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# Technical Requirements for SMART100

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01

# SMART100 Overview

# Introduction

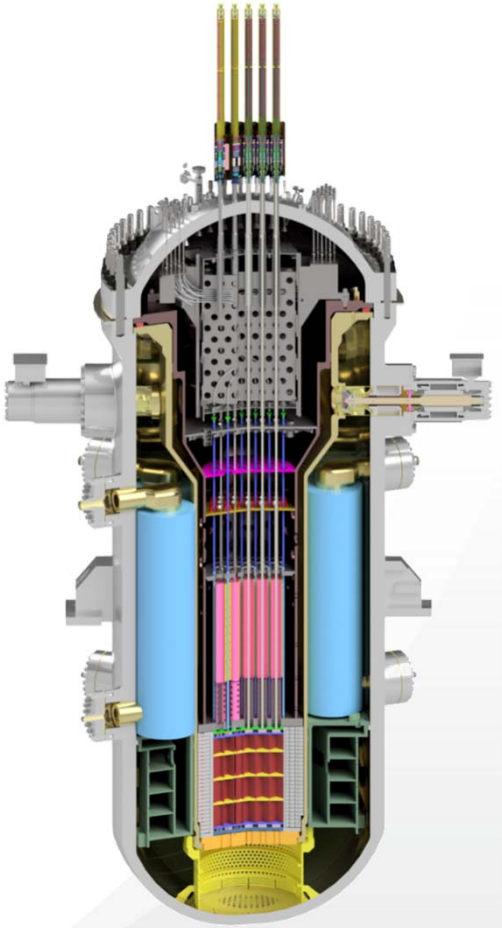


## SMART100

- Advanced integral PWR for electricity generation and district heating or desalination

## Specification

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



# Development Milestones

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- **1999** • Conceptual design development
- **2002** • Basic design development
- **2007** • SMART-PPS (Pre-Project Service)
- **2012** • Standard Design Approval (SDA)
- **2015** • Pre-Project Engineering started.
- **2019** • The Pre-Project Engineering completed.
- **2020** • SMART100 Standard Design Approval Applied.

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02

# Design Principle

# Design Philosophy



- **Enhancement of safety**
  - Passive safety system and inherent safety features
  - Simplified and Reliant safety system
- **Improvement of economical and commercial competitiveness**
  - Multiple construction at small grid system
  - System simplification
  - In-factory fabrication
  - Reduction of construction time
  - High plant availability

# Design Principles



- **Simplified design for the operation and maintenance**
  - Minimization of the number of components
  - Exclusion of the possibility of misjudgment of operator
- **Enough design margins**
  - Enhance the accident resistance
  - Provide enough margin time for correction action on accident
  - Minimization of a release of radioactive material
- **Design optimization**
  - Optimization of arrangement of system, structure and components for the effective maintenance.

# Design Principles



- **Proven technologies**
  - Based on verified and validated technologies
- **Advanced human engineering concept**
  - Minimization of the possibility of human errors
- **Quality assurance program**
  - Established and adopted to all design stages.
- **Decommissioning Consideration**
  - Decommissioning plan should be reflected in all the steps

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03

# Design Requirement

# Safety-related Requirements



## Safety Goal

- Core Damage Frequency (CDF)
- Containment Failure Frequency
- Radioactive material release target

## Thermal Margin

- Fuel thermal margin

## Operator Grace Time

- To cool the RCS below the safe shutdown condition within 36hr
- To keep the core undamaged for 72hr without any corrective actions by operators

# Safety-related Requirements



## Station Blackout Mitigation

- To be maintained at safe shutdown condition for at least 72 hours under the complete loss of onsite and offsite AC power

## Reactor shutdown

- To be equipped the redundant and diverse means to perform a reactor shutdown

## Hazards protection

- To be protected from internal events and external events

# Safety-related Requirements



## Severe Accident

- The equipment to mitigate the effect of severe accident should be installed.
- The equipment to prevent the hydrogen explosion and the direct containment heating phenomenon should be installed.
- The accident management program should be prepared to cope with the severe accident.

## Containment

- To be designed to protect the reactor from external missile, seismic, tsunami, etc. and have the radiological shielding function when accidents occur

# Safety-related Requirements



## Control Room Habitability

- Adequate radiation protection should be provided to permit access and occupancy of the control room under accident conditions.

## Ultimate Heat Sink

- The capacity of the ultimate heat sink should be sufficient to provide cooling for the time necessary to evaluate the situation and take corrective action.
- Site wet-bulb temperature and related meteorological information will be supplied after an environment survey.

# Performance-related Requirements



## Availability

- To be designed considering the annual average availability
- To be designed considering the number of unplanned reactor trips

## Load Follow

- Reactor should have the capability of the daily load follow operation.
- Sudden power change should be possible during power operation.

## Load Rejection Capability

- Operation mode changes to on-site load should be possible without reactor shutdown at full power operation.

# Performance-related Requirements



## Maintenance

- The maintenance conditions should be considered for the design of structures, systems and components.
- Accessibility, maintenance space, install of lift rig, test and inspection should be considered for the maintenance.
- The standardization of components and parts should be pursued for the maintenance.
- The maintenance facilities must be designed to facilitate the use of the automatic equipment such as robots for the maintenance.

# Security-related Requirements



## Aircraft Crash

- To be designed to minimize the effects on the key safety function (core cooling, containment integrity, spent fuel storage integrity) of a large, commercial aircraft and military aviation.

## Cyber Security

- To be designed to protect the cyber threats for digitalized plant systems

## Sabotage

- Security organization and physical protection program will be established and .

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# Users' Requirement

# Consideration Points for Users



- **Deployment Target**
  - Schedule / Site location
  - Application
- **Economics Target**
  - Cost competitiveness
  - Harmonization with renewable energy
- **Safety Target**
  - Public acceptance
  - Environmental effect

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# THANK YOU

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