HTGR–POLA AS THE FORERUNNER FOR HIGH TEMPERATURE NUCLEAR POLIGENERATION FOR INDUSTRY IN POLAND AND EUROPE

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HTGR-POLA is a reactor design primarily developed by the National Centre for Nuclear Research (NCBJ) in collaboration with the Japan Atomic Energy Agency (JAEA). While NCBJ and JAEA are the main partners driving this project, they receive engineering support from several domestic industrial companies, including Energoprojekt Katowice, MHI (Mitsubishi Heavy Industries), Fuji Electric, and Toshiba ESS (Toshiba Energy Systems and Solutions).
HTGR-POLA is a small-scale, prismatic-type, helium-cooled, graphite-moderated research HTGR with a thermal power of 30 MWt. It is planned to be constructed at the NCBJ's site. The reactor outlet coolant temperature reaches 750°C and is directed to the steam generator, where it produces superheated steam with parameters typical of those in fossil power plants: 565°C at 135 bar.
The primary objective of HTGR-POLA is to facilitate the licensing and demonstration path for higher power commercial reactors, such as the Gemini+ reactor (180 MWt). The secondary objective is to demonstrate and examine HTGR technology along with its practical application in an industrial environment. This includes coupling the nuclear site to various end-user test applications. This initiative may ultimately support national decarbonization efforts in the chemical and petrochemical industries, contributing significantly to energy security and environmental sustainability.
The HTGR-POLA site consists of nuclear and conventional islands, functioning as a nuclear heat and power plant. The plant is intended to supply the NCBJ campus with electricity, low-temperature heat (district heating), and most importantly – high-temperature heat for processes at an industrial demo-scale plant. The process heat is exported from the nuclear plant in the form of superheated steam, 545°C at 130 bar. The industrial plant and process are subjects for further selection; possibilities include hydrogen production plants, ammonia production, synthetic fuel production, etc.
Different available plant operational modes have been foreseen. These include varying reactor loads between 25% and 105%, adjustable heating power demands up to 17 MWt, and process steam production at rates such as 25 tons per hour. The proposed solutions also accounted for variable condensing loads arising from these conditions, ensuring that the system can operate across a broad spectrum suitable for end-users' needs.

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