Operation of the High-Temperature Engineering Test Reactor

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   (**HTTR** : **H**igh **T**emperature Engineering **T**est **R**eactor)

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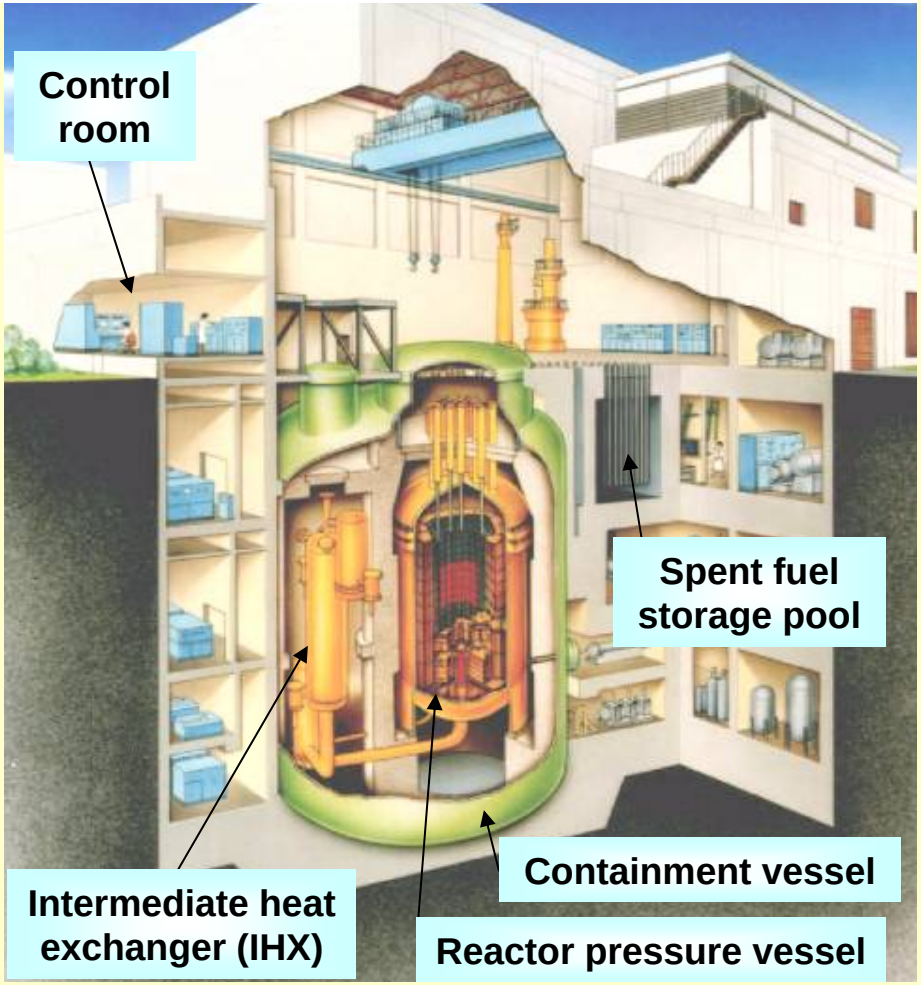
1. Outline of the HTTR

HTTR

Graphite-moderated/helium gas-cooled HTGR



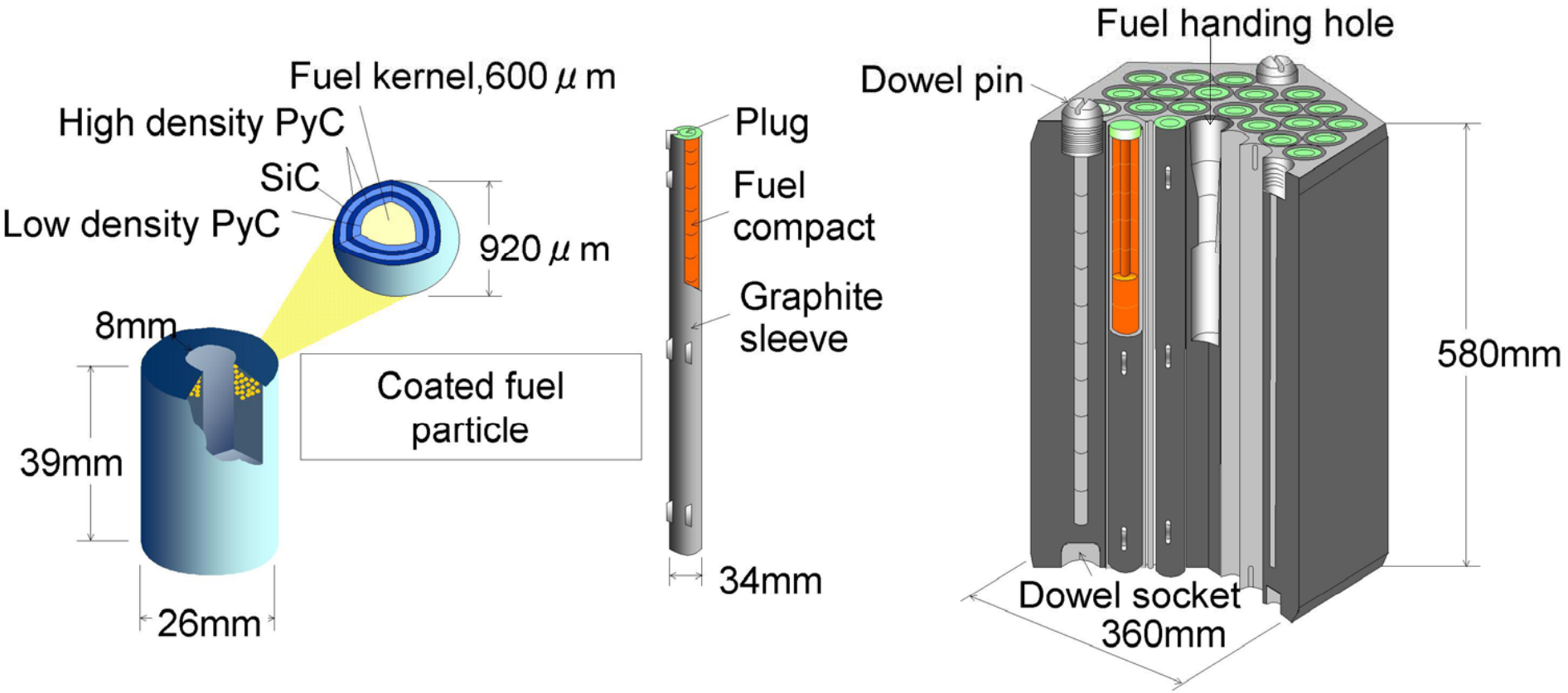
Major specification

Thermal power	**30 MW**
Fuel	**Coated fuel particle / Prismatic block type**
Core material	**Graphite**
Coolant	**Helium**
Inlet temperature	**395 °C**
Outlet temperature	**950 °C (Max.)**
Pressure	**4 MPa**

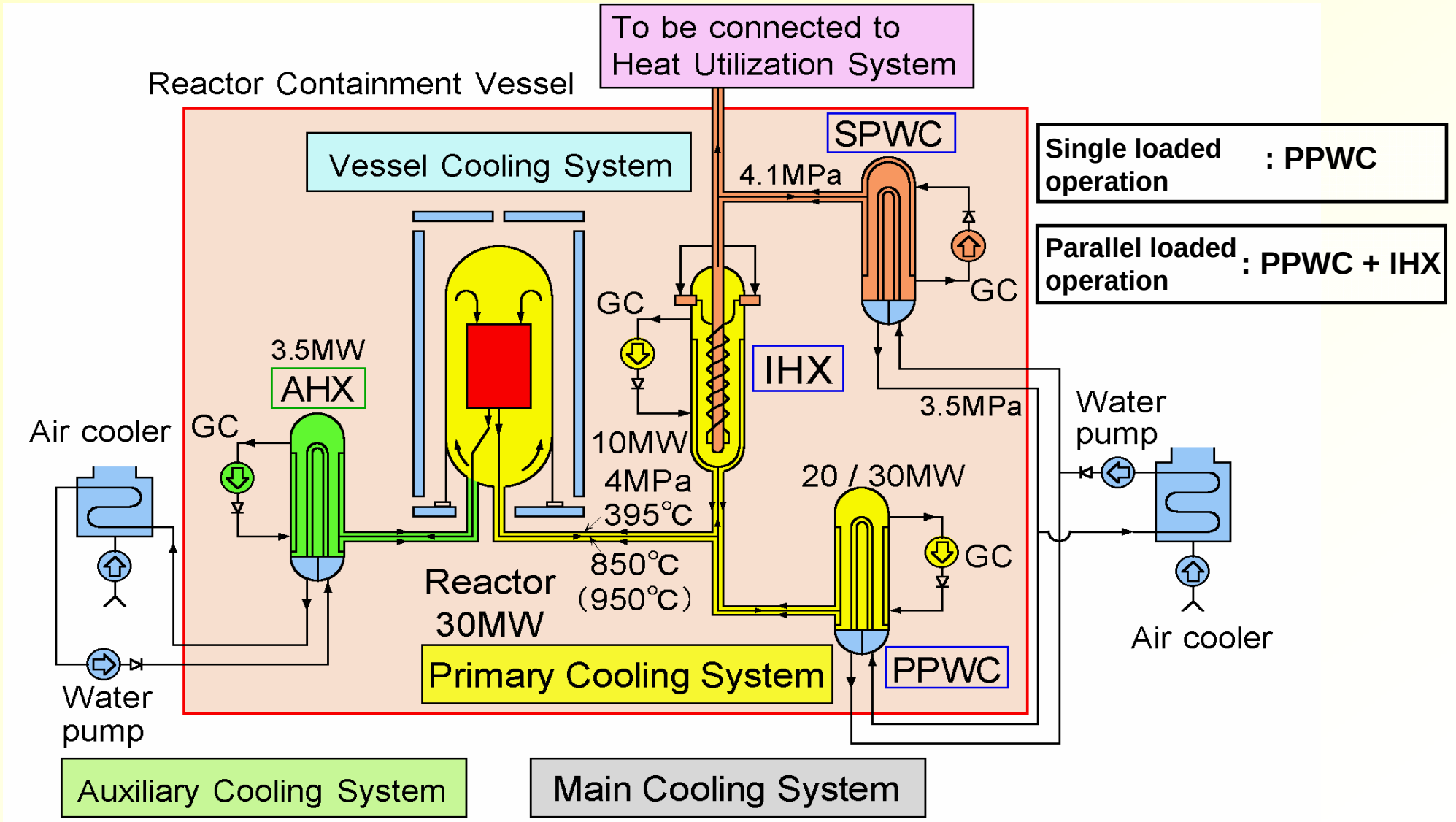
History

- First criticality : 1998
- Full power operation : 2001
- Safety demonstration test : 2002
- High temperature operation (950°C) : 2004

Block Type Fuel of the HTTR

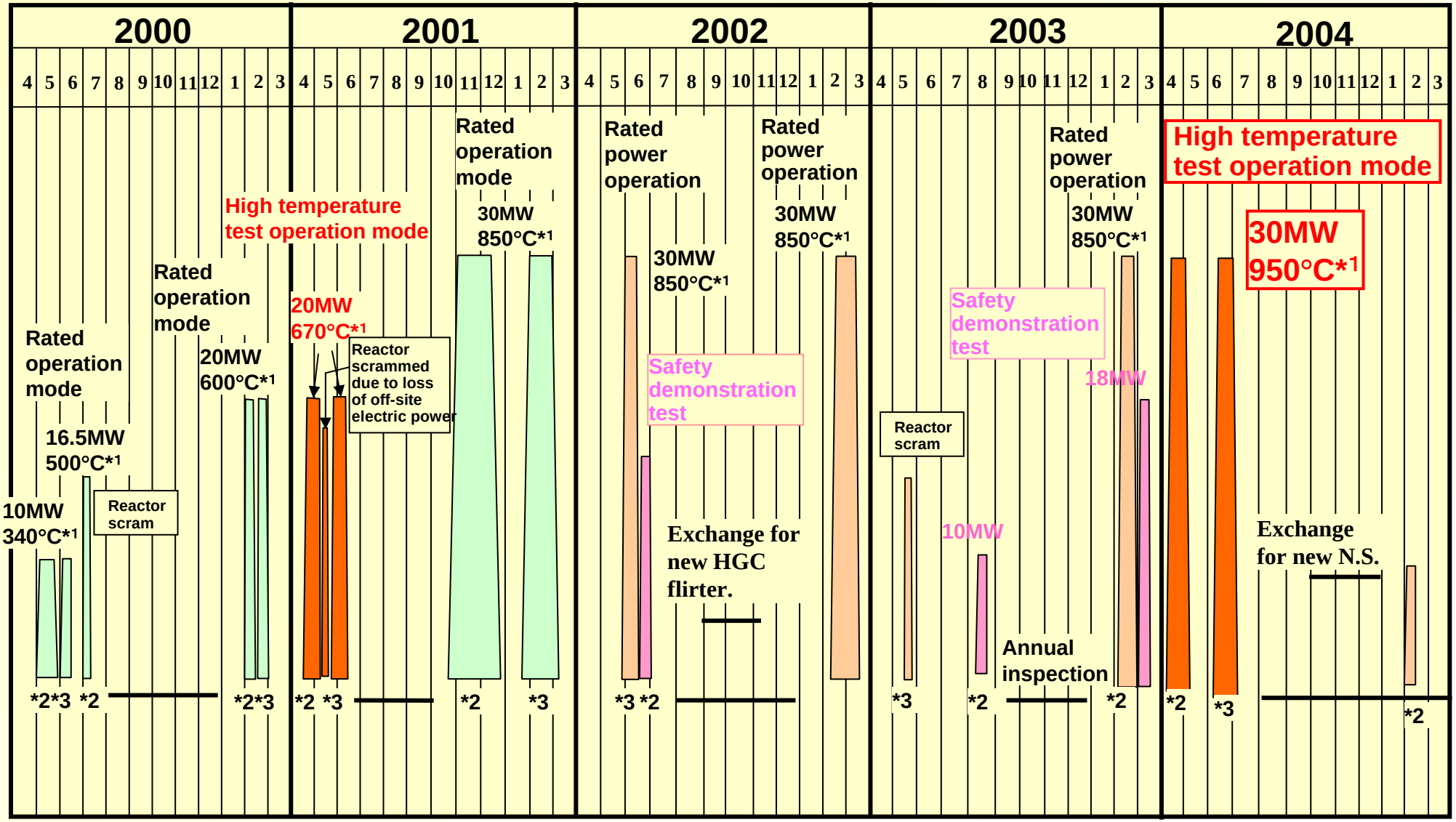


Cooling System of the HTTR



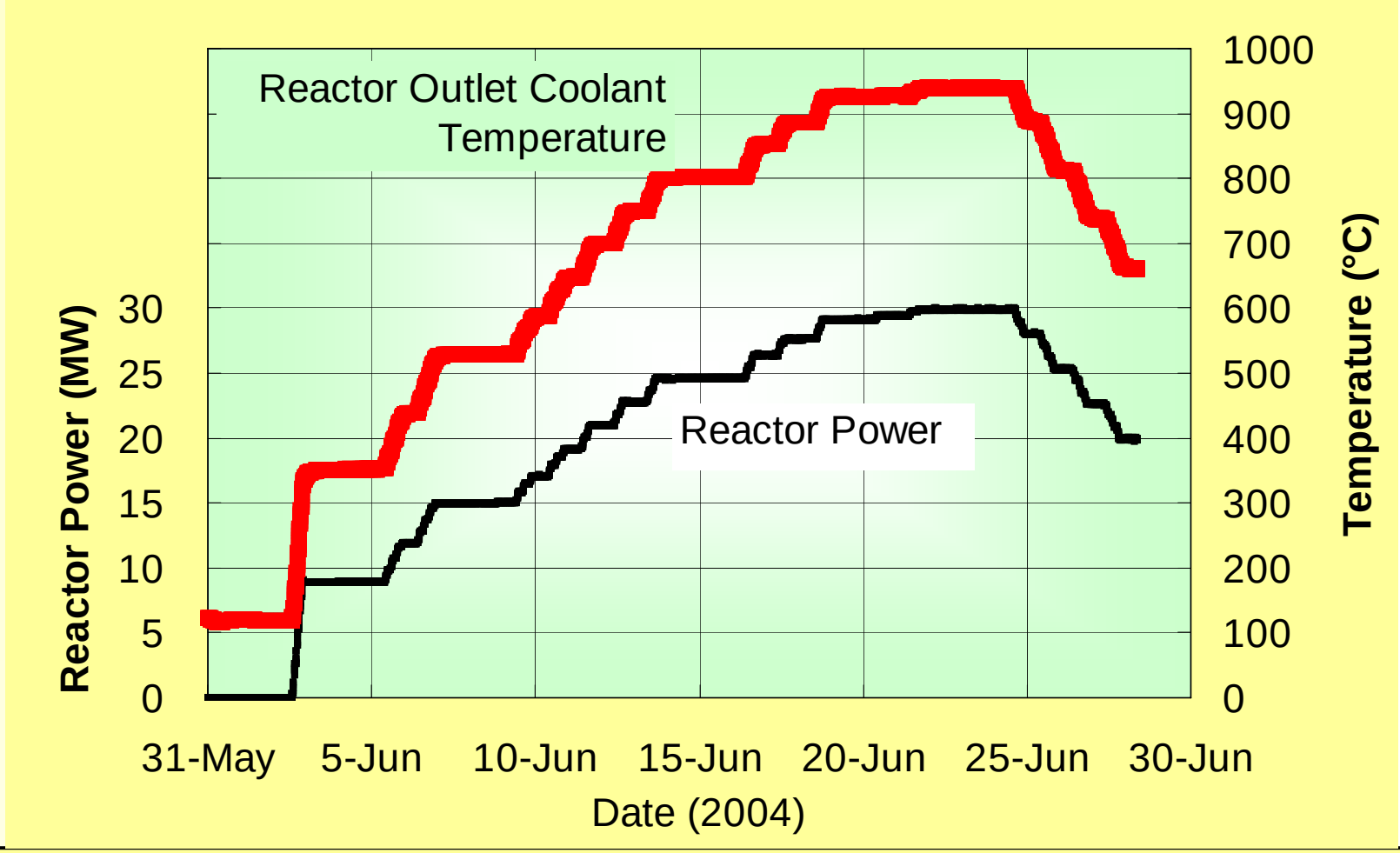
IHX : Intermediate heat exchanger
PPWC: Primary pressurized water cooler
SPWC: Secondary pressurized water cooler
AHX : Auxiliary heat exchanger

2. Power-up test and achievement of 950 °C



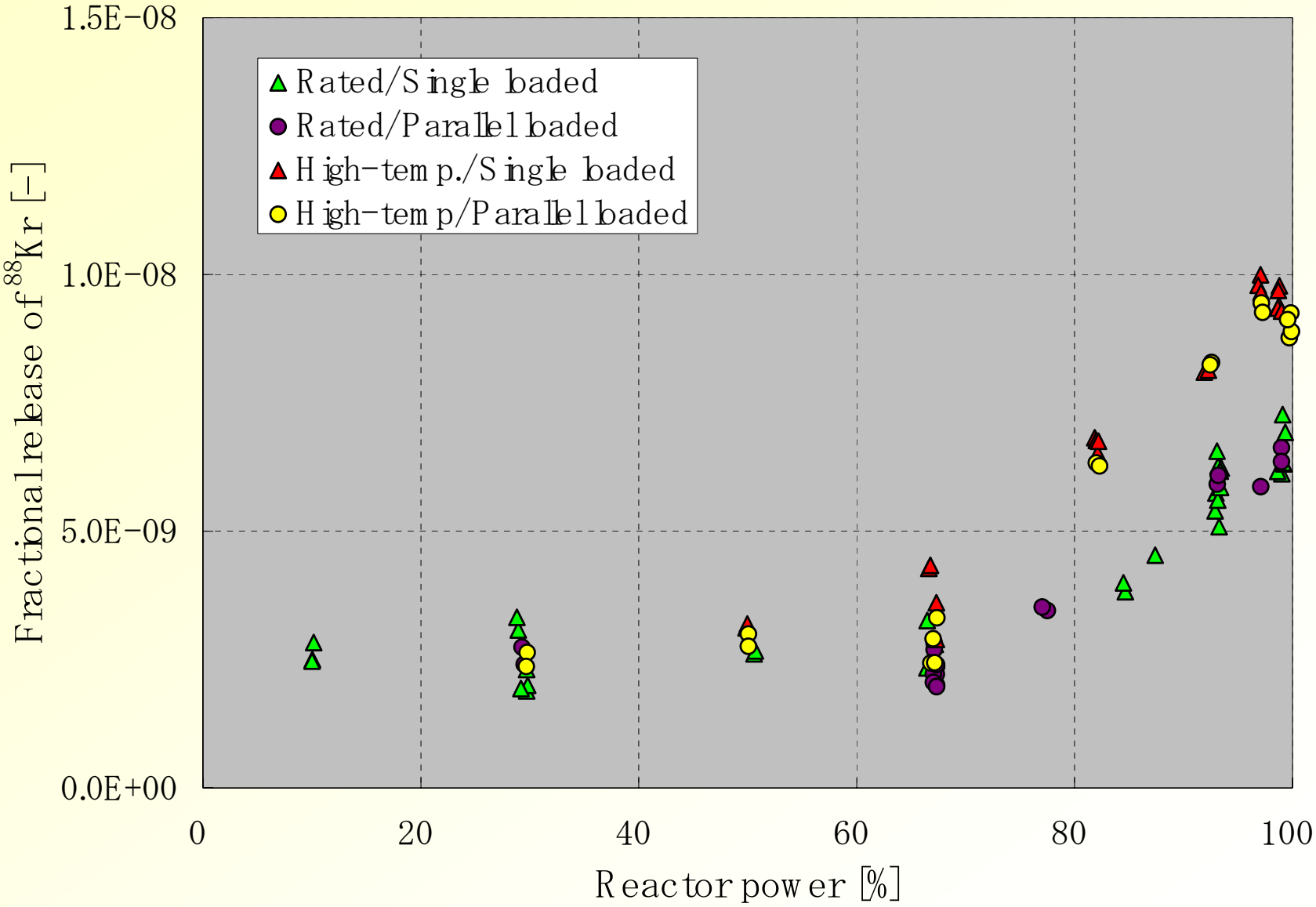
*1: Reactor outlet temperature, *2: Single loaded operation, *3: Parallel loaded operation

Achievement of 950 °C

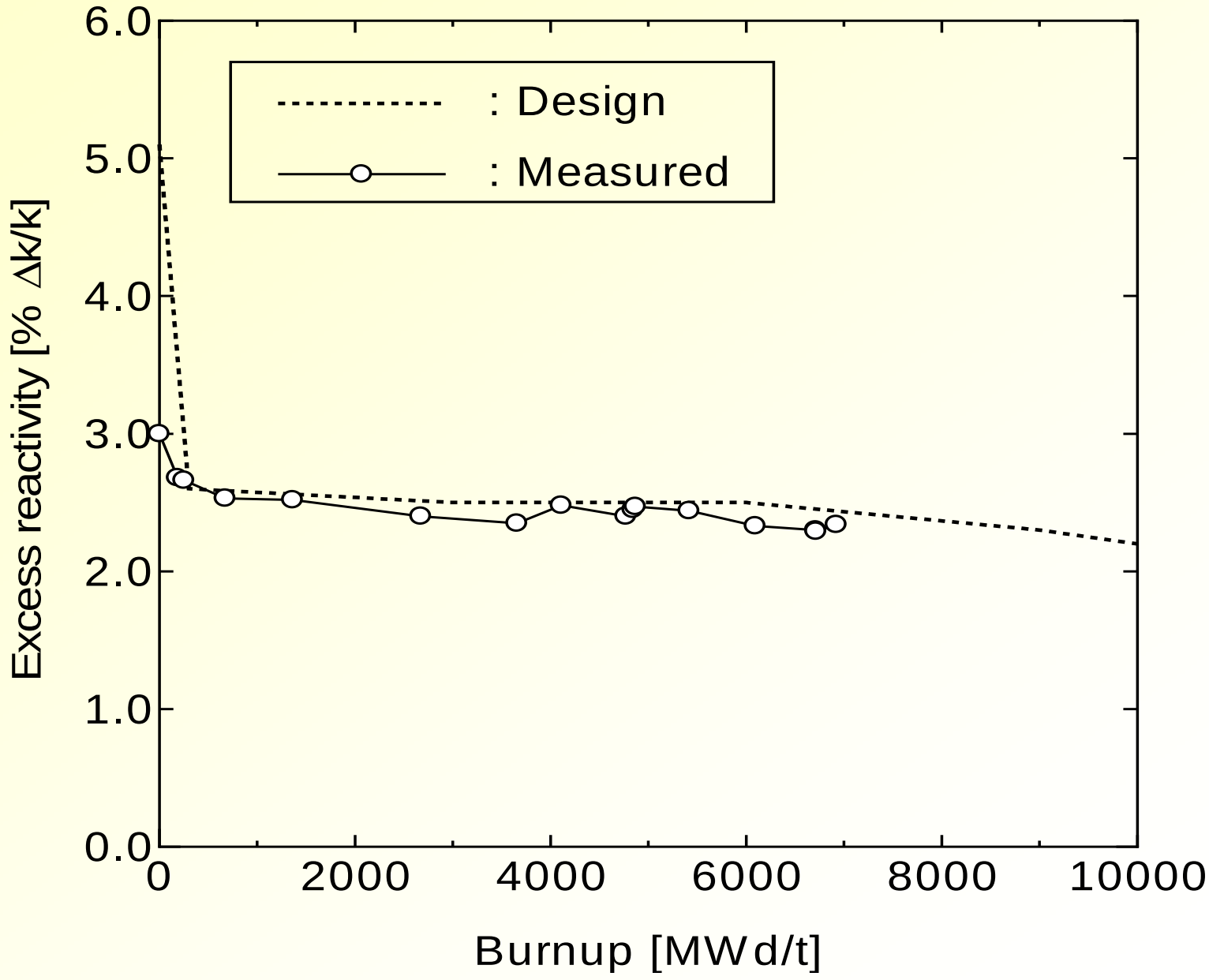


Power-up tests at 950°C were completed, and JAEA received an operation permit for the high-temperature test operation (950°C operation) from the government.
(June 24, 2004)

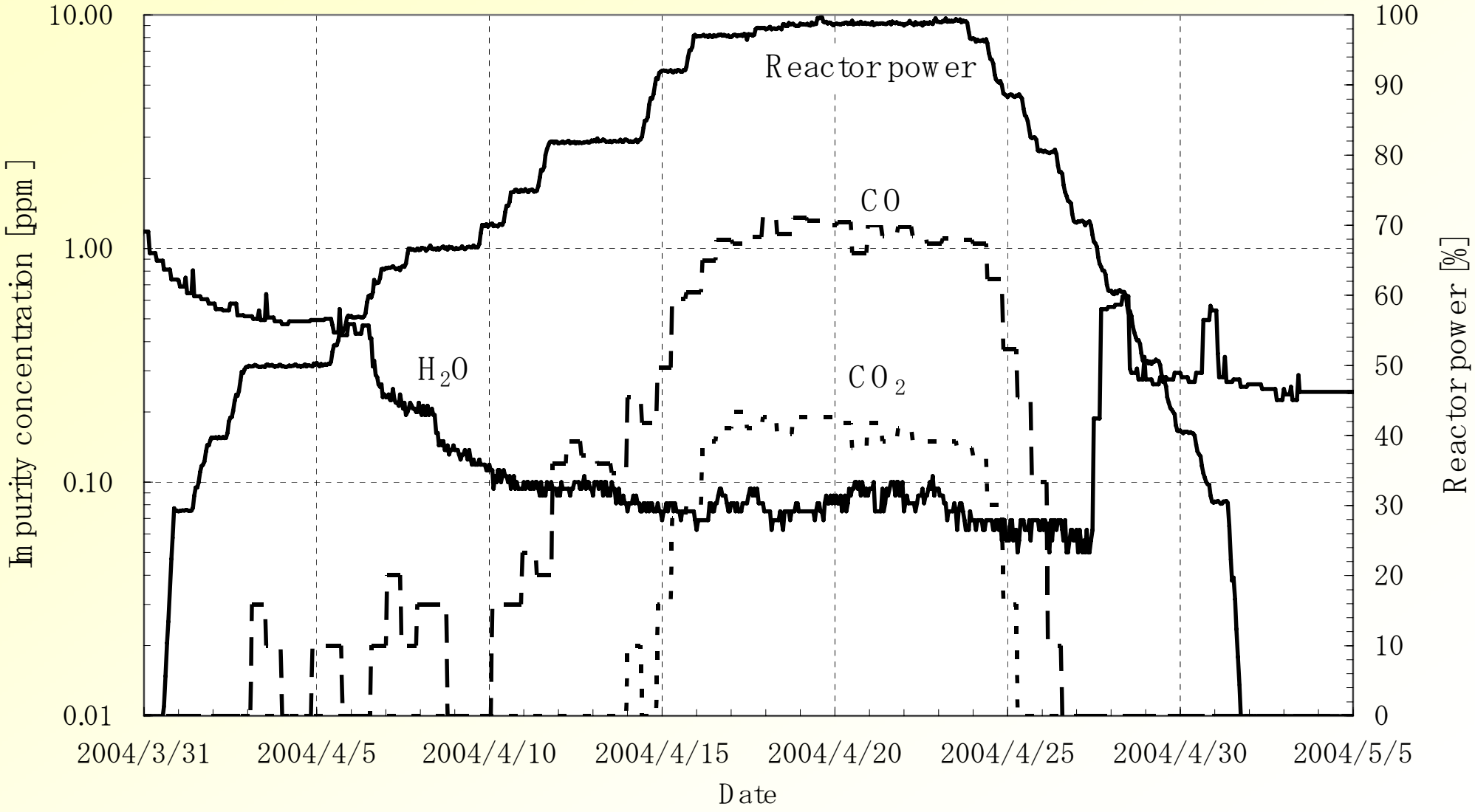
Fuel performance



Change in excess reactivity with burn up



Chemical impurities in primary coolant



3. Maintenance experience

The HTTR has been operated about eight years since the first criticality achieved. Many maintenance works have been carried out.

- **Typical maintenance works for the improvement of the HTTR plant performance**
  - Filter exchange of primary gas circulator
  - Maintenance for reserved shutdown system
  - Neutron detector replacement

4. Future plan

2007 → 2020

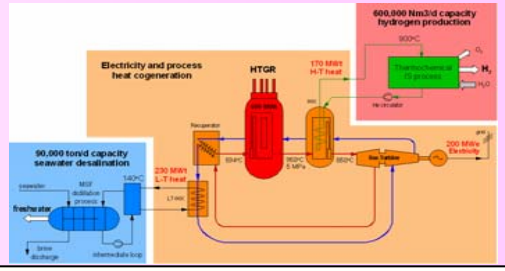
High temperature gas reactor technology development（HTTR）

- The achievement of nuclear reactor exit temperature 950°C（The first in the world）
- **Safety demonstration tests**
- **Long high-temp. operation to grasp reactor characteristic**
- **Accumulation of operation, management maintenance technology**

IS method hydrogen production technology development

A design study of cogeneration system

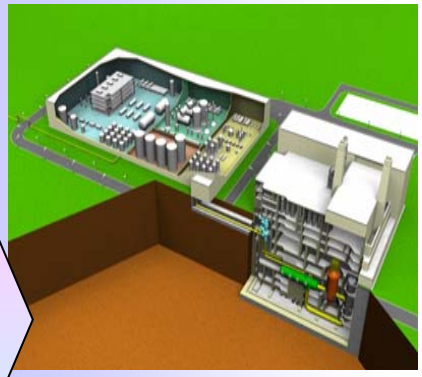
- Design of GTHTR300−Cogeneration
- Research and development of compressor and magnetic bearing



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

Commercial HTGR System

Hydrogen production for commercial use in 2020s



Future operation plan

2007

- 30 days operation (850°C, Parallel loaded operation)

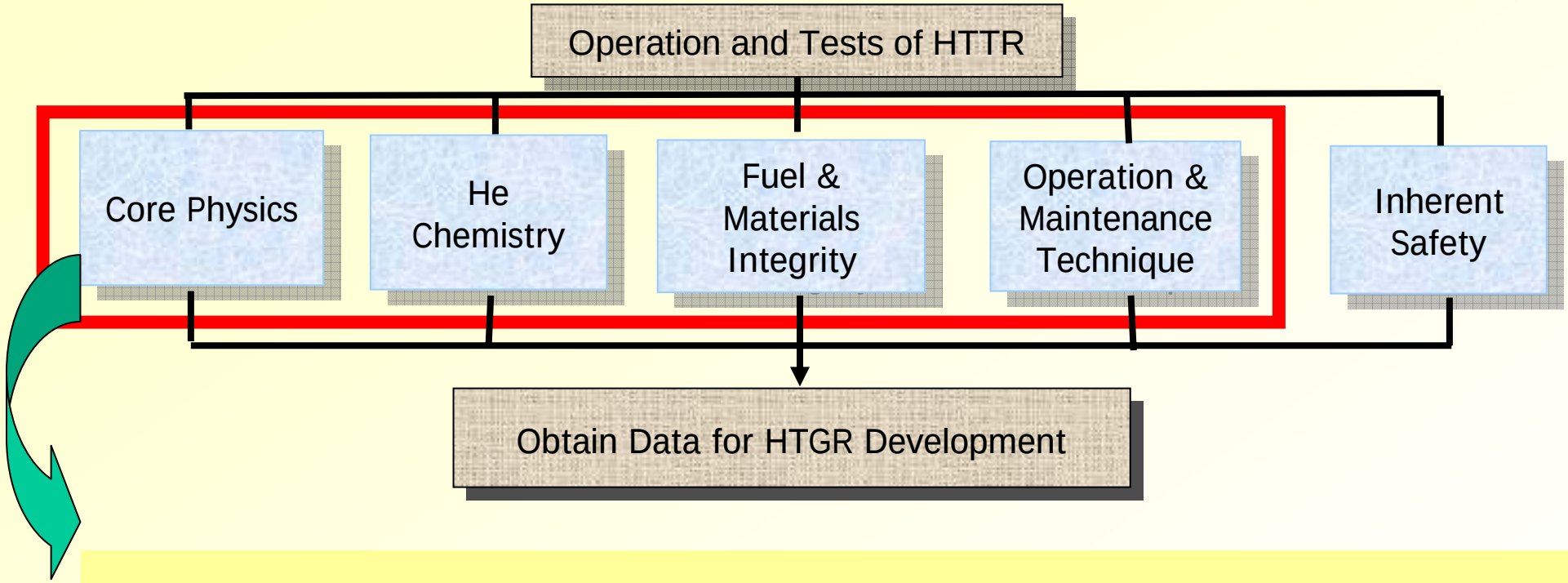
2008

- Safety demonstration tests (All G/C stop, 9MW)
- 50 days operation (950°C, Parallel loaded operation)

2009

- Safety demonstration tests (All G/C & VCS stop, 9MW)

Purpose of Long High-temp.(50days/950°C) Operation



Core Physics : Excess reactivity and other core physics parameters change by fuel burn-up

He Chemistry : Impurities behavior at high temperature under radiation environment
Performance of primary He purification system

Fuel and Materials Integrity : FP release, High temp. component (IHX), In-core components (Graphite core support and reflectors)

Operation and Maintenance Technique : Control of primary coolant (Leak, Purification,・・・)

5. Summary

- **JAEA is promoting R&Ds on HTGR** which has salient inherent safety features and can be used for various nuclear heat utilization.
- **The HTTR**, the first HTGR in Japan, **achieved the reactor outlet coolant temperature of 950°C** in April 2004.
- **Many kinds of operation and maintenance data** of the HTTR are now being accumulated.
- **Demonstration of hydrogen production** with HTTR will be performed in near future.


Thank you for your attention.
HTTR
High Temperature Engineering Test Reactor
高温工学試験研究炉
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