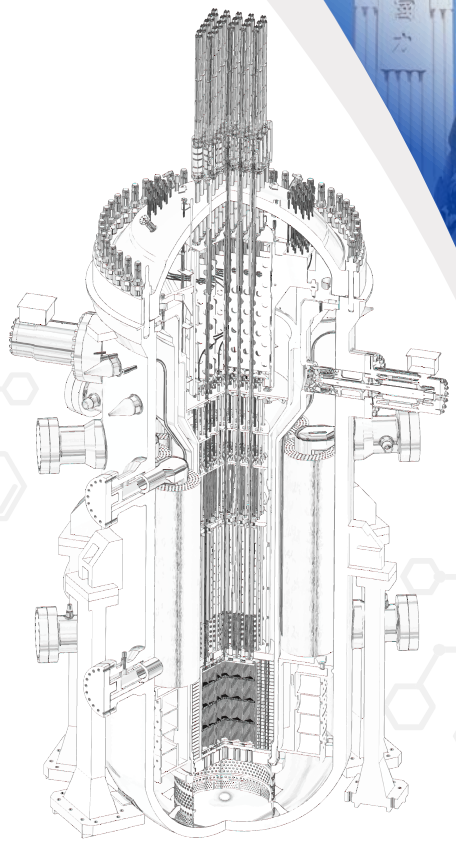
A nuclear research institute
reshaping the future
based on **peoples trust**

Overview of Modified Design Features of SMART-C

October 23, 2024

Min Young Park
Korea Atomic Energy Research Institute

Korea Atomic Energy Research Institute



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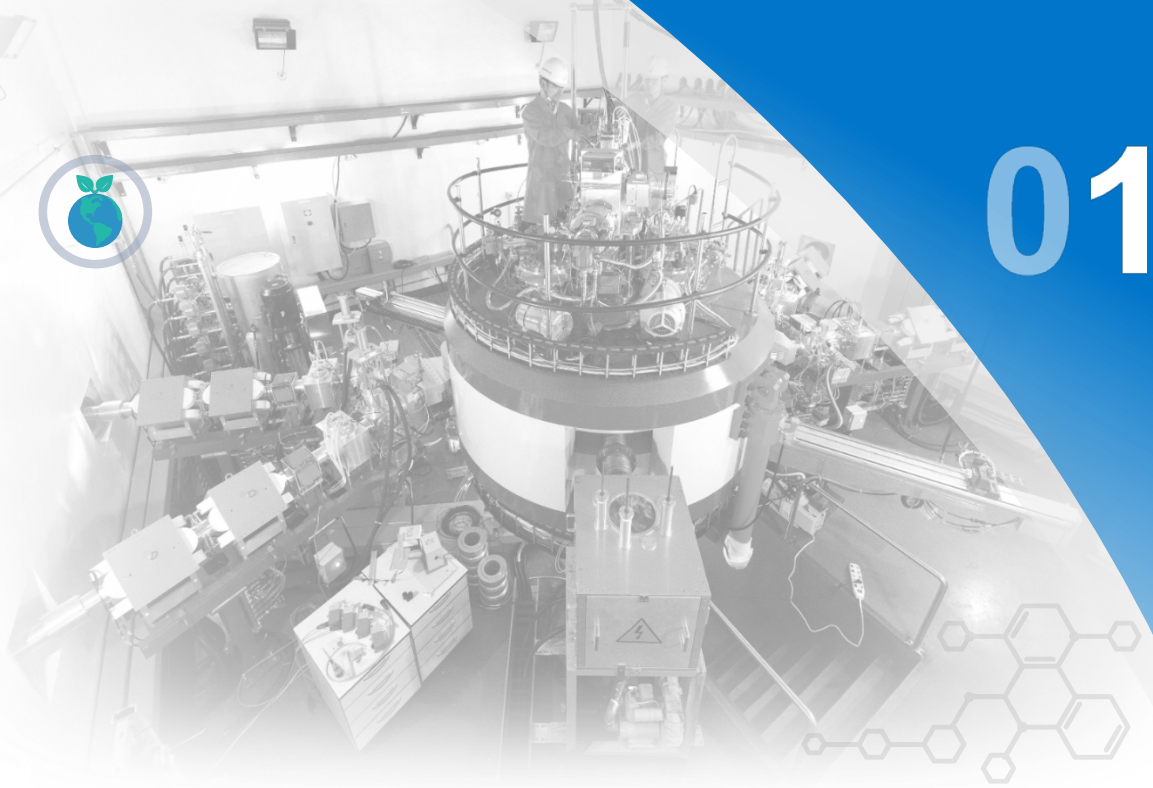

01

Introduction

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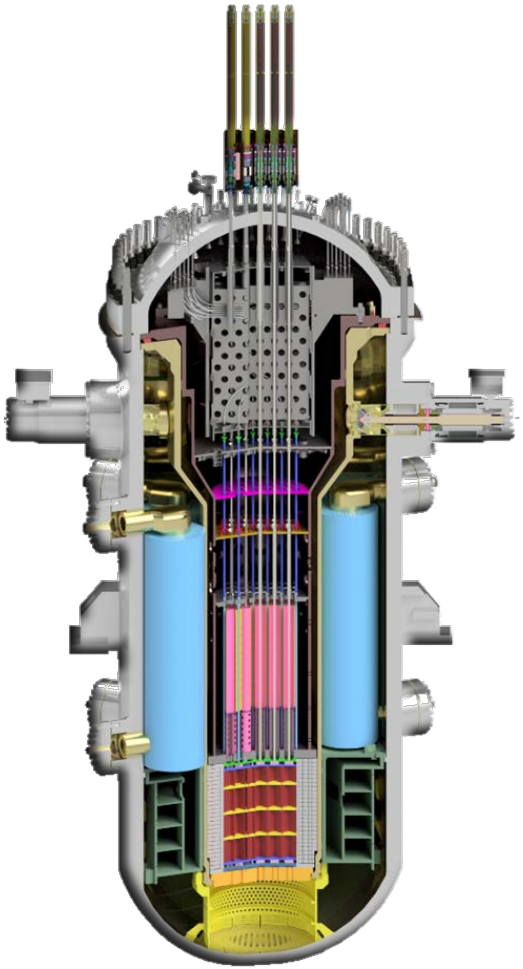
01 Introduction



NAME

SMART

System-integrated **M**odular **A**dvanced **R**eac**T**or

TYPE

Advanced Integral PWR

THERMAL POWER

365 MW

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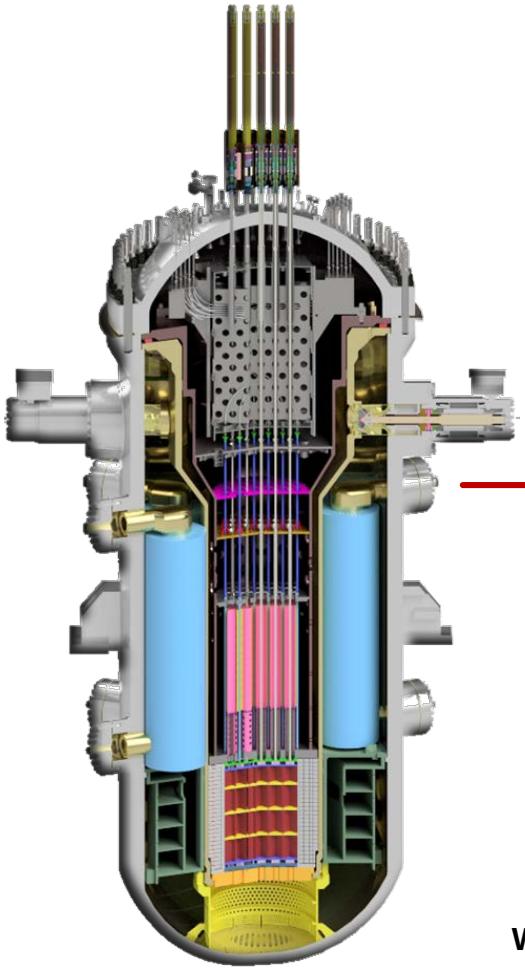
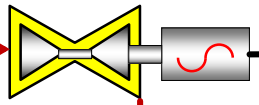


PURPOSE

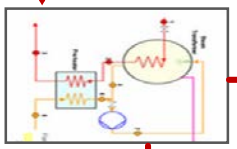
Electricity Generation and Desalination or District Heating



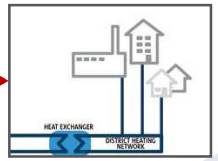
Electricity

100 MWe

Steam Transformer



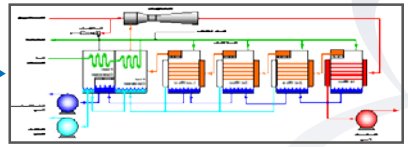
Hot Water Heat supply



Desalination Plant

Steam

Sea Water



Fresh Water

40,000 t/day

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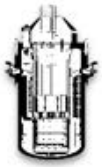
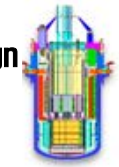


Conceptual design of SMART

97.7~99.3



Basic design of SMART

99.4~02.3

SMART Prototype

02.7~06.2

SMART Preliminary feasibility study

06.7~07.6

1997 — 1999 — 2002 — 2006 — 2007

Technology Optimization

07.7~08.12

SMART Standard Design Approval

09.1~12.7

Safety enhancement

12.3~16.2

2008 — 2009 — 2012

SMART Pre-project Engineering

15.12~18.11

Standard design of SMART100

19.1~24.09

2016 — 2019 — 2023

Integral Reactor World First SDA

SMART PPE Project

02

Overview of SMART

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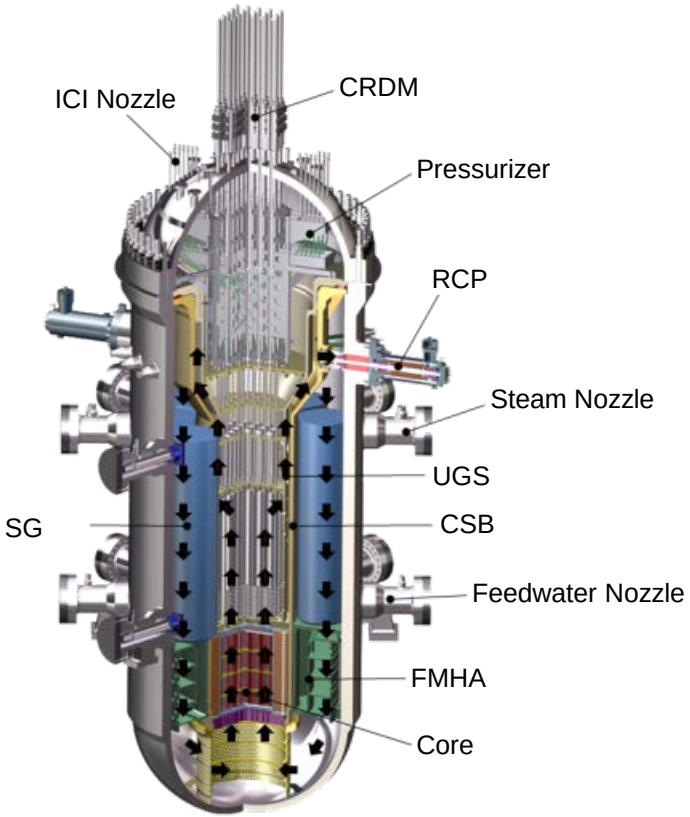
02 Overview of SMART (1/2)



CORE

- 57 fuel assembly
- Cylindrical low enriched uranium oxide pellets

Reactor Coolant Pump

- 4 canned motor pump
- Horizontally mounted

Steam Generator

- 8 cassettes
- Once-through type with helically coiled tubes

Pressurizer

- Maintain the coolant in a saturated state
- Wet thermal insulator is installed

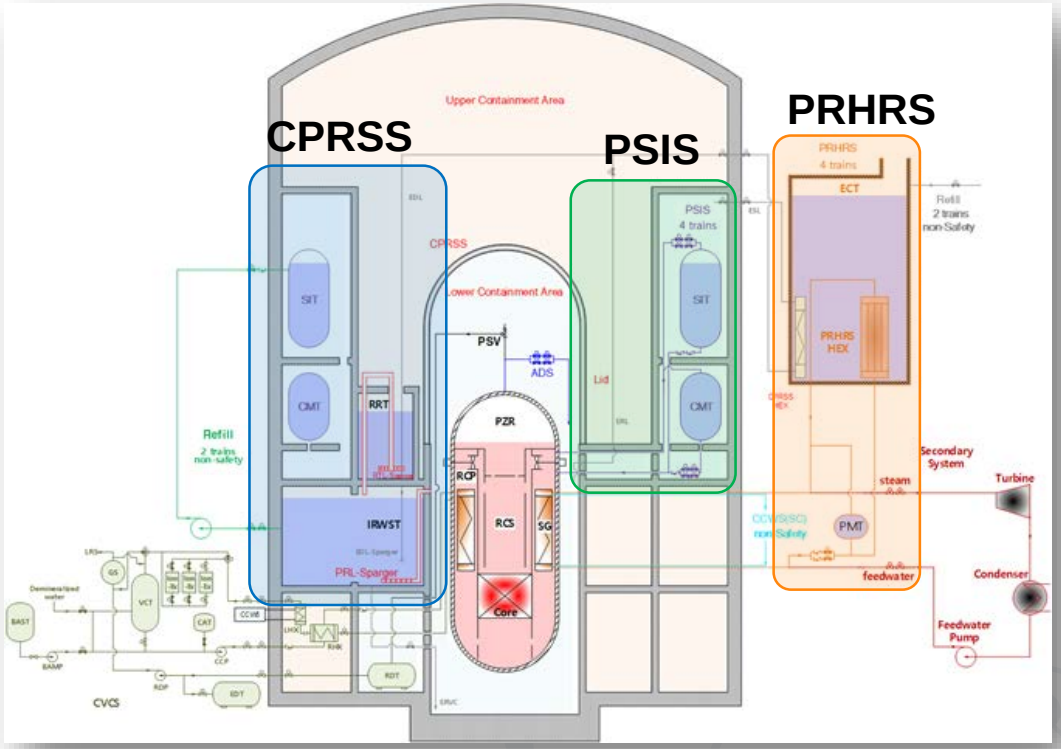
02 Overview of SMART (2/2)

CORE

- Passive Residual Heat Removal System
- Passive Safety Injection System
- Containment Pressure and Radioactivity Suppression System

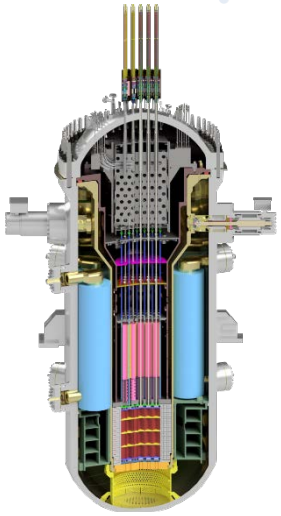
FEATURE

- To maintain a reactor in the safe condition for 72 hours without any operator action at the postulated design basis accidents.
- All safety systems can operate not depending on electrical power from emergency diesel generator for 72 hours.
- Safety-grade batteries provide necessary DC power for valve initiation and post accident monitoring.



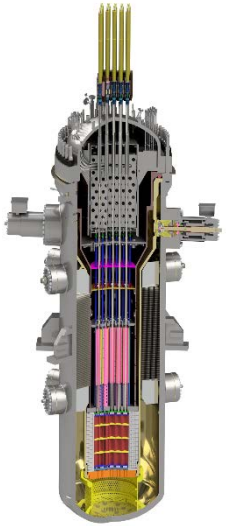
02 Overview of SMART-C

SMART100



	SMART100	SMART-C
Thermal power	365 MWt	365 MWt
Electric output	110 MWe	110 MWe
Reactor type	PWR	PWR
Reactor configuration	Integral	Integral
Reactor size (diameter)	About 6 m	About 4.6 m
Refueling cycle	30 months	30 months
SG type	Cassette type helically coiled SG	Block type helically coiled SG
Safety system	Passive (4 SIT trains)	Passive (2 SIT trains)
Emergency power	Battery	Battery
Driving force	DC power + natural circulation	DC power + natural circulation
Operator action	72 hour	72 hour
Core Damage frequency	$< 1.0X10^{-7}$/RY	$< 1.0X10^{-7}$/RY
Containment building	Arch-shaped rectangular	Reduced arch-shaped rectangular

SMART-C



03

Key Design Features of SMART-C

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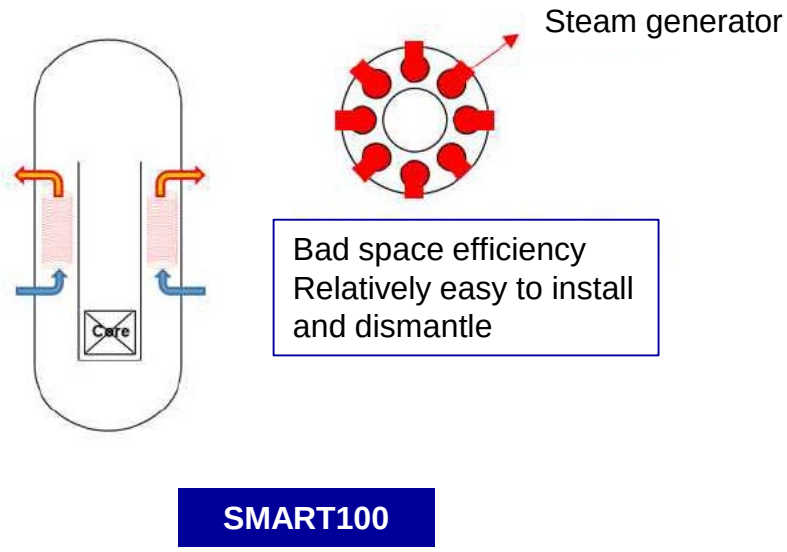
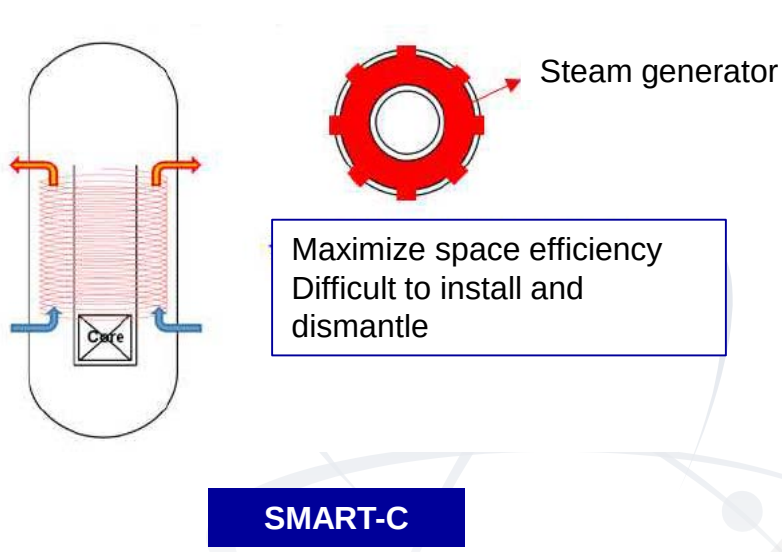
03 Key Design Features of SMART-C

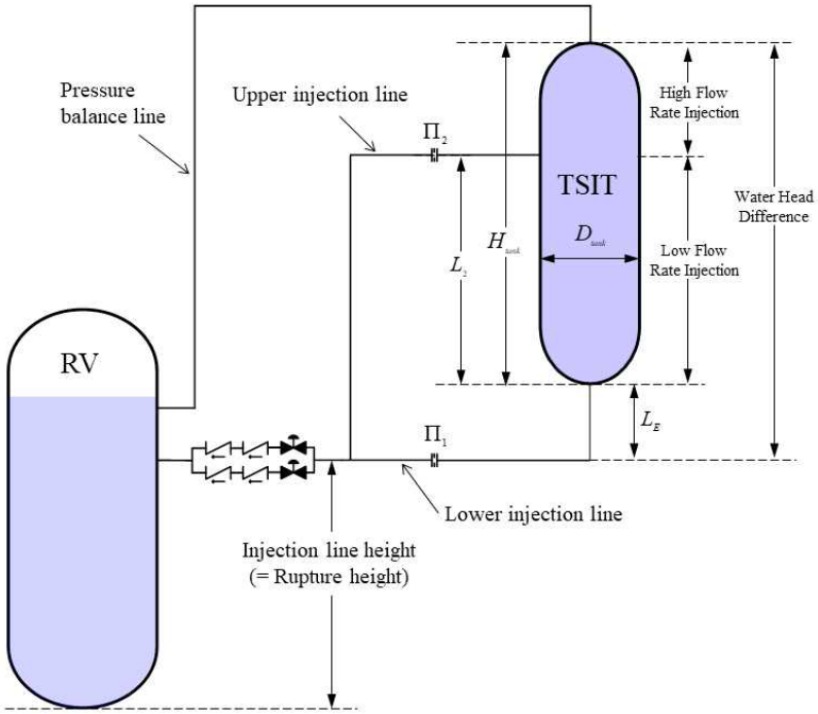
- Volume and weight reduction of reactor vessel by 45%
  - For portability and cost-effectiveness
  - Achieved through modification in steam generator design
    - 8 cassette type SGs to block type SG
  - Reactor vessel diameter has decreased from 6 m to 4.55 m



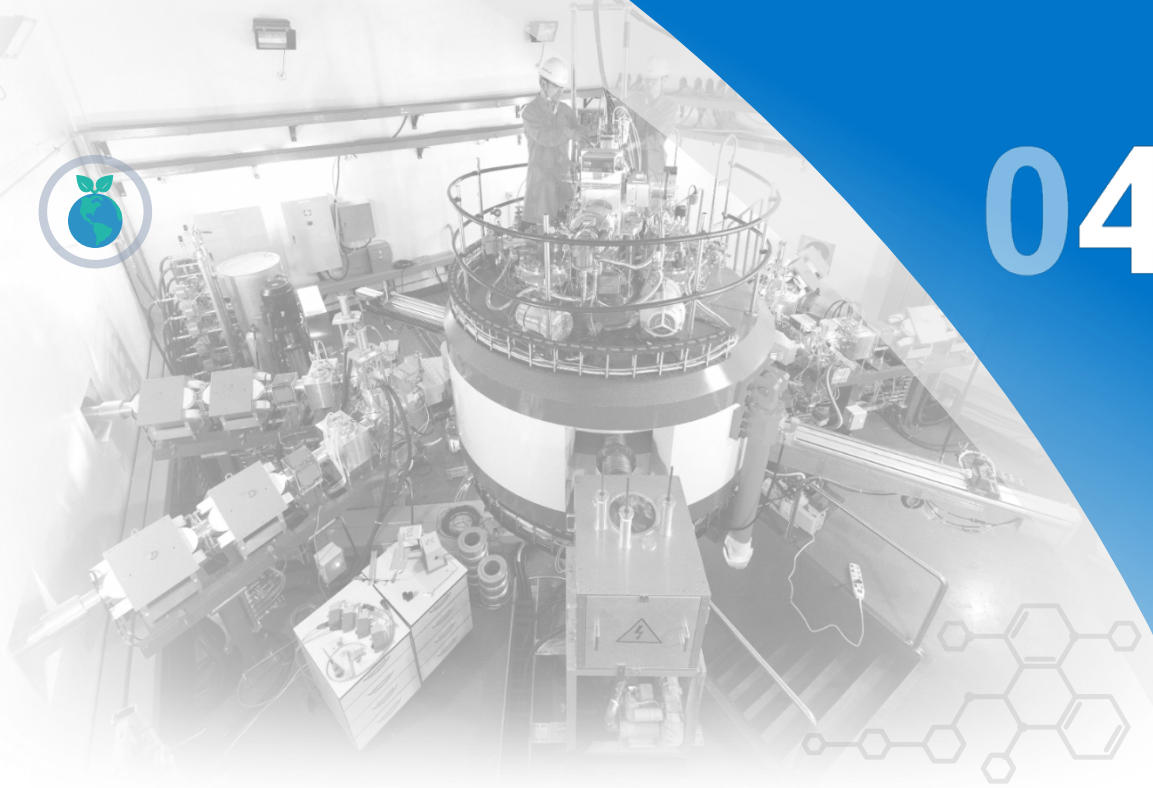


03 Key Design Features of SMART-C

- Simplification of passive safety system
  - Reduction in number of trains from 4 to 2
  - Implementation of the two-stage SIT
    - CMT and SIT merged into a single tank (TSIT)
  - High/low flow injection achieved by implementing independent injection line with different orifices (with different flow resistances)



Conceptual design of two-stage SIT



04

Summary

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01 Summary

- KAERI developed an integral type PWR, SMART
  - SMART and SMART100 has gained standard design approval in 2012 and 2024, respectively.
- One of the most promising SMRs
  - High degree of development completeness (SDA)
  - Safe and innovative SMR
  - Wide range of applications, including the potential for cogeneration
- Variation of SMART has been proposed, SMART-C
  - Enhanced portability and economic viability
    - Through SG and safety system modification
- Further studies (detail design) will be conducted on SMART-C and the feasibility in various industrial fields will be evaluated

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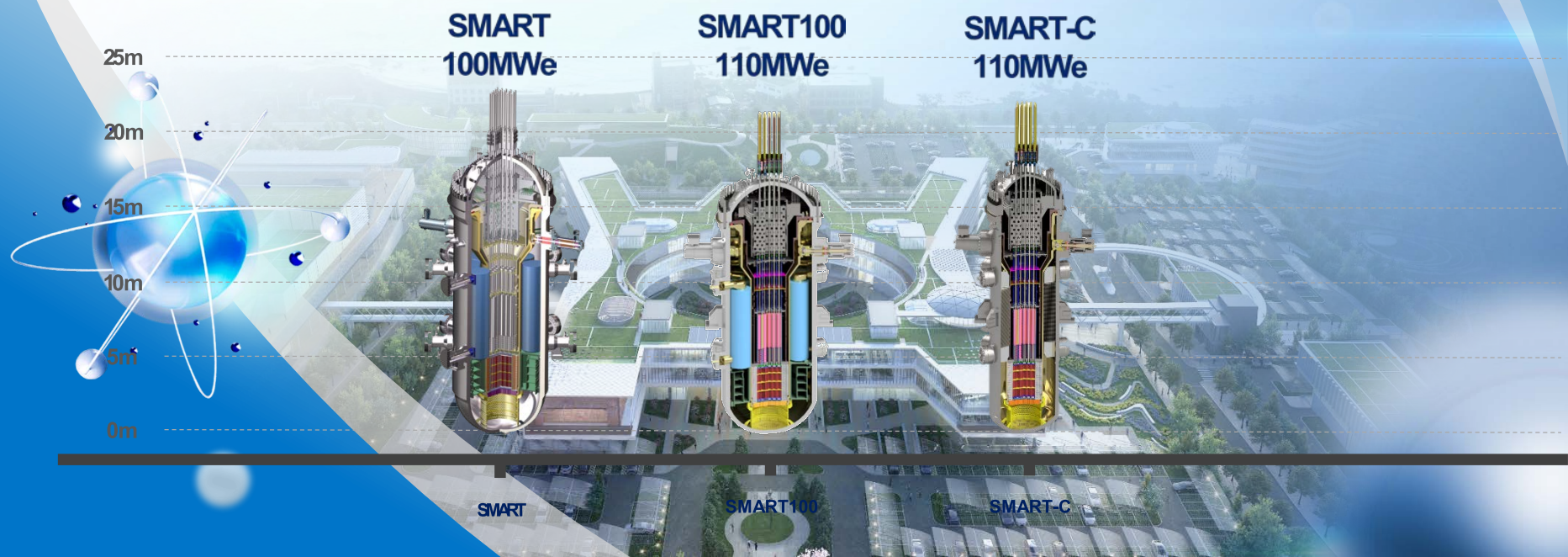
THANK YOU



SAVE the DATE

NURETH-21

21st International Topical Meeting on Nuclear Reactor Thermal Hydraulics

August 31 (Sun) - September 5 (Fri), 2025
BEXCO · Busan, Korea

www.nureth-21.org

Important Dates

· Abstract submission deadline	*October 25, 2024*
· Author notification of acceptance	*November 15, 2024*
· Full paper submission deadline	*January 31, 2025*
· Full paper review notification	*March 15, 2025*
· Final paper submission deadline	*May 2, 2025*

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