

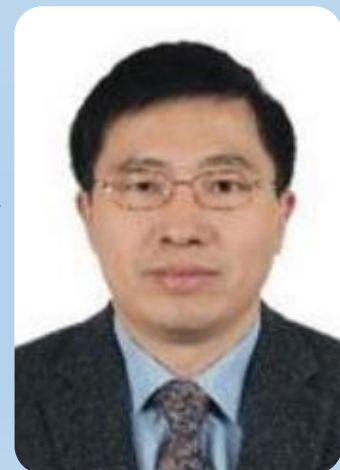
Design, Safety Features and Progress of the HTR-PM

Summary / Objectives:

The high-temperature gas-cooled reactor pebble-bed module (HTR-PM) is aimed to extend nuclear energy application beyond the grid, including cogeneration, high-temperature heat utilization, and hydrogen production. The first concrete of HTR-PM demonstration power plant, which has been approved as part of the National Science and Technology Major Projects, was poured five years ago, in Rongcheng, Shandong Province, China. The thermal power of a single HTR-PM reactor module is 250 MWth, the helium temperatures at the reactor core inlet/outlet are 250/750 ° C, and a steam of 13.25 MPa/567 ° C is produced at the steam generator outlet. Two HTR-PM reactor modules are connected to a steam turbine to form a 210 MWe nuclear power plant. The progress of HTR-PM project in China has drawn considerable attention worldwide. In this webinar, the design basis, design principles, general design features and safety characteristics of HTR-PM will be presented. Main engineering verification experiments of components and systems for the HTR-PM, such as helium blower, steam generator, will be introduced. Progress of the HTR-PM demonstration power plant, including civil engineering, first-of-a-kind equipment manufacturing, licensing, installation of the main equipment, will be described. In addition, the irradiation test results of pebble fuel samples and the status of commercial fuel production plant will be explained.

Meet the Presenter:

Dr. Yujie Dong is a Professor in Nuclear Engineering at Tsinghua University, Beijing, China, where he earned his PhD degree in Nuclear Reactor Engineering and Safety. From 1997 he worked to develop advanced nuclear reactors at the Institute of Nuclear and New Energy Technology, INET, Tsinghua University. He was Head of the Division of Reactor Thermal Hydraulic Calculation, Head of the Division of Reactor Physics, Thermal hydraulics and system simulation. From 2006 he was responsible for the Division of General Design of High Temperature Gas-cooled Reactor (HTGR). Currently, he is the Deputy Director and Deputy Chief Engineer of INET in charge of HTGR projects. Also, he has been appointed by the National Energy Administration as Deputy Technical



Director of the HGTR Nuclear Power Plant Project, which is one of the National Science and Technology Major Projects. He was actively involved in planning the System Arrangement of VHTR as a member of System Steering Committee in the frame of GIF.

Technical Goals of HTR-PM:

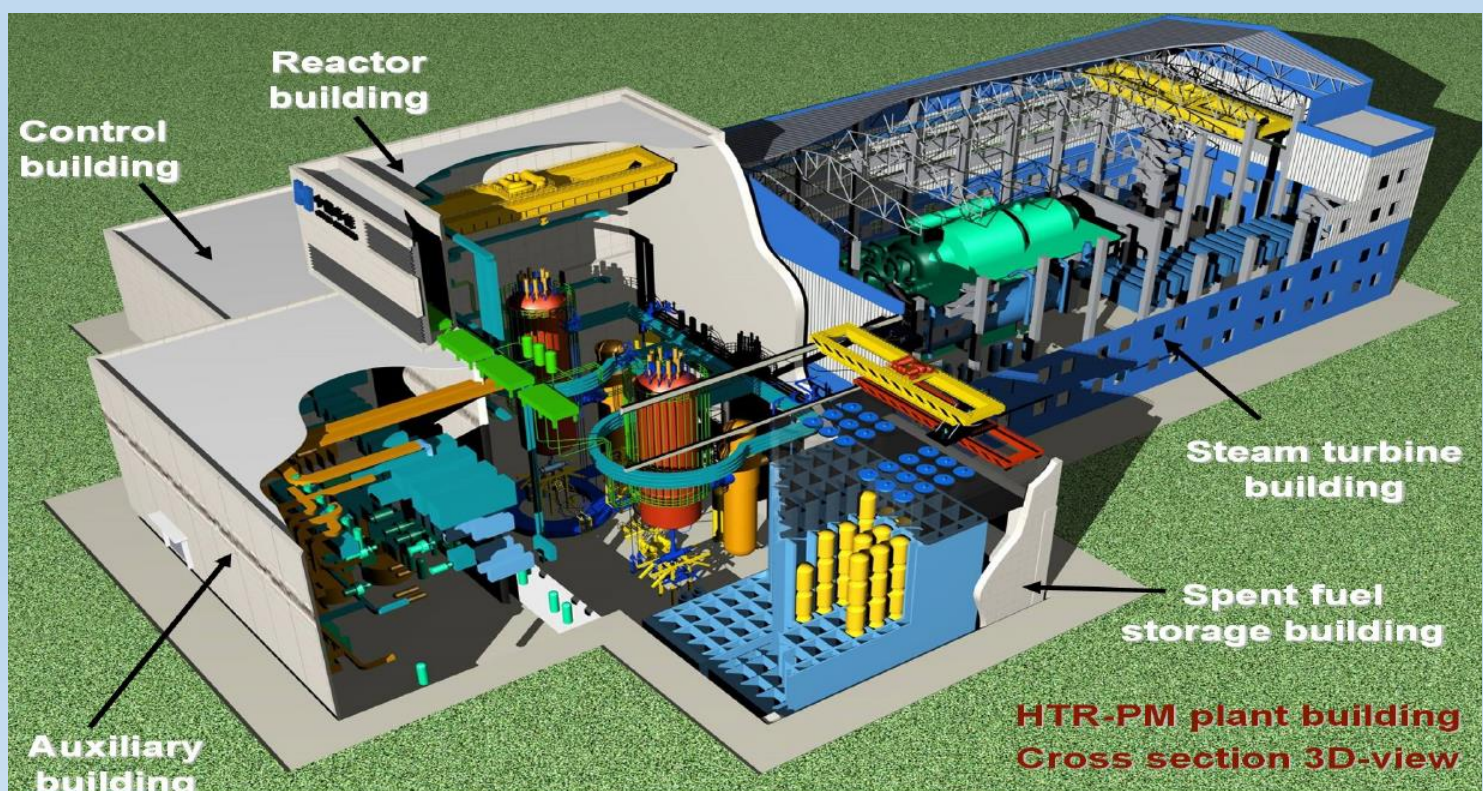
Technical goals of HTR-PM which is a HTGR demonstration power plant comprises four points:

- Keep inherent safety
- Achieve economic competitiveness
- Realize standardized design
- Use proven technology as much as possible
 - HTR-10 proven technology
 - Global experience
 - Steam turbine
 - Global purchase of some key components

HTR-PM: High Temperature Reactor- Pebble-bed-Module

HTR-PM Plant Building Cross Section 3D-view:

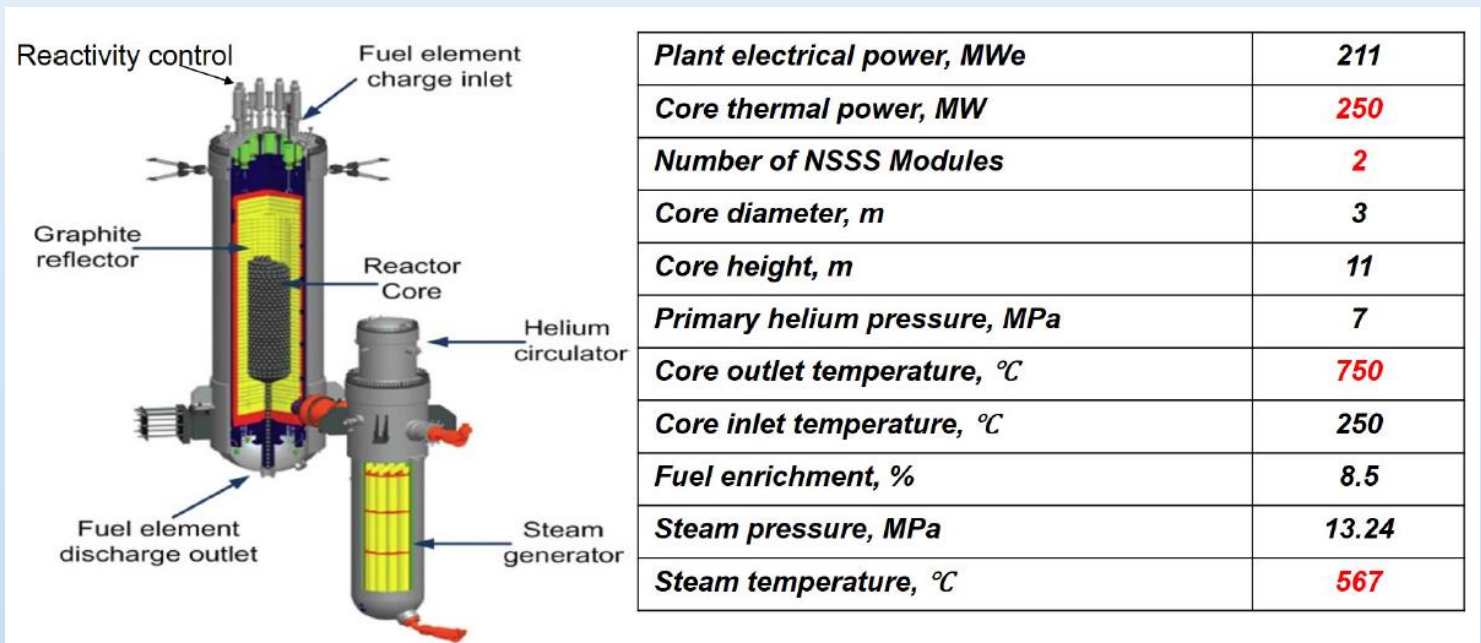
HTR-PM consists of a reactor building, a control building, an auxiliary building, a spent fuel storage building, and steam turbine building. There are two modules in the reactor building and they are connected to one steam turbine generator.



Overview of Design:

The left-side figure illustrates the one module of HTR-PM, and there are one reactor, one steam generator and one helium circulator. The reactor and the steam generator are connected by side-by-side arrangement.

The right-side table shows the main parameter of HTR-PM.



Situation of Construction:

Most components delivered on schedule, and the HTR-PM construction is smoothly going.



Fuel Fabrication:

The fuel production plant for HTR-PM put into operation successfully.

- Commercial fuel plant, 300,000/a, Baotou, CNNC fuel plant
 - 2013/03/ started construction
 - 2016/03/ finished plant installation and commission
 - 2016/08/ started production
 - 2017/12/ 300,000 fuel pebbles produced



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HTR-PM600:

The next step of HTR-PM, 6-module commercial 600 MWe unit (HTR-PM600), can be deployed, as supplement to PWRs, such as replacing coal-fired power plant, co-generation of steam and electricity.

- **6 reactor modules connected to one steam turbine, 650 MWe**
 - the same safety features,
 - the same major components,
 - the same parameters,
 - comparing with HTR-PM demonstration plant;
- the same site footprint and the same reactor plant volume comparing with the same size PWRs.
- Plant Owner: China HUANENG Cor. , China Nuclear Engineering Cor.(CNEC) , China General Nuclear Power Cor.(CGNPC)
- Feasibility study of sites:
 - *Sanmen, Zhejiang; Ruijin, Jiangxi; Xiapu, Fujian; Wan'an Fujian; Bai'an, Guangdong*