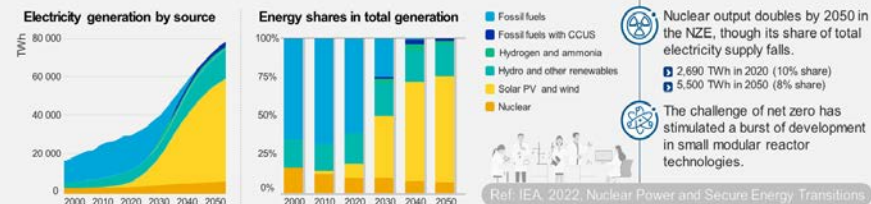


# 국내 SMR Fleet 현황(I) [SMART 기술개발 및 인허가]

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SMART Development Group

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## Global nuclear power generation and total generation by type of energy in the Net Zero Emissions by 2050 Scenario



### Roles of SMR in NZE

- Replacement of coal plants to supply on-grid power
- Replacement of fossil fuels in heavy industry, off-grid mining and district heating
- Hydrogen production, desalination and merchant shipping

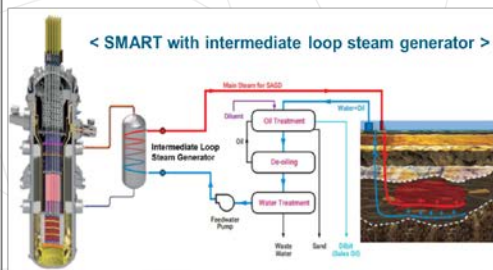


### SMART can supply carbon-free hot steam necessary for SAGD process now.

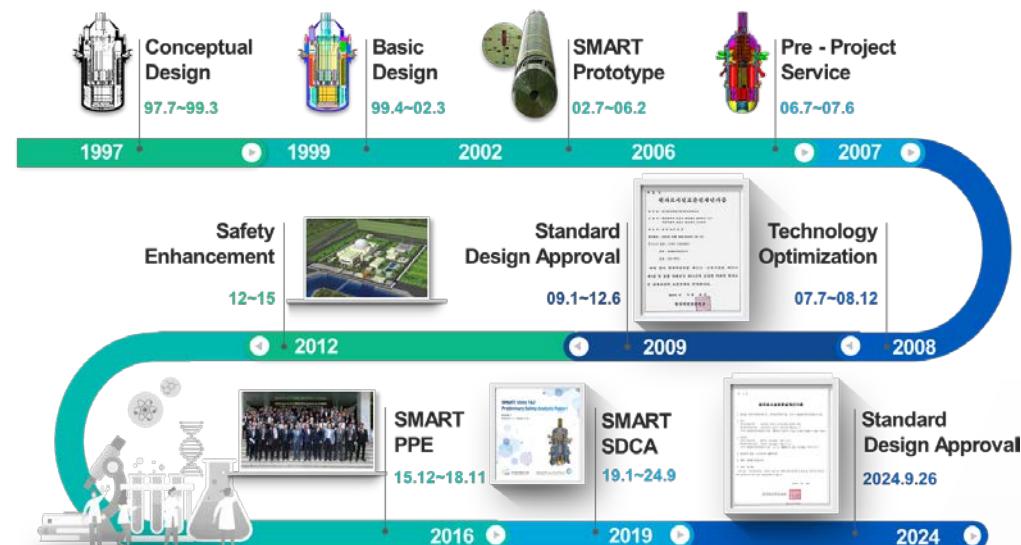
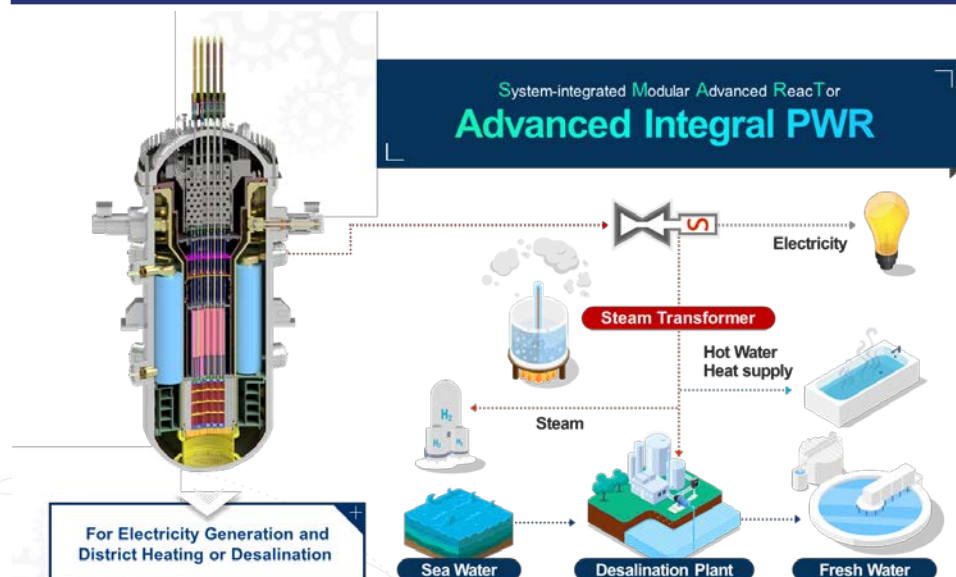
- SMART technologies are safe, reliable and licensed through the standard design approval.
- SMART has competitive economics compared to Gas Boiler with CCS

### KAERI signed MOU for SMART cooperation with Alberta Government and AECL in 2023.

- KAERI and HEC applied CNL SMR siting program in September 2023.
- Joint feasibility study for oil sand application will be expected to start soon.



## ALL-IN-ONE: Harmonizing Innovative concept and Proven Technology for Licensability and Market Acceptability



### Innovative Concept

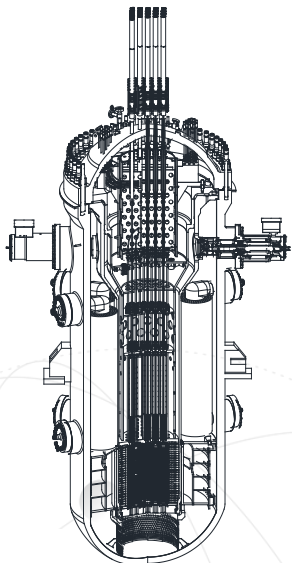
- ▶ All Major Components in Rx Vessel
- ▶ Modularization for Field Installation and Maintenance
- ▶ Passive Safety System
- ▶ Fully Digitized Control System

### Proven Technologies

- ▶ 17 x 17 UO<sub>2</sub> Proven Fuel Technology
- ▶ Control Rod Drive Mechanism
- ▶ Reactivity Control Concepts Using BP and Soluble Boron



## Design Features of SMART



SMART Reactor Assembly

### General Information

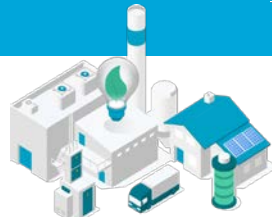
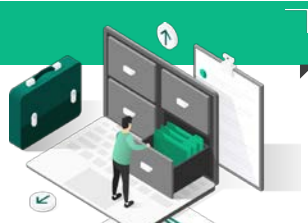
- ▶ Thermal Power : 365 MWt
- ▶ Electric Power : 100~110 MWe
- ▶ Desalination : 40,000 ton/day
- ▶ Design Life : 60 years

### Reactor Coolant System

- ▶ Design Pressure : 17 MPa
- ▶ Operating Pressure : 15 MPa
- ▶ Design Temperature : 360 °C
- ▶ Core Inlet/Outlet Temperature : 295.5/322 °C

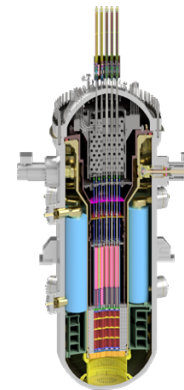
### Fuel and Reactor Core

- ▶ Fuel Type : 17×17 Square FA
- ▶ Fuel Material : UO<sub>2</sub> ( < 5.0 w/o)
- ▶ Active Core Height : 2.0 m
- ▶ Refueling Cycle : 30 months



## SMART Fleet

### SMART100



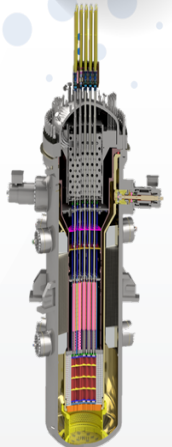
#### • SMART100 •

330 MWt  
110 MWe  
가압경수형  
일체형  
30개월  
나선형 카세트  
4개월 완전피동  
축전지  
직류전력 + 자연력  
72시간  
< 1.0×10<sup>-7</sup>/RY  
아치형 사각  
격납건물

#### • SMART-C •

365 MWt  
Optional  
가압경수형  
일체형  
30개월  
단일블록형 나선형  
2개월 완전피동  
축전지  
직류전력 + 자연력  
72시간  
< 1.0×10<sup>-7</sup>/RY  
축소된 아치형  
격납건물

### SMART-C



Electric generation: SMART100 (Data Center)



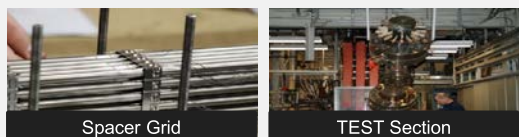
Processor Heat: SMART-C (Oil Sand Mining)

## Fuel TH Tests

### Fuel Performance Tests

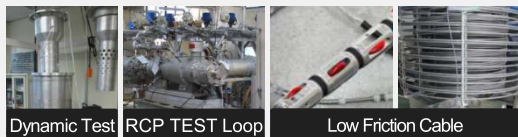


### CHF Measurement Test

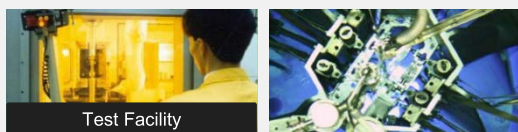


## Mechanics and Components

### RPV Dynamics Test, RCP Mockup Test and Helical ISI Test



### SG Tube Material (A690) Irradiation Test



## Thermal - Hydraulics Experiment



## SMART – ITL <sup>1)</sup>

### World's Unique and Largest Full Scope Accident Simulation 1:1 Height, 1/49 Volume

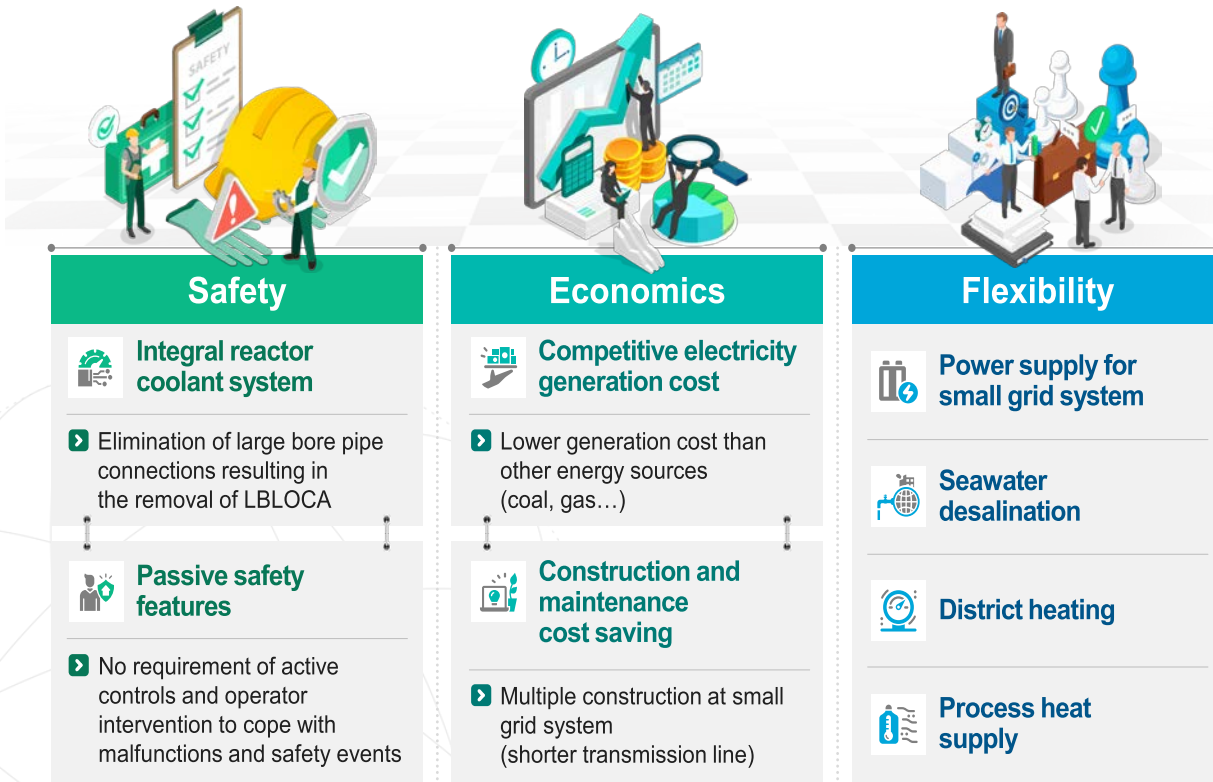


## SMART - MCR <sup>2)</sup> Simulator



- ❑ Systems, Component, and Design Tools have been fully Developed and Licensed.
- ❑ SMART Standard Design Approval in 2012 and 2024

## Competitiveness



## Advantages

### Safe Nuclear Power Plant

- ▶ ~100 times Safer than Current Nuclear Power Plant
- ▶ Safe against Natural Hazards and Terror
  - Earthquake and Tsunami
  - Aircraft Crash



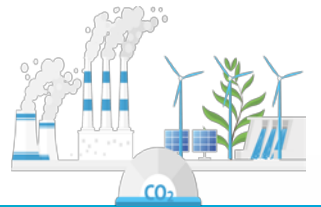
### Licensed and Validated Technology

- ▶ Standard Design Approval in 2012
- ▶ Meet the Most Country's Licensing Requirements



### Competitive Economics

- ▶ Competing with Renewable Energy with ESS or Gas Power Plant with Carbon Capture



### Minimize the Unexpected Operating and Maintenance Issues

- ▶ Similar Operating Condition of Current Nuclear Power Plant



### Reliable Equipment Suppliers

- ▶ Ready to Deploy in Anywhere

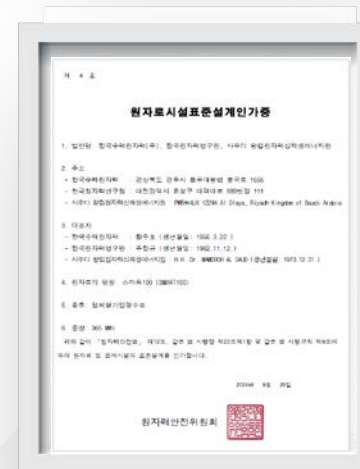
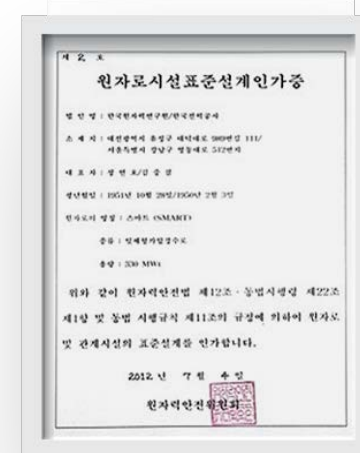


## ▶ Standard Design Approval (2024)

- ▶ To confirm safety for design with fully passive safety systems and upgraded safety features
- ▶ Based on SMART PPE Design
- ▶ Co-Applicants: KAERI, K.A.CARE, and KHNP
- ▶ Currently under safety review by Korean Nuclear Safety and Security Commission (NSSC)

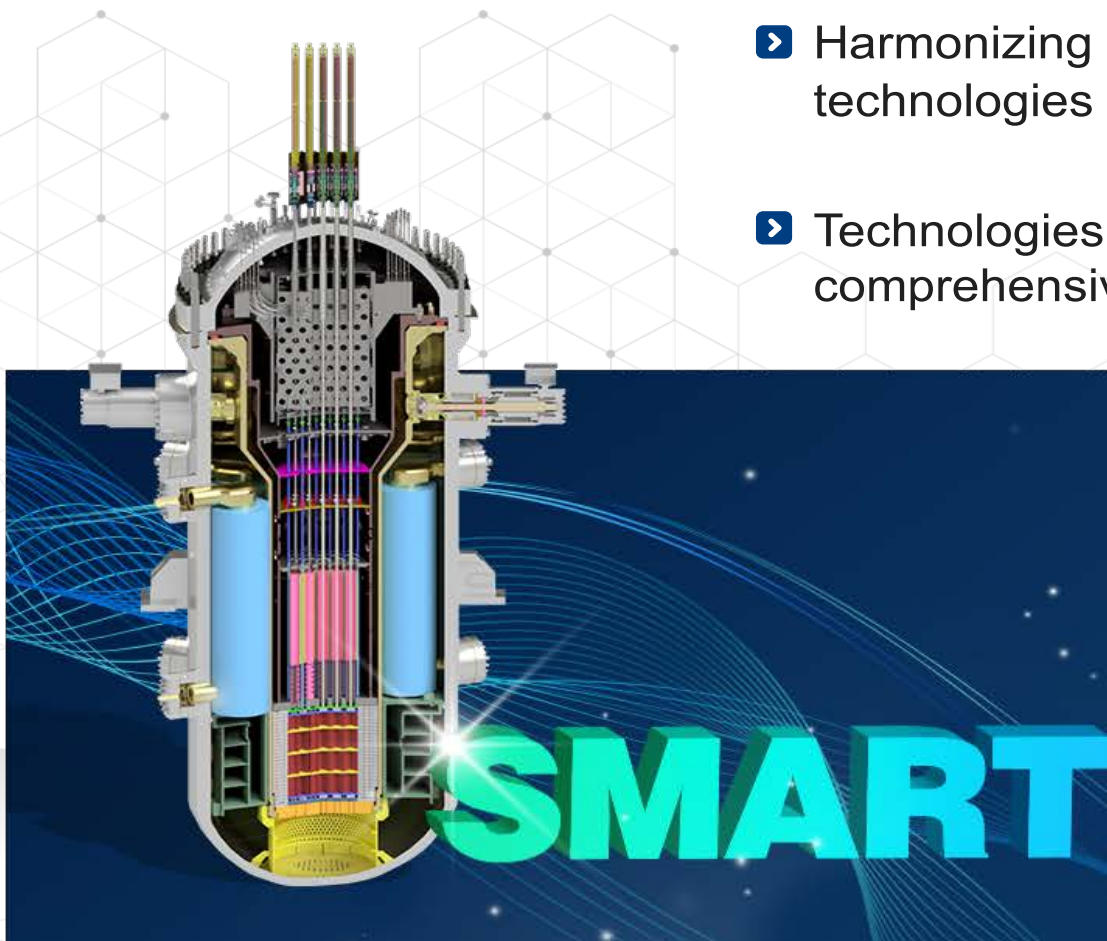


Completion of technical safety review by the end of 2022 and issuance of SDA by NSSC in September of 2024

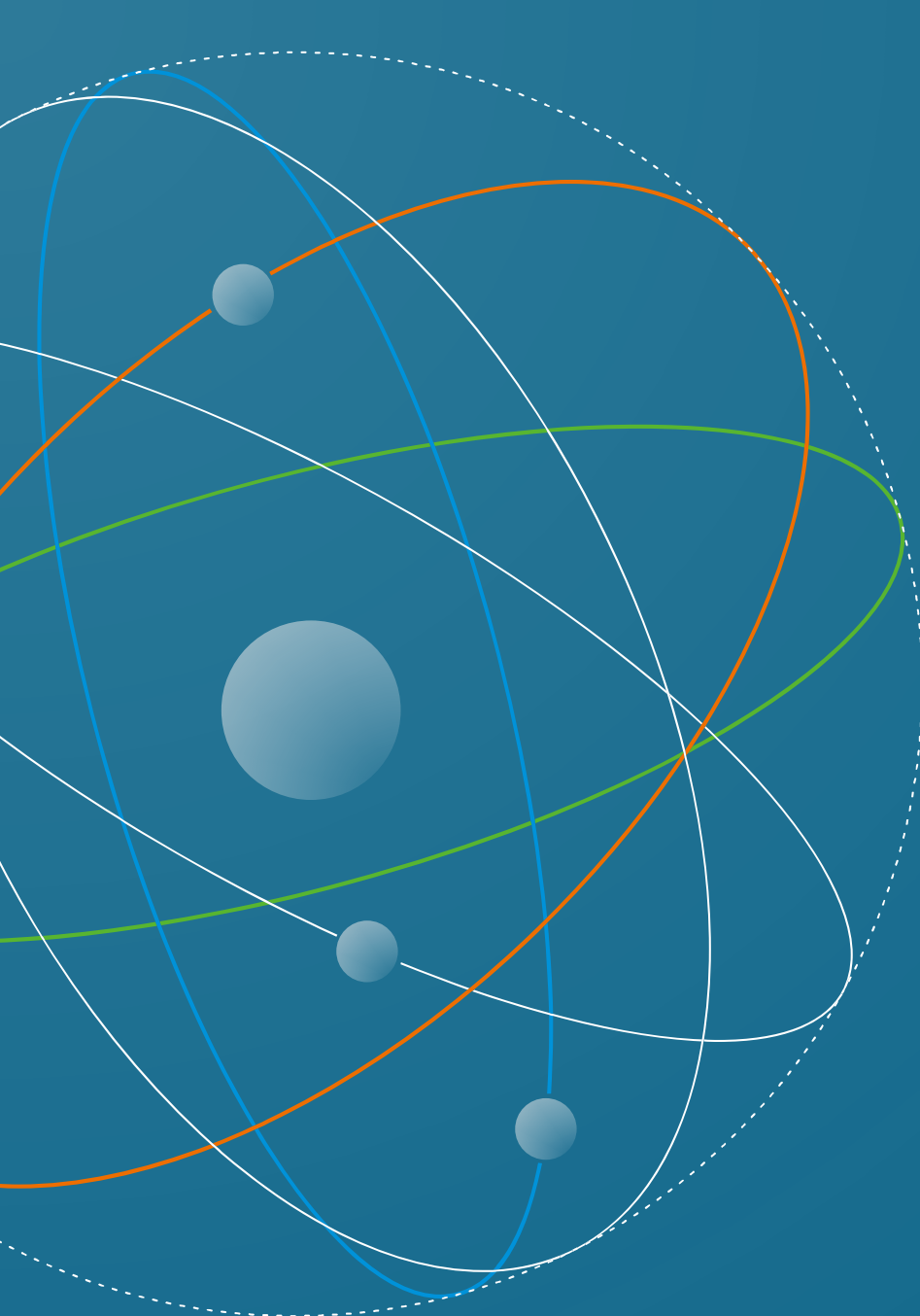


**SMART is ready for immediate deployment with established supply chain.**

- ▶ Harmonizing innovative concepts and proven technologies for licensing and market acceptability
- ▶ Technologies proven through comprehensive technology validation program



**Paving the way toward  
small modular reactor  
deployment with enhanced  
safety and diversified  
utilization**



**A nuclear energy  
reshaping the future** based  
on **peoples trust**

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**THANK YOU**



**Korea Atomic Energy  
Research Institute**