



# NOVEL DESIGN FEATURES OF PROPOSED LIGHT-WATER SMRs —A SWEDISH PERSPECTIVE

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## INTRODUCTION

Light-water-cooled and -moderated small modular reactors (SMRs) are one option for adding new nuclear capacity in Sweden. This type of SMRs is similar to current Swedish reactors and should therefore be relatively straightforward to deploy. However, proposed SMR designs entail features not previously used in Sweden. In this work, such features have been identified, along with their potential impact on the possibility to license, construct, and operate and maintain the reactors.

## WORK PERFORMED

- 5 SMRs relevant for Sweden investigated
  - 1 BWR
  - 4 PWRs
- Design data and descriptions from available literature
- Comparison with current Swedish reactors
- Notable novelties described at general rather than design-specific level

## INVESTIGATED SMRs

BWRX-300

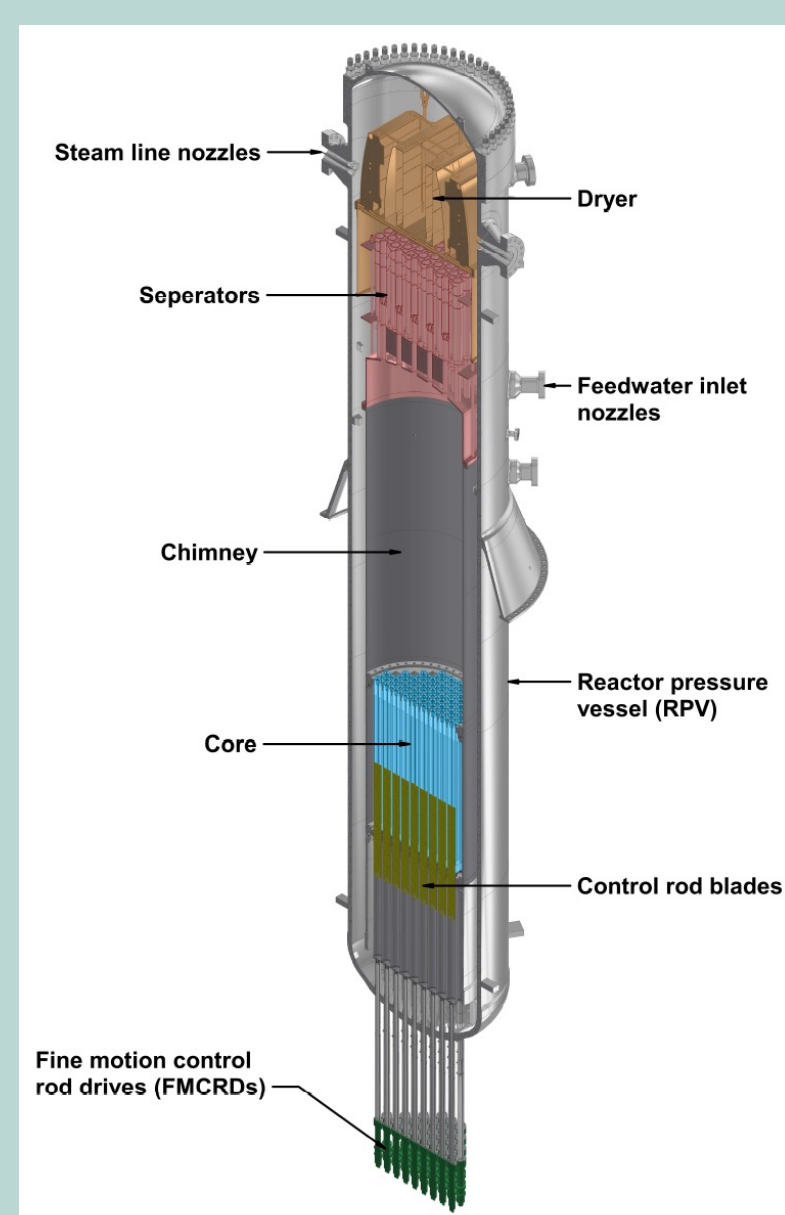


Image courtesy: GE Hitachi

AP300

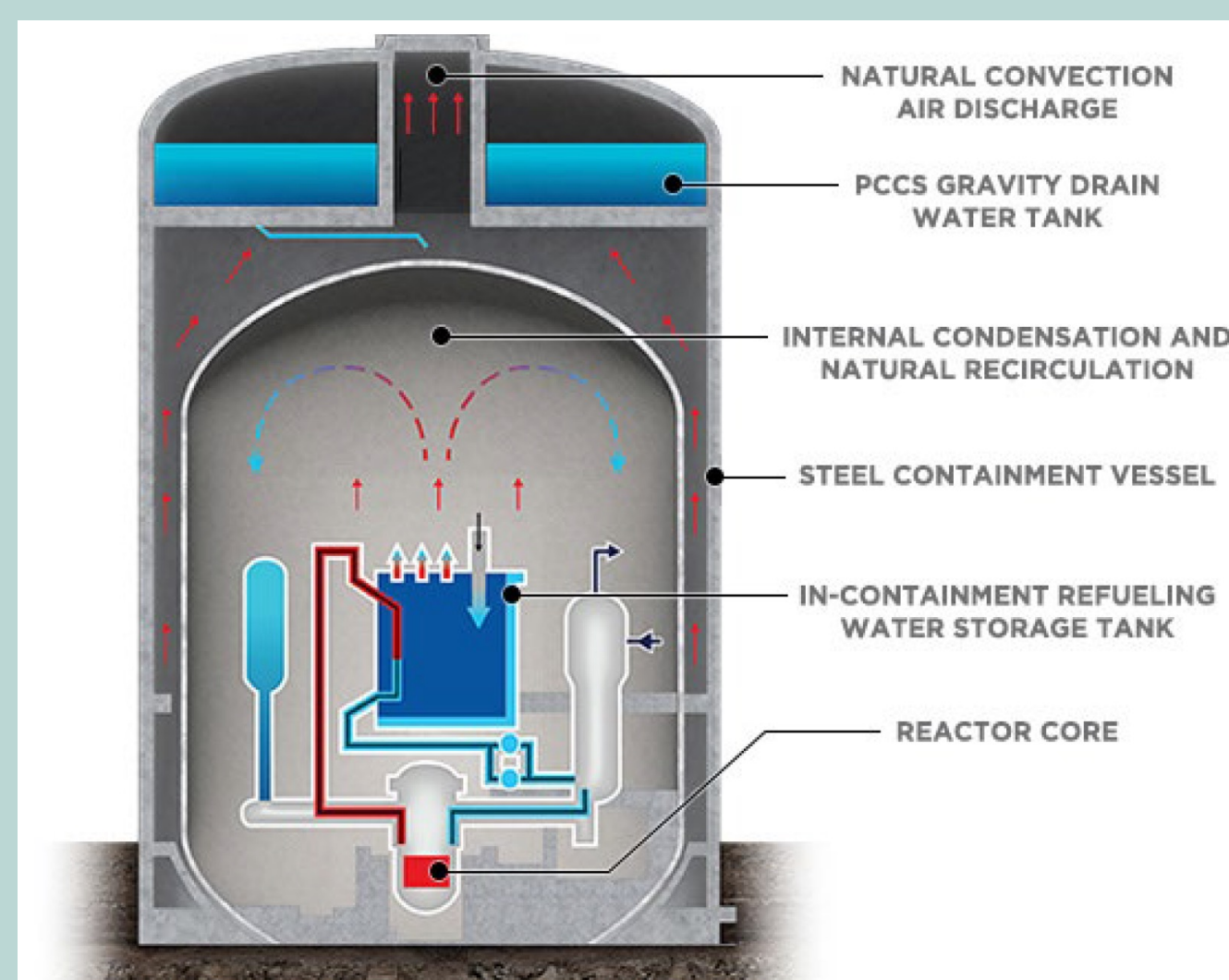


Image courtesy: Westinghouse

NUWARD\*

\*Design now being redrafted

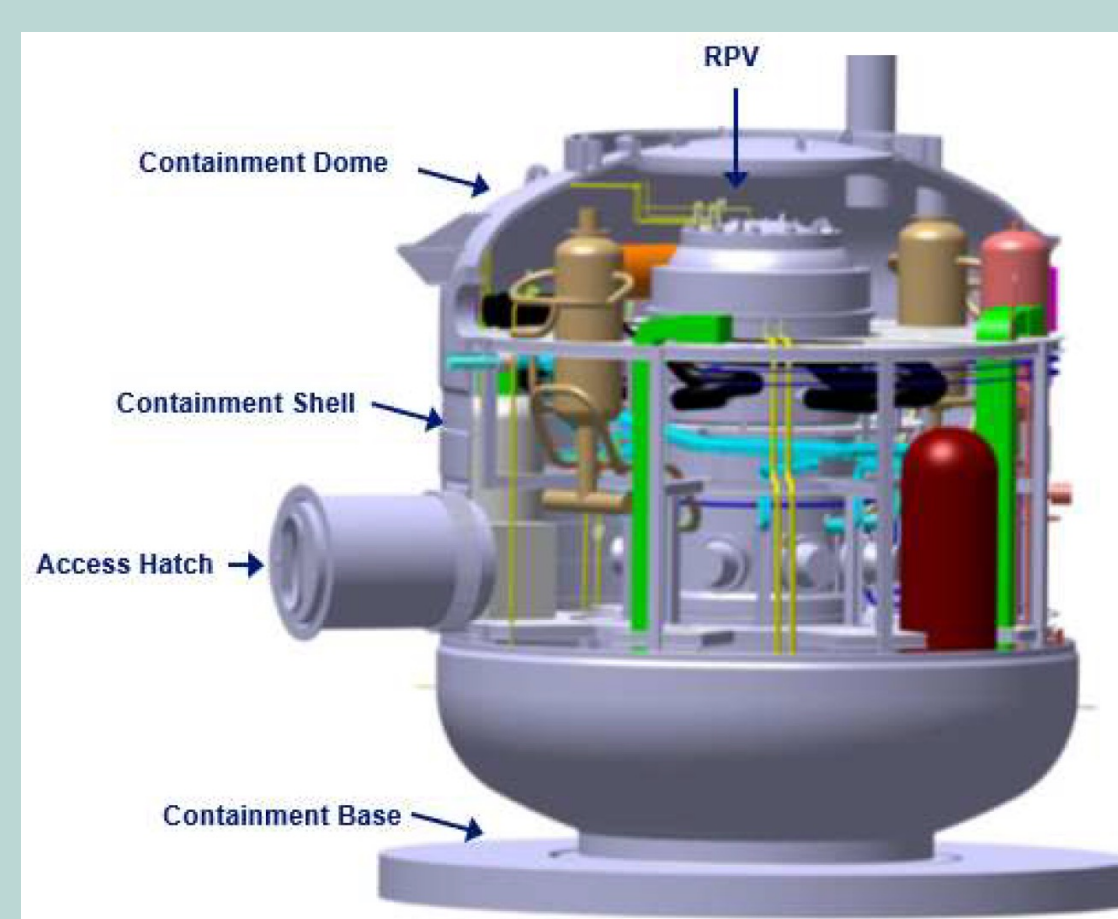


Image courtesy: EDF

Rolls-Royce SMR

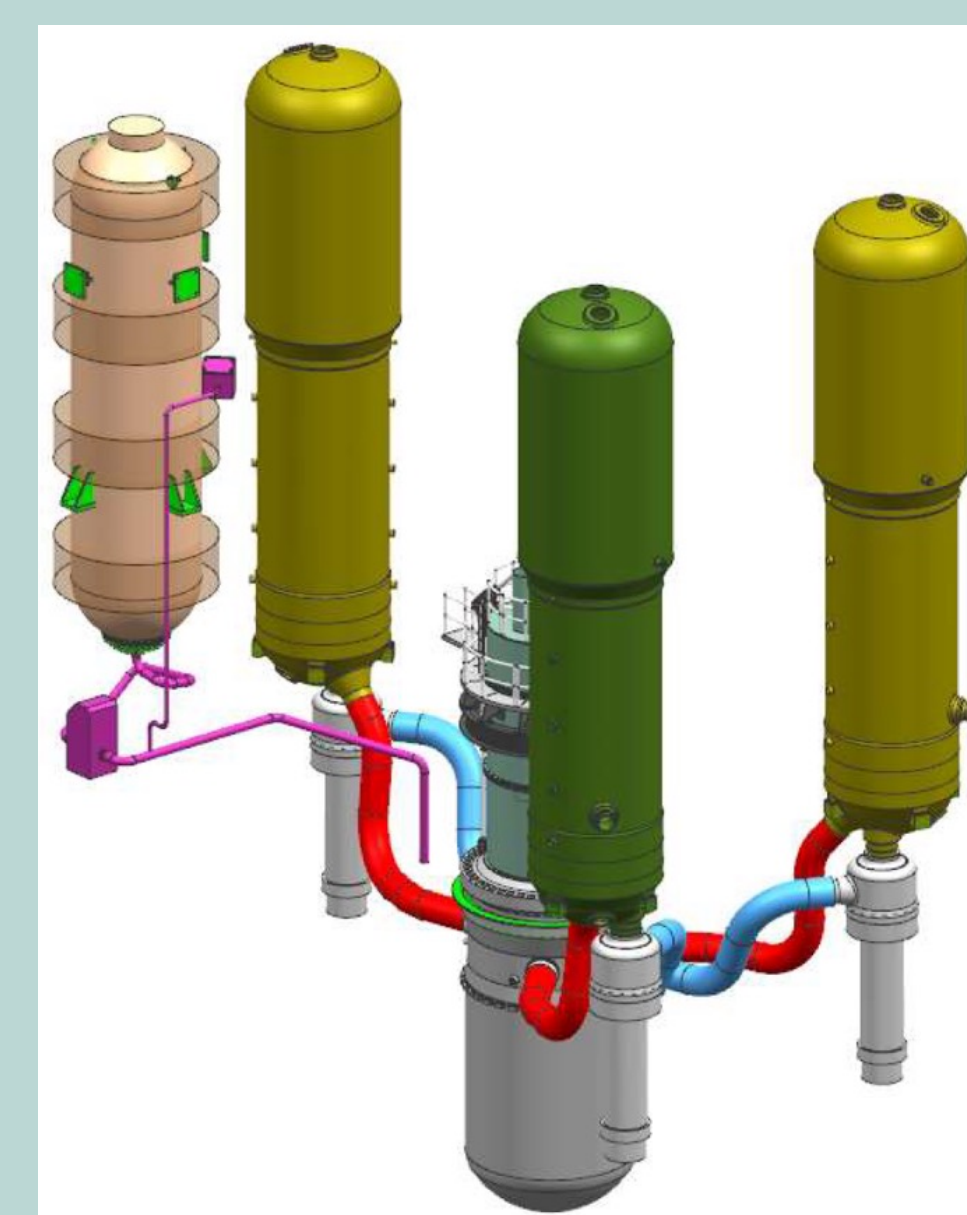


Image courtesy: Rolls-Royce

VOYGR

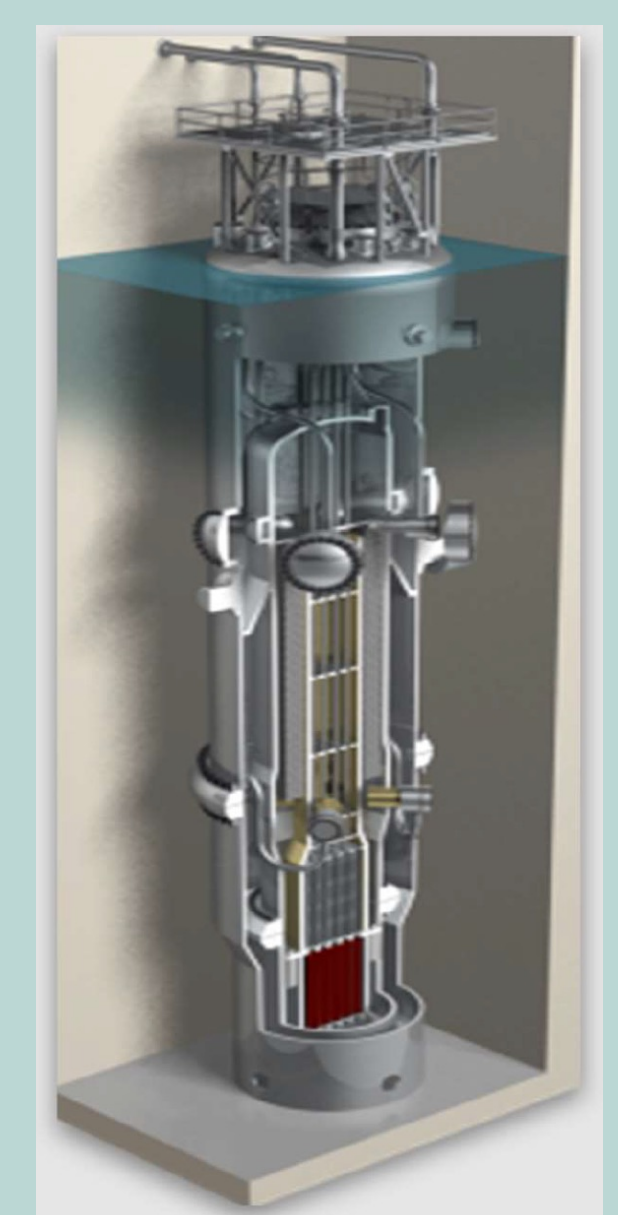


Image courtesy: NuScale

## NOVELTIES

*Notable novelties in proposed SMR designs compared with current Swedish reactors, and from which of the perspectives licensing, construction, and operation/maintenance they could be barriers to deploying the SMRs.*

<u>NOVELTY</u>	<u>LICENSING</u>	<u>CONSTRUCTION</u>	<u>OPERATION/ MAINTENANCE</u>
<b>MODULARITY</b>	<b>X</b>	<b>X</b>	<b>X</b>
Modular construction	X	X	
Several reactor modules/unit	X	X	X
<b>SMALLER SIZE</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>INTEGRAL PWRs</b>	<b>X</b>		<b>X</b>
<b>BORON-FREE PWR COOLANT</b>	<b>X</b>		<b>X</b>
<b>ENHANCED NATURAL CIRCULATION</b>	<b>X</b>		<b>X</b>
Normal operation	X		X
Accident conditions	X		X
<b>INCREASED PASSIVE SAFETY</b>	<b>X</b>		<b>X</b>
<b>NOVEL CONTAINMENT DESIGNS</b>	<b>X</b>	<b>X</b>	<b>X</b>
Steel or steel-plate composite containment	X	X	X
Dry BWR containment	X		
<b>INCREASED LOAD-FOLLOWING CAPABILITY</b>	<b>X</b>		<b>X</b>
<b>DRY STORAGE OF SPENT NUCLEAR FUEL</b>	<b>X</b>		

## CONCLUSIONS

Important novelties from a Swedish perspective have been identified in proposed light-water SMR designs. The novelties might affect one or more of licensing, construction, and operation and maintenance of the SMRs. Further investigation regarding the novelties is needed to successfully deploy SMRs in Sweden.

