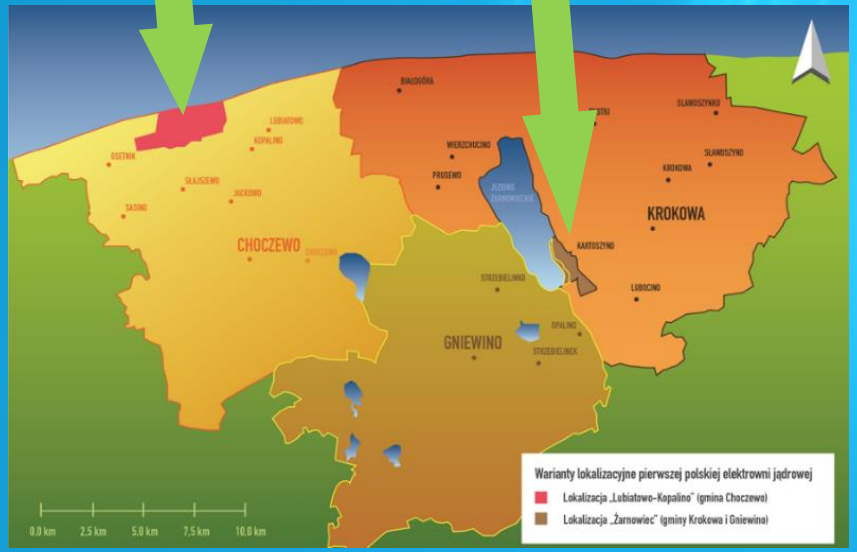
Current work under the **PNPP focuses on site and environmental evaluations**

2016 – selection of two potential locations:

(1) "Lubiatowo-Kopalino"

(2) "Żarnowiec"

March 2017 - launch of site and environmental evaluations on both sites



Poland supports nuclear innovations contributing to transition to a clean energy economy

- Capabilities of Poland in the R & D on nuclear energy
- Scientific project for advanced nuclear technologies in Poland
- IDWG Workshop „*Nuclear energy beyond electricity" held in Warsaw* on 24 September 2019

Nuclear research institutes

Poland has 4 Institutes, subordinate to the Minister of Energy, with high competences and involvement in the field of nuclear power R&D programmes:

1. National Centre for Nuclear Research (NCBJ)
2. Institute for Nuclear Chemistry and Technology (IChTJ)
3. Central Laboratory for Radiological Protection (CLOR)
4. Institute for Plasma Physics and Laser Microfusion (IPFiLM)

Advanced nuclear technologies in Poland

Altough priority od Poland is to implement nuclear power programme based on large-scale reactors we are aware of potential future benefits of SMRs (like HTGRs). As a result we initiated the scientific project on HTGRs (especially for industrial cogeneration) with the following objectives:

Decreasing dependence on fossil fuel import.

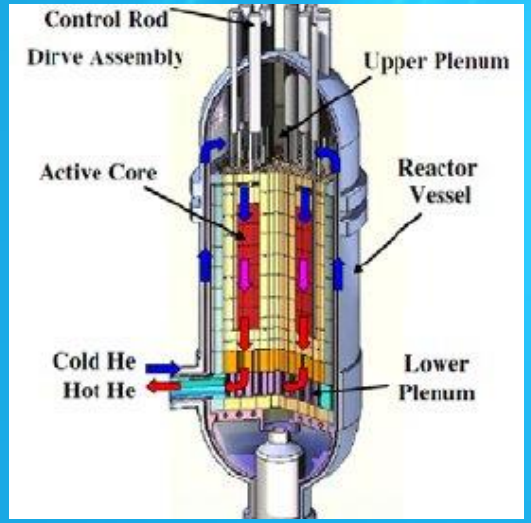
HTGR may be an alternative to replace fossil fuels for industrial heat production. With expected growth of CO_2 tax and low discount rate, the cost of the steam from HTGR could be comparable to that from gas, while having more secure availability and more predictable prices.

Decreasing sensitivity of economy to environmental regulations.

Industry dependent on fossil fuels might become less competitive in case of stronger environmental regulations (CO_2 tax, emission limits, etc.). HTGR being a zero emission technology is immune to that.

Synergy with multi-GW LWR programme.

Increasing scientific and industrial potential, upgrading the regulatory framework, developing human resources and creating a supply chain, will be beneficial for both HTGR and LWR projects.



Multi-Body Dynamic Analysis Computer Program For the Prismatic Core of a HTGR - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Cross-sectional-view-of-a-HTGR_fig1_281069761 [accessed 7 Nov, 2019]

IFNEC's considerations on nuclear innovations for energy transition

IDWG Workshop
Nuclear energy beyond electricity
September 24, 2019, Warsaw

Source: Pixabay / Skitterphoto

Topics discussed:

- Nuclear cogeneration
- High Temperature Reactors
- Future role of Hydrogen and development of innovative nuclear systems

Thank you for attention

polskiatom

Resources for nuclear power infrastructure in Poland