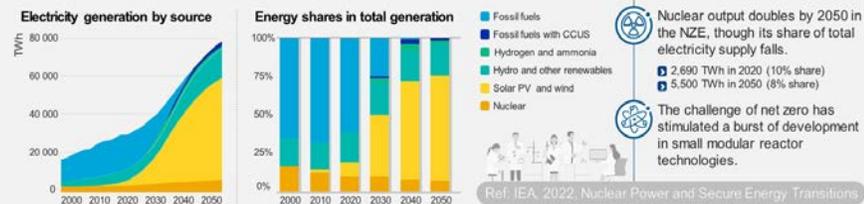


국내 SMR Fleet 현황(I) [SMART 기술개발 및 인허가]

Hyouk Kwon
SMART Development Group

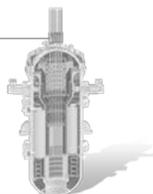
Oct. 2024

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

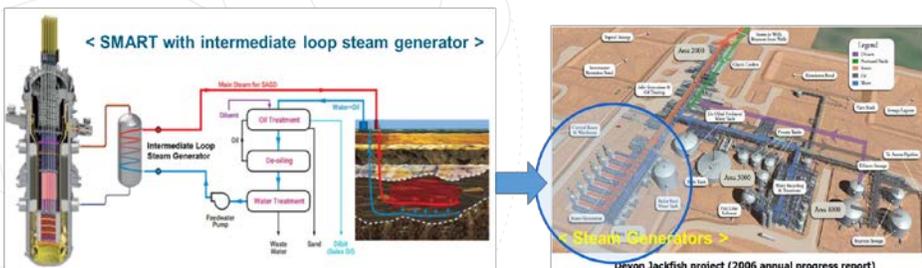


Roles of SMR in NZE

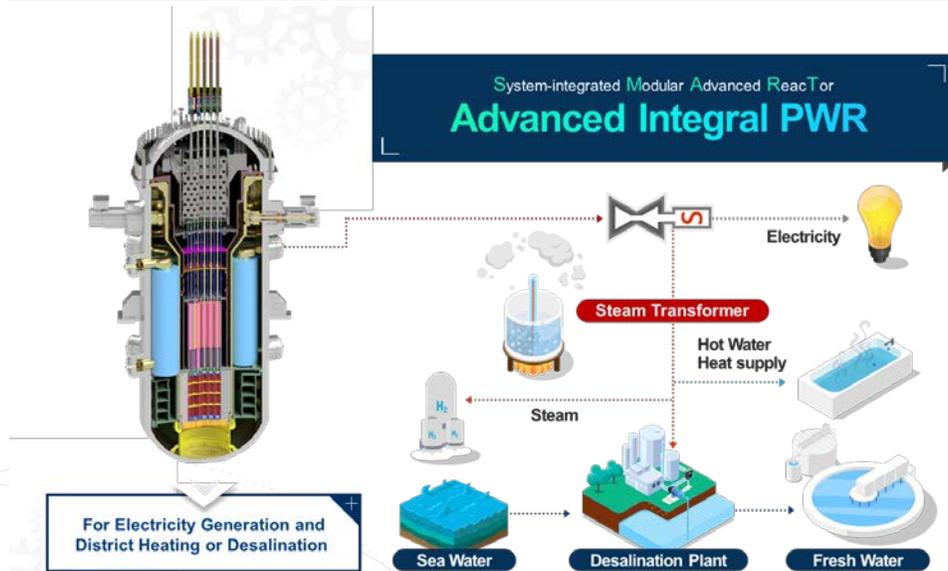
- Replacement of coal plants to supply on-grid power
- Replacement of fossil fuels in heavy industry, off-grid mining and district heating
- Hydrogen production, desalination and merchant shipping



- 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

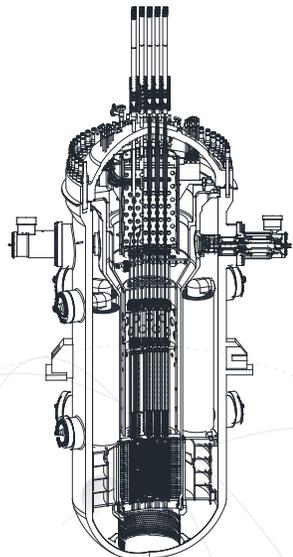
- ▶ All Major Components in Rx Vessel
- ▶ Modularization for Field Installation and Maintenance
- ▶ Passive Safety System
- ▶ Fully Digitized Control System

Proven Technologies

- ▶ 17 x 17 UO₂ 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



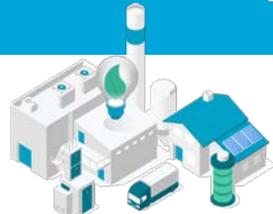
Reactor Coolant System

- ▶ 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 : 17x17 Square FA
- ▶ Fuel Material : UO₂ (< 5.0 w/o)
- ▶ Active Core Height : 2.0 m
- ▶ Refueling Cycle : 30 months



SMART Fleet

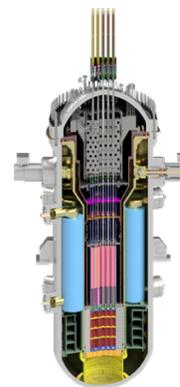
• SMART100 •

330 MWt
110 MWe
가압경수형
일체형
30개월
나선형 카세트
4개월 완전피동
축전지
직류전력 + 자연력
72시간
< 1.0x10⁻⁷/RY
아치형 사각
격납건물

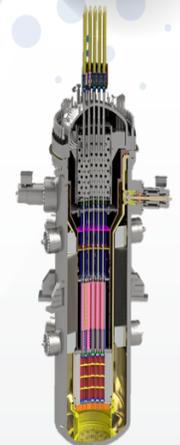
• SMART-C •

365 MWt
Optional
가압경수형
일체형
30개월
단일블록형 나선형
2개월 완전피동
축전지
직류전력 + 자연력
72시간
< 1.0x10⁻⁷/RY
축소된 아치형
격납건물

SMART100



SMART-C



❏ Electric generation: SMART100 (Data Center)

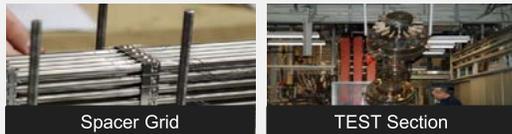
❏ Processor Heat: SMART-C (Oil Sand Mining)

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 ¹⁾

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

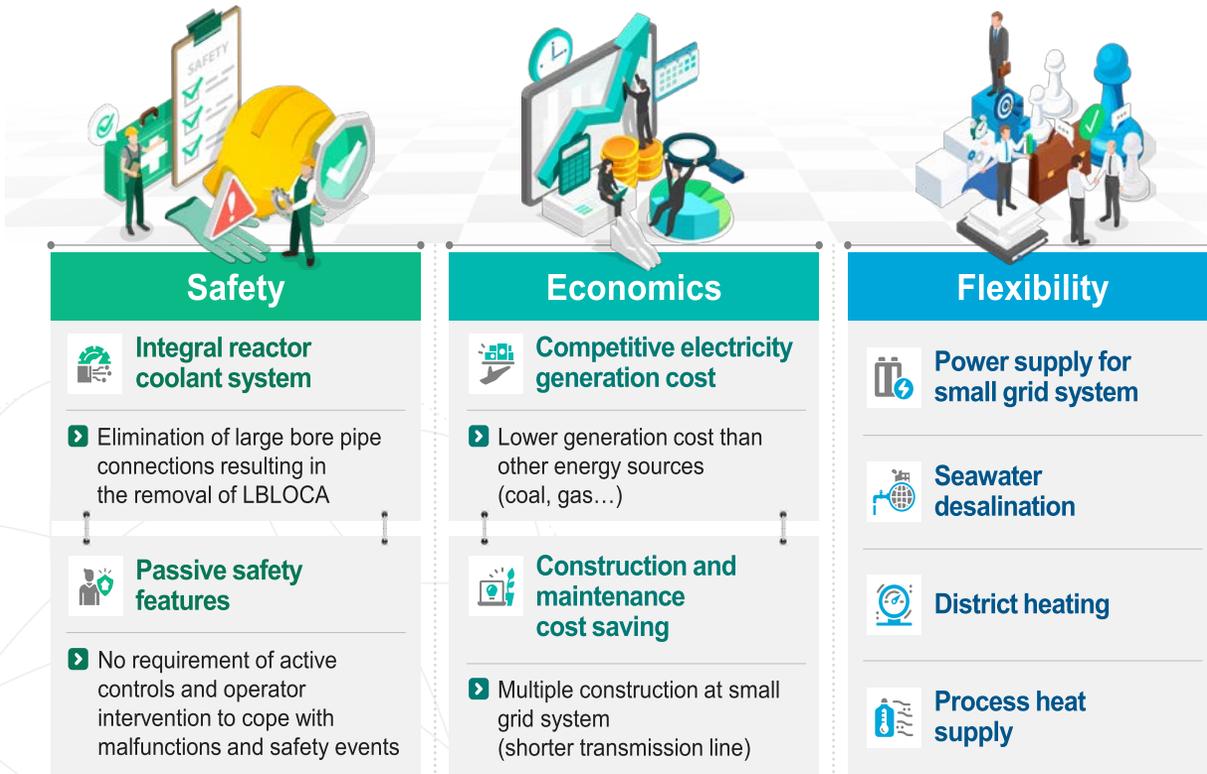


SMART - MCR ²⁾ Simulator



- ❑ 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



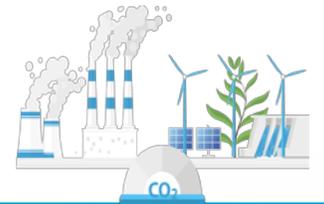
Licensed and Validated Technology

- 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

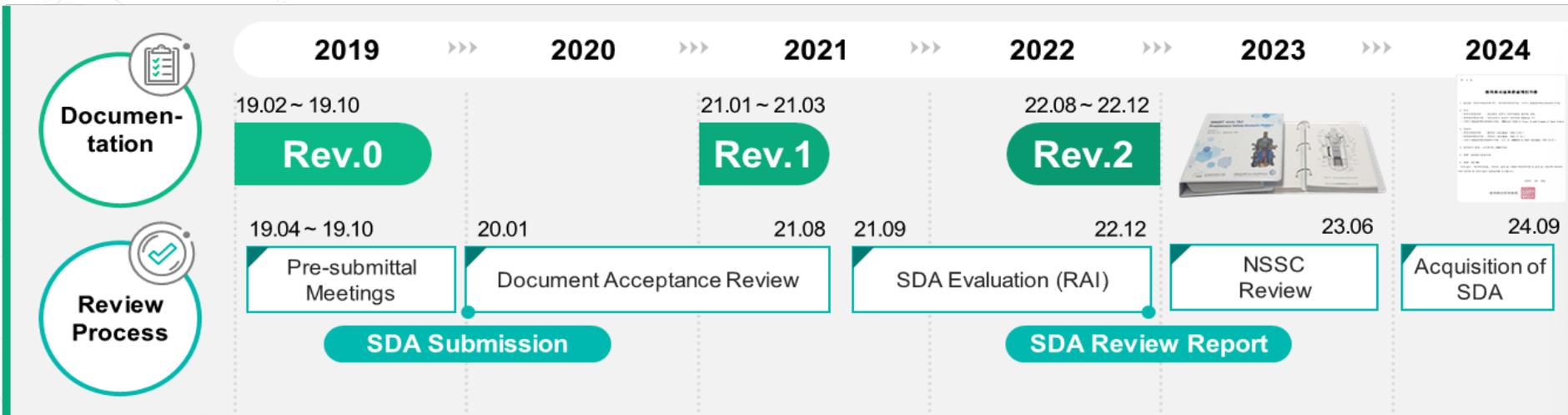
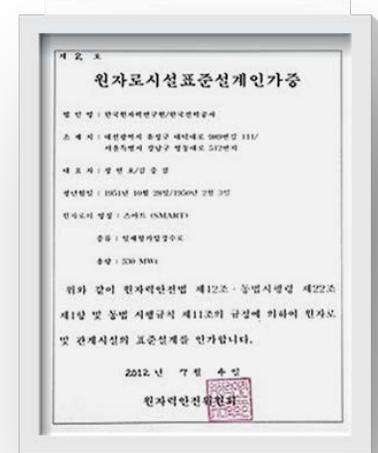
- Ready to Deploy in Anywhere



▶ Standard Design Approval (2024)

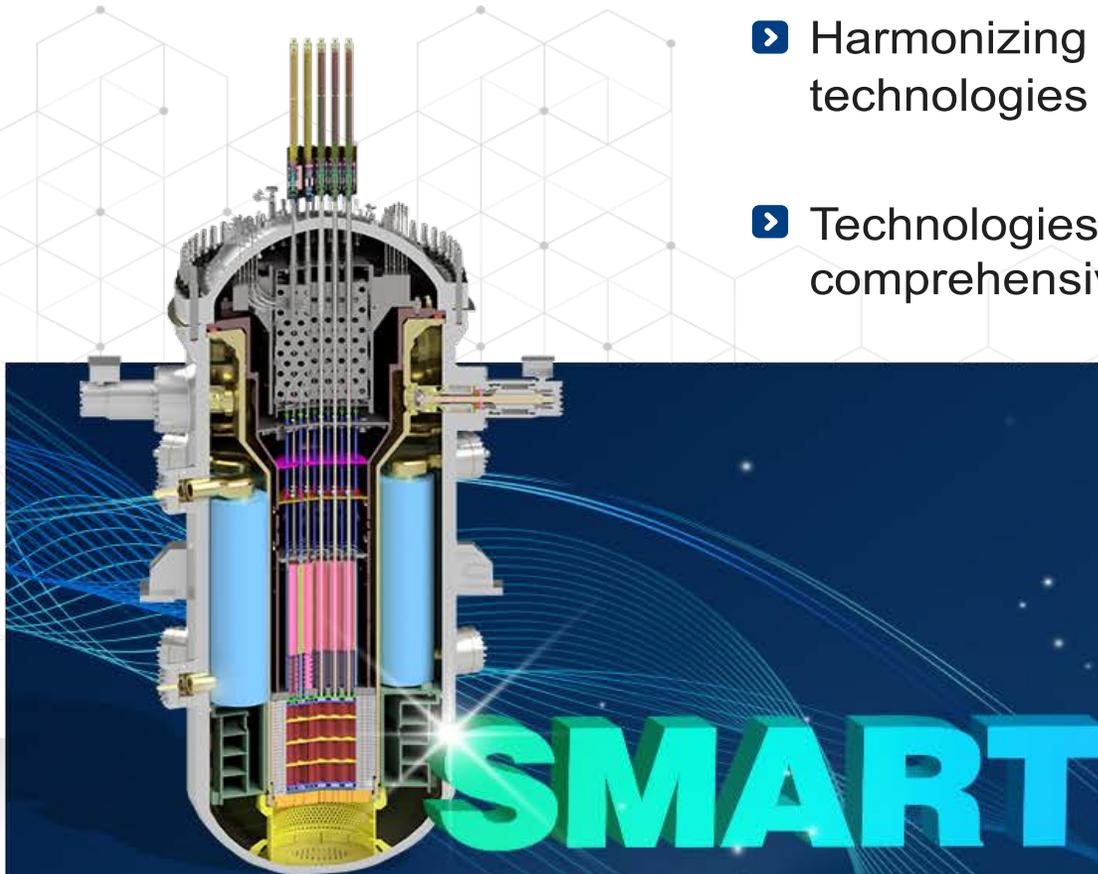
- ▶ To confirm safety for design with fully passive safety systems and upgraded safety features
- ▶ Based on SMART PPE Design
- ▶ Co-Applicants: KAERI, K.A.CARE, and KHNP
- ▶ Currently under safety review by Korean Nuclear Safety and Security Commission (NSSC)

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

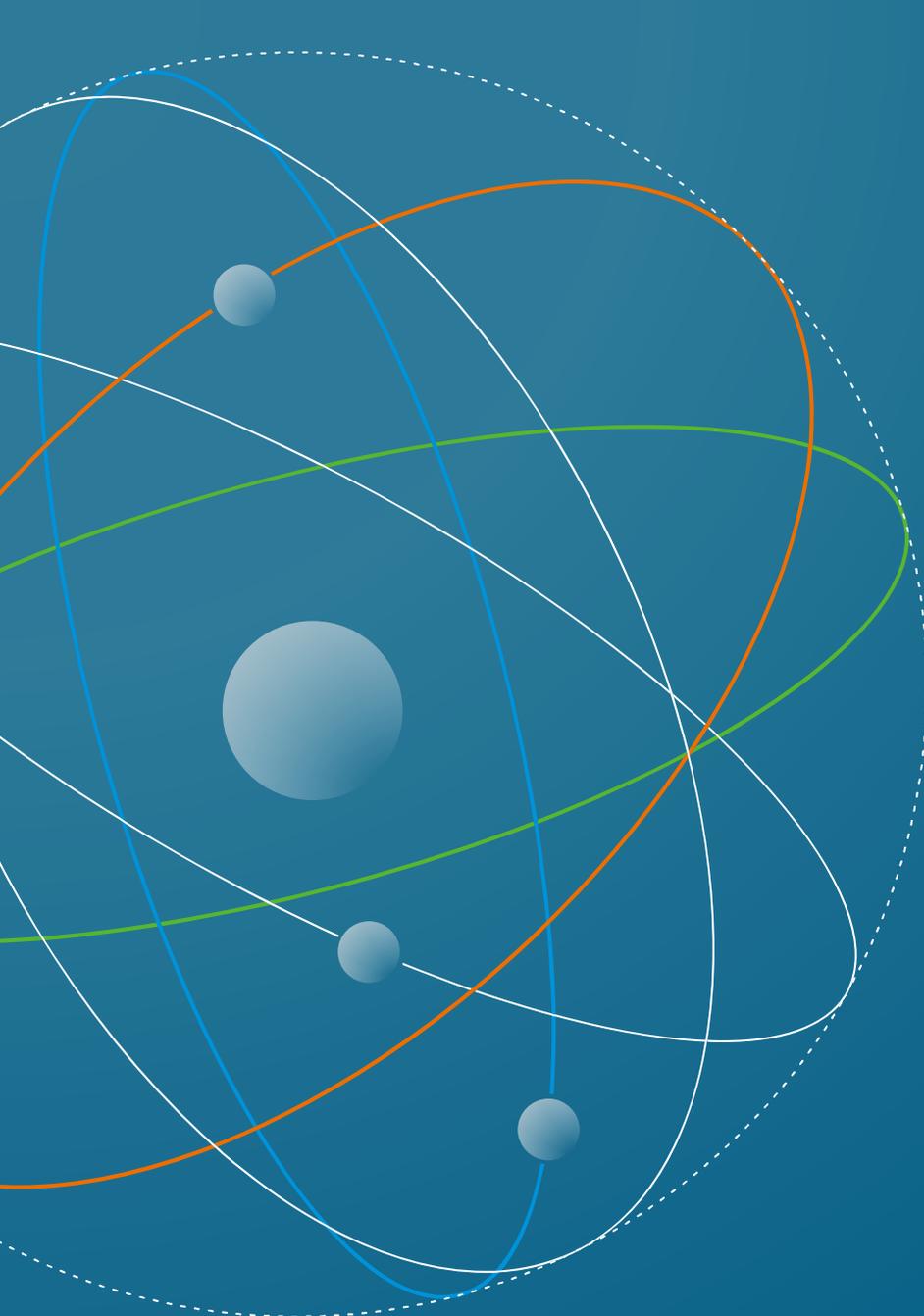


SMART is ready for immediate deployment with established supply chain.

- ▶ 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**



THANK YOU



**Korea Atomic Energy
Research Institute**