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Topical safety improvements – comparison with LAES-2

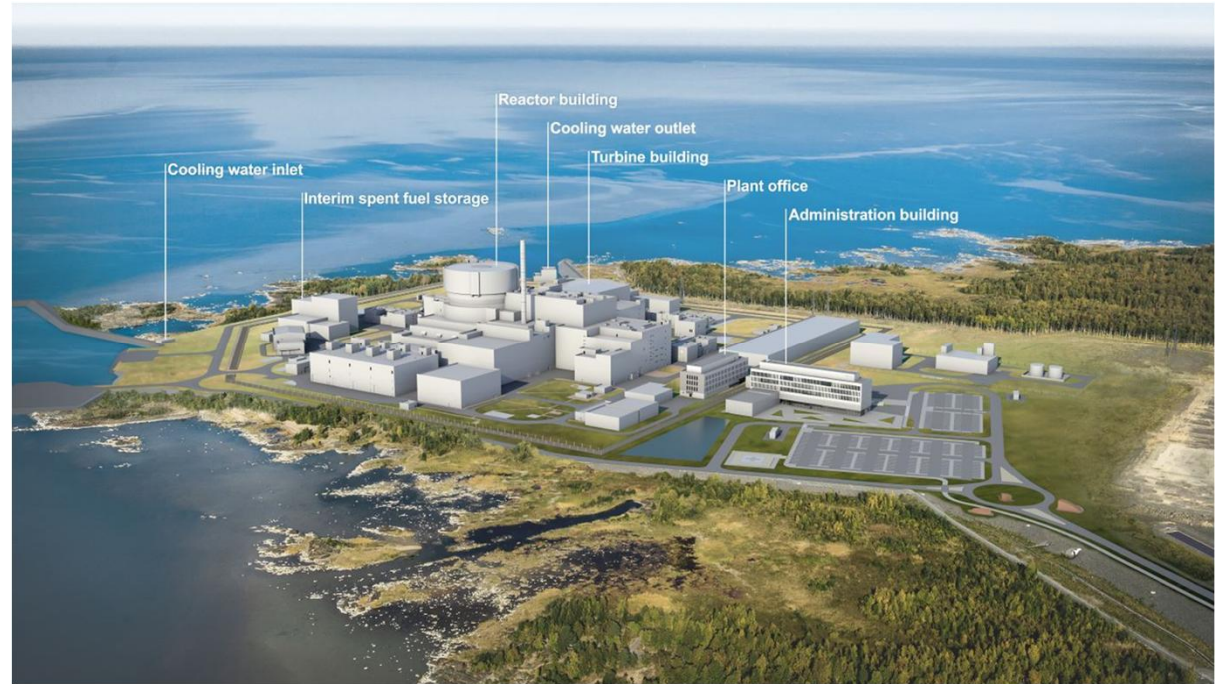
Hannu Tuulensuu / Denis Kolchinsky 12.3.2019

Content

§ Main reasons for changes

§ Comparison with LAES-2

- Plant/system level changes
- Primary circuit
- Lifetime requirements



Main reasons to change reference plant design (LAES-2)

- § **YVL requirements;**
- § **EPC-contract requirements;**
- § **Site characteristics;**
- § **Western Codes and Standards;**
- § **Experience from other nuclear projects**

Plant level changes from LAES-2 to FH-1

External event protection:

- Protection against large APC
 - Physical separation
 - Structural protection
 - Diverse cooling chain to safe state
- Enhanced requirements to seismic loads
- Reverse sea cooling water channel

Application of structural and functional safety classification

To avoid safety classified components from Turbine Island

Diverse safety injection system for DEC conditions

Power supply architecture: “4 EDG + 2 SBO DG + off-site DG” instead of “4 EDG + 1 Unit DG + 2 SA DG”

PHRS tanks volume is increased to ensure 72 hours autonomy taken into account N+1 criteria

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Plant level changes from LAES-2 to FH-1

PHRS tanks volume is increased to ensure 72 hours autonomy taken into account N+1 criteria

Demineralized water storage tanks volume is increased up to 1000 m³ (4 tanks)

Separate pressure relief line for severe accidents is added

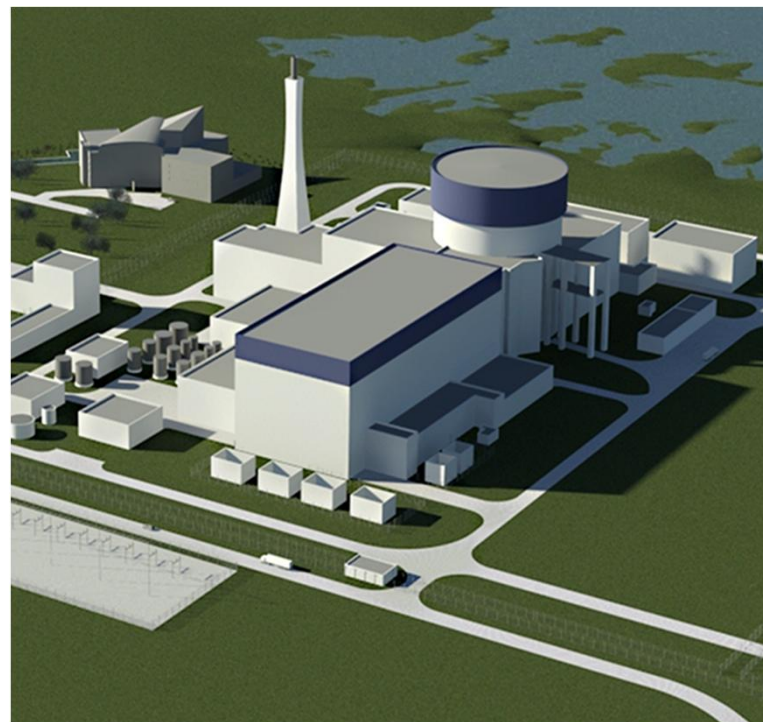
Requirement to use non-fiber thermo-insulation inside the containment to avoid filter clogging

Containment isolation applies pneumatic and solenoid valves

Division of Spent Fuel Pool for two parts to have possibility of repair actions

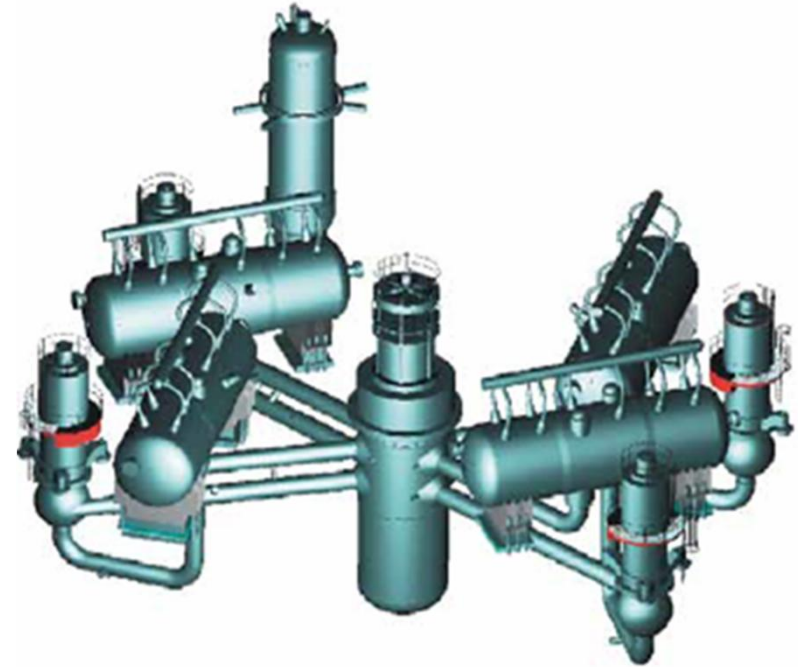
Steam Cell protection against high-energy pipeline breaks

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Changes in Primary Circuit

Name	LAES-2 (RP V-491)	FH1 (RP V-522)
1. Reactor vessel		
1.1 Number of welded joints	6	5
1.2 Branch pipe diameter for Hydro-accumulator pipeline connection,	300	150
1.3 Number of instrumentation branch pipes	1	2
2 Fuel	Natural enriched uranium	Reprocessed uranium
3 RCP		
3.1 Cooling and lubricating medium of the electric motor	Fire-resistant oil	Water
3.2 Structural design of the shaft	Two-shaft with torsion coupling	Single-shaft with solid coupling
3.3 Electric motor	Double-speed	Single-speed
4 Steam generator		
4.1 The design pressure of generated steam at the outlet from the SG header, MPa	8.1	9.0
4.2 Dimension type of the SG steam header pipe, mm	630x25	640x30
4.3 SG casing length, mm	13820	14020



Changes in lifetime requirements

- ∅ Reactor Plant and main equipment:
 - for FH1 – 60 years + decommissioning
 - for LAES-2 – 50 years + decommissioning
- ∅ Constructions:
 - for FH-1 - structures lifetime is 100 years
 - for LAES-2 - lifetime of civil engineering structures is 60 years.





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