

Achieving a **Low-carbon Society** by the High Temperature Gas-cooled Reactor - HTGR -

Japan Atomic Energy Agency (JAEA)



HTGR

Multipurpose heat utilization

Inherent and passive safety

The image shows an aerial view of the HTGR facility. A central callout box labeled 'HTGR' is connected by white lines to two ovals containing the text 'Multipurpose heat utilization' and 'Inherent and passive safety'. A circular inset highlights a specific part of the facility, which is shown in a larger inset image at the bottom right.

HTTR (High Temperature Engineering Test Reactor)

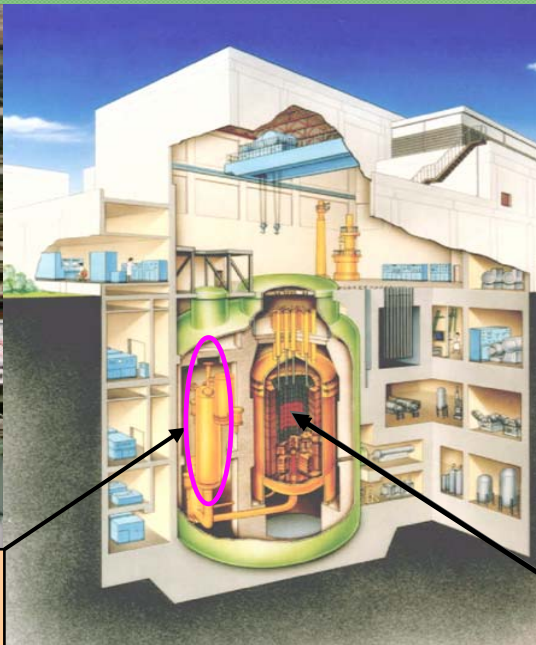


The inset image shows a large, modern, white building with a tall, red and white striped chimney. A sign in the foreground reads 'HTTR' and 'High Temperature Engineering Test Reactor' with Japanese text below it.

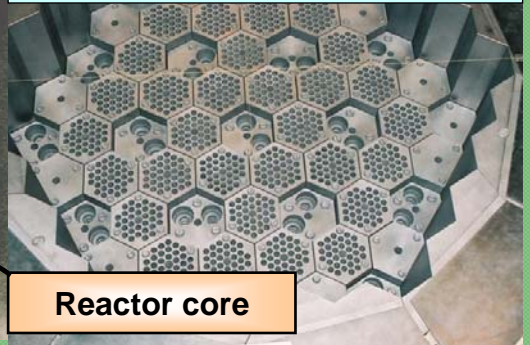
HTTR : Criticality in 1998



Intermediate heat exchanger



Thermal power : 30 MW
 Fuel : Coated fuel particle / Prismatic block type
 Core material : Graphite
 Coolant : Helium
 Core outlet temp.: 950°C(max)
 Pressure : 4 MPa



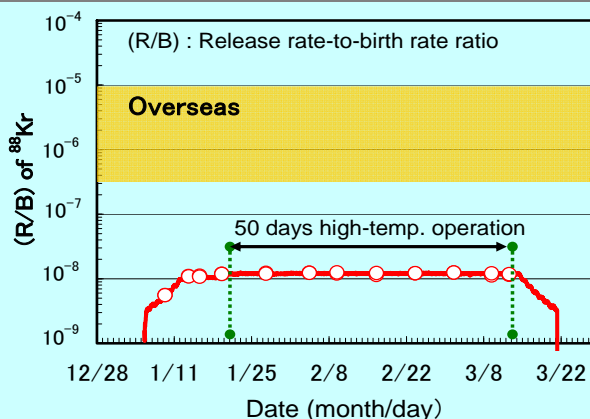
Reactor core

Long-term high-temperature operation

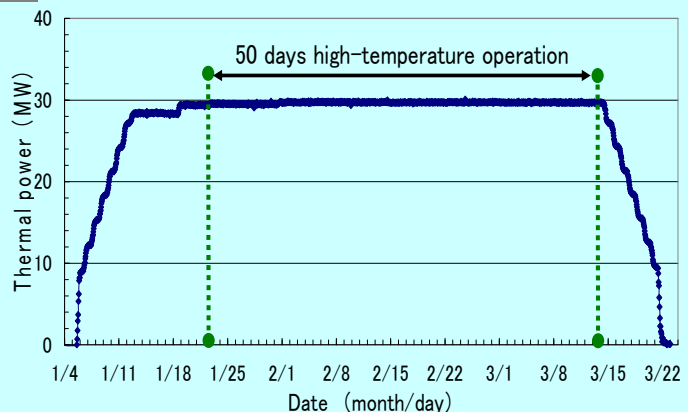
- ◆ 850°C/30days : from March 27 to April 26, 2007
- ◆ 950°C/50days : from January 22 to March 13, 2010

Achievement of 50 days high-temperature operation

The fission product gas release from the fuel in HTTR is well below the results observed overseas.



Plant parameters are very steady through the long-term operation.



■ Demonstration in advance of the world to be able to supply hot nuclear heat to a thermo-chemical hydrogen production system.

Future plan of HTTR program

HTGR technology development using the HTTR

- The achievement of nuclear reactor exit temperature 950°C (The first in the world)
- Long-term high-temperature operation, Safety demonstration test, etc.

Thermo-chemical (IS method: without CO₂ emission) hydrogen production technology development

HTGR plant design and gas turbine technology development

Hydrogen Production with HTTR-IS System (1000m³/h)



Commercial HTGR System

Hydrogen production for commercial use in 2020s



GTHTR300C

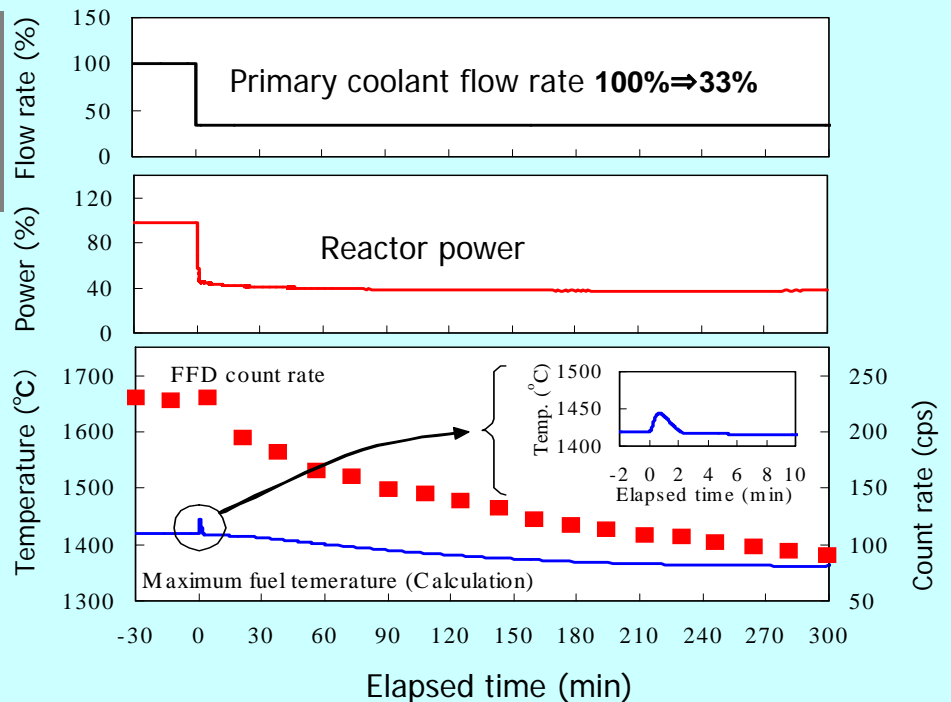
Safety demonstration test

- ◆ Control rod withdrawal test, coolant flow reduction test: completed
- ◆ Loss of forced cooling test : from FY2010 to FY2012

Coolant flow reduction test

Reactor power decreased to a stable level only by negative reactivity feedback.

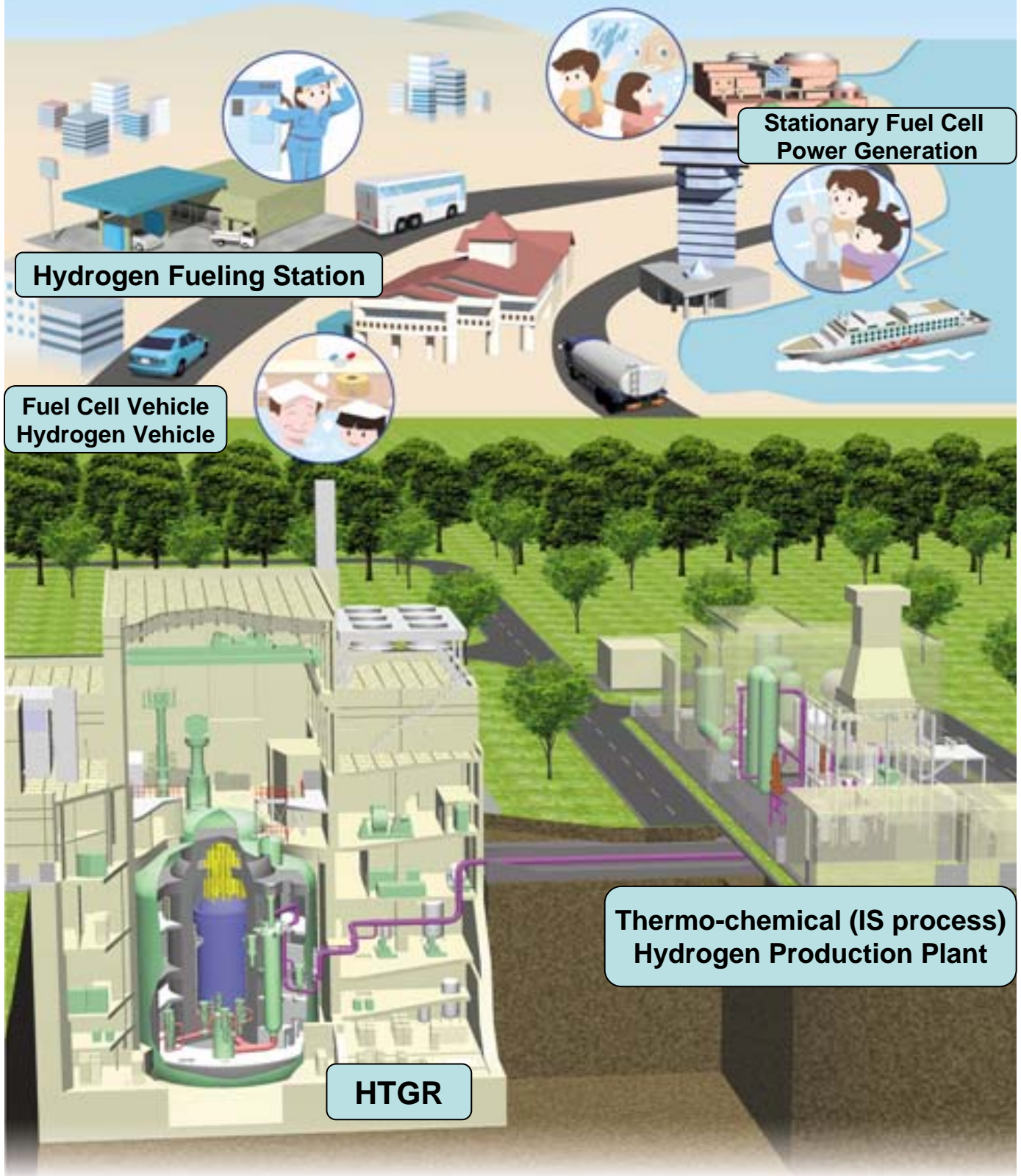
Test case	
Initial power	Coolant flow rate
30%	100%⇒66% 100%⇒33%
60%	100%⇒66% 100%⇒33%
80%	100%⇒33%
100%	100%⇒33%



FFD : Fuel Failure Detection

■ Demonstration of the HTGR inherent safety.

Hydrogen Town Initiative with the Commercial HTGR System



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