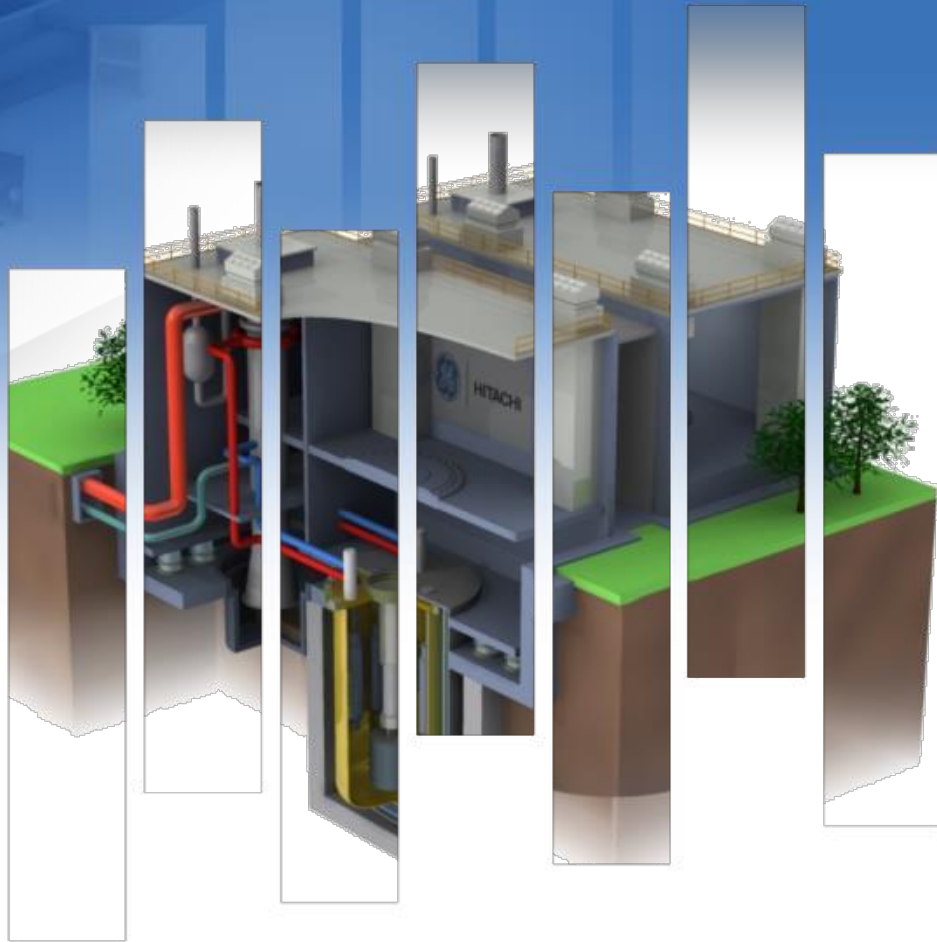


# PRISM & U.S. Licensing

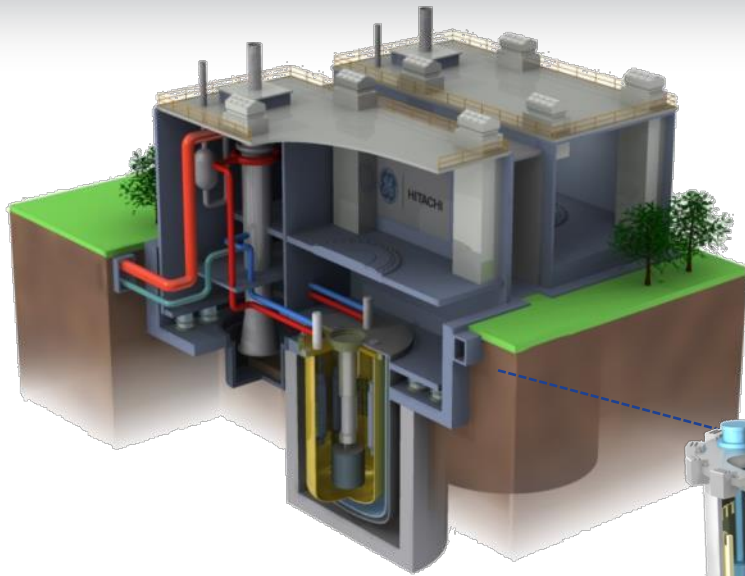
Original Use Date: 07 June 2016



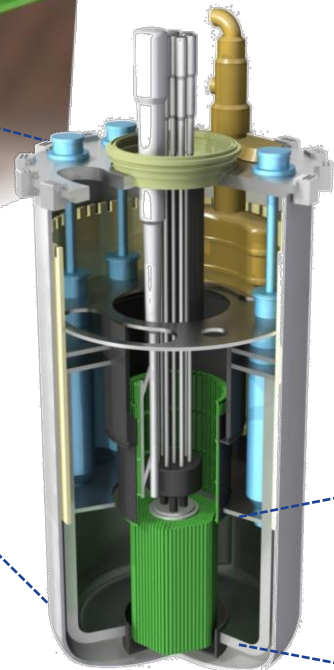
**HITACHI**

Scott Rasmussen, Vice President, PRISM Product Line  
Eric Loewen, Ph.D., Chief Engineer

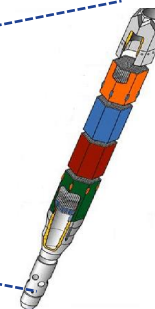
# What is PRISM?



Power Reactor  
Innovative  
Small Module  
(PRISM)



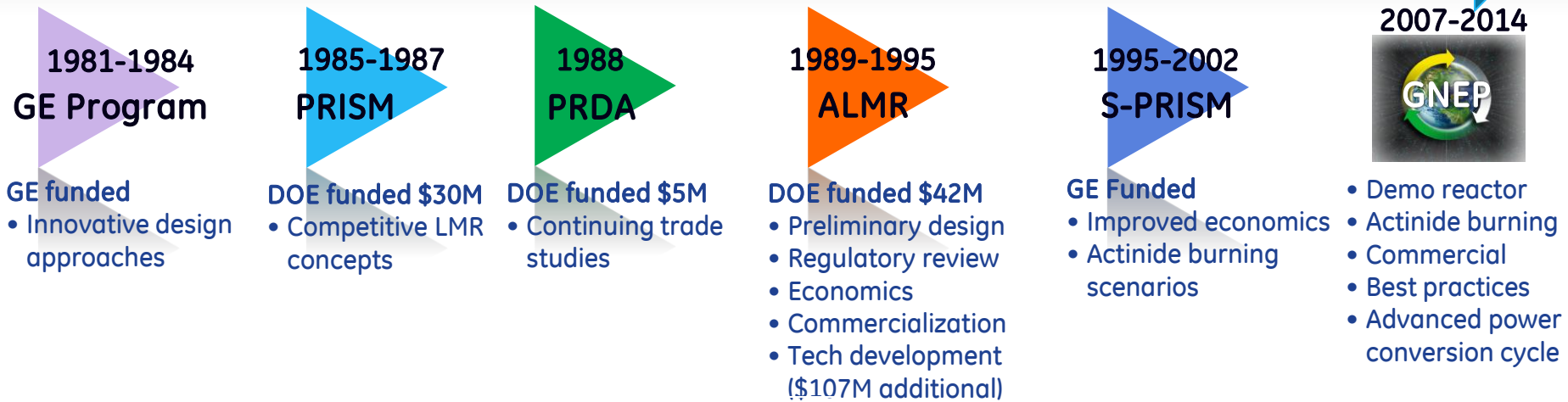
- 311 MWe (840 MWth) per reactor
  - Two reactors per turbine-generator
- Modular components allow for factory fabrication
- Design prevents Loss of Coolant Accident
- Design removes decay heat without automatic or operator actions
- Metallic fuel



Metallic fuel  
is key

# Decades of technology development without a license

## PRISM related technology programs



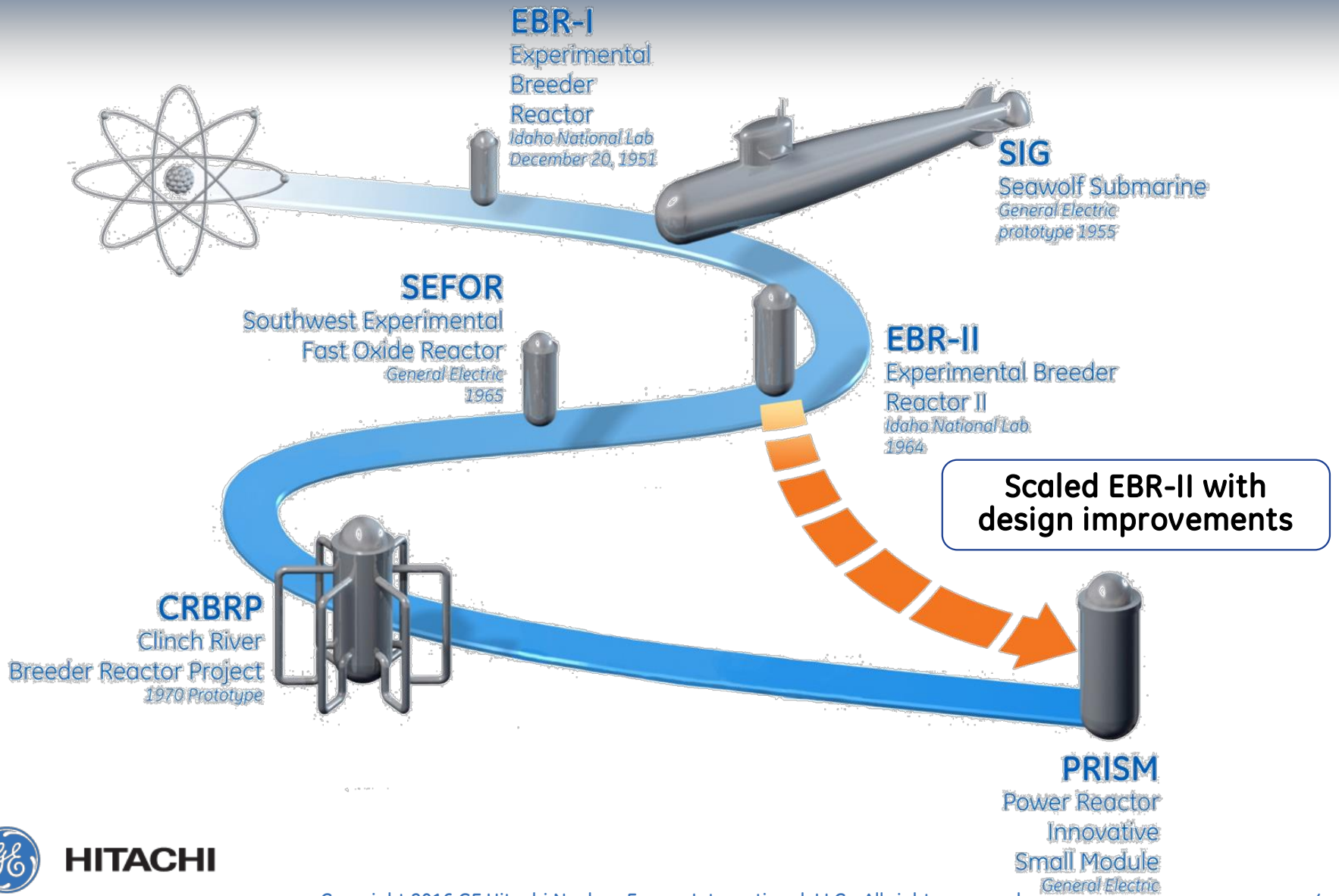
- ✓ **Advanced Conceptual Design**
  - Development sponsored by US Government
  - Various US development programs since 1985
- ✓ **Nuclear Regulatory Commission: “no obvious impediments to licensing”**



PRISM Conceptual Design Document

- PRDA - Program Research & Development Announcement
- ALMR - Advanced Liquid Metal Reactor program
- GNEP - Global Nuclear Energy Partnership

# Licensed sodium cooled reactors have operated



# First step: General Design Criterion (GDC)

- Establish fundamental requirements (GDCs)
- Expedite finalizing & published (NUREG or RG)
  - ❖ Utilize industry to complete inputs
  - ❖ Simplify language and redundancy

# Second Step: Establish Process for going forward

- Streamline process:
  - ❖ Part 52 for “Certification” of a standard design is UNWORKABLE for any advanced reactor.
  - ❖ NRC bill for ESBWR approached \$70MM; ESBWR was not a “quantum leap” in technology (coolant, fuel, etc.)
  - ❖ Current NRC processes led to cost and schedule uncertainty, making project difficult to complete.
- Re-invigorate use of prototype allowance (10CFR 50.43(e))
  - ❖ Demo plant licensing drives certification of follow-on units
  - ❖ Agreement on component testing details and milestones
  - ❖ Use exceptions/exemptions where LWR requirements are not adequate or not applicable to drive decision making

# Second Step: Establish Process for going forward

## **10CFR 50.43(e)**

**“...If a prototype plant is used to comply with the testing requirements, then the NRC may impose additional requirements on siting, safety features, or operational conditions for the prototype plant to protect the public and the plant staff from the possible consequences of accidents during the testing period.”**

# Third Step: Recommendations - Expediting the review process

- Non water cooled reactors need a fundamental change to NRC processes – Prototype Allowance
- Train NRC staff on technologies before beginning the licensing review
  - ❖ Better inform the Prototype Allowance decision-making process
  - ❖ Informed agreement between parties based on standards, NRC Policy Statements, etc.
- Manage iterations jointly



# What if ... advanced reactors were licensed by test?

## Today

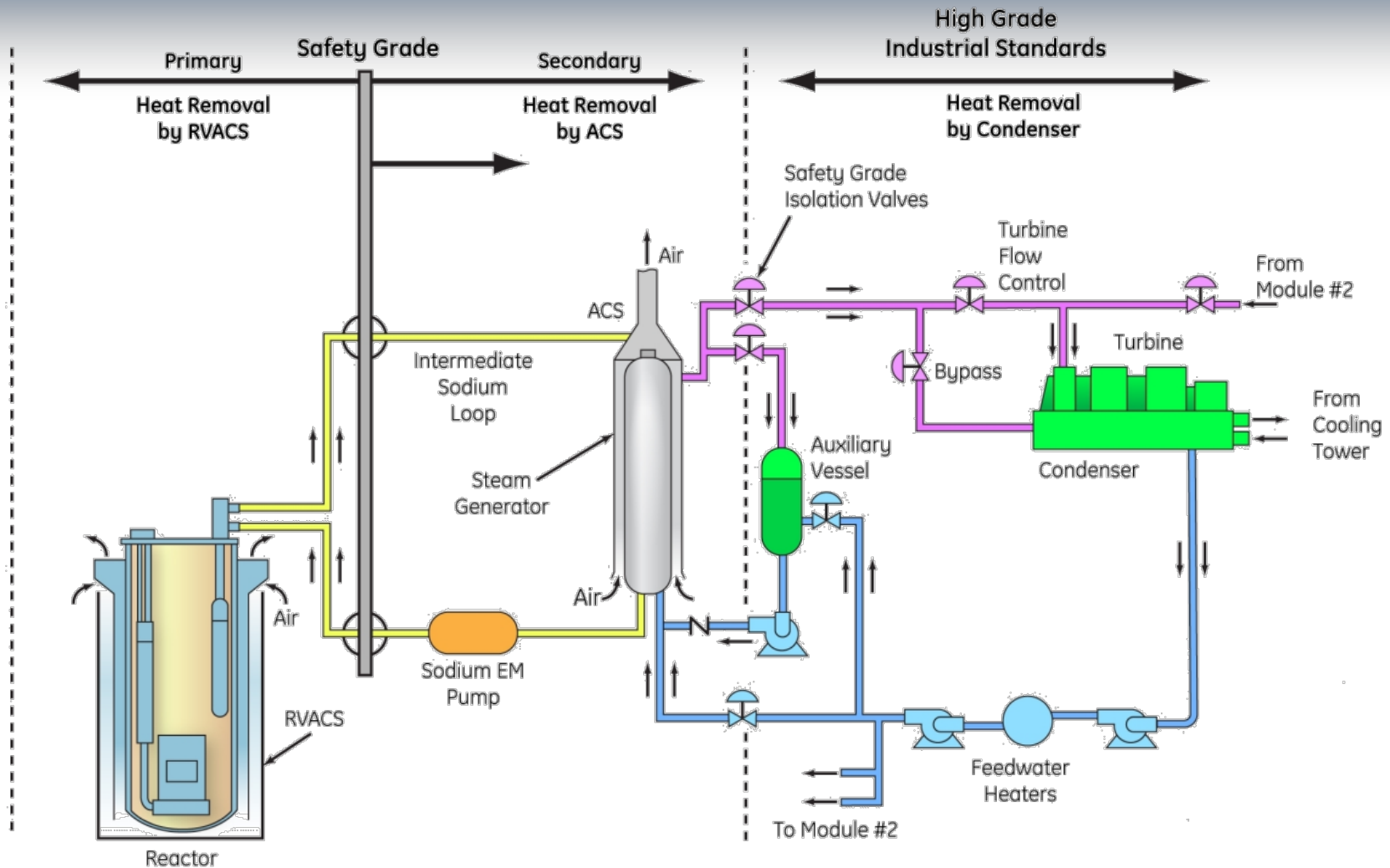
- Multitude of RAI's have slowed communications and understanding
- No advanced reactor licenses yet ... No company has yet found a way to effectively obtain a license

## What's possible

- Reactors with inherent feedback to control the reactor power
- Direct removal of decay energy without external power
- "Affordable" nuclear implementation

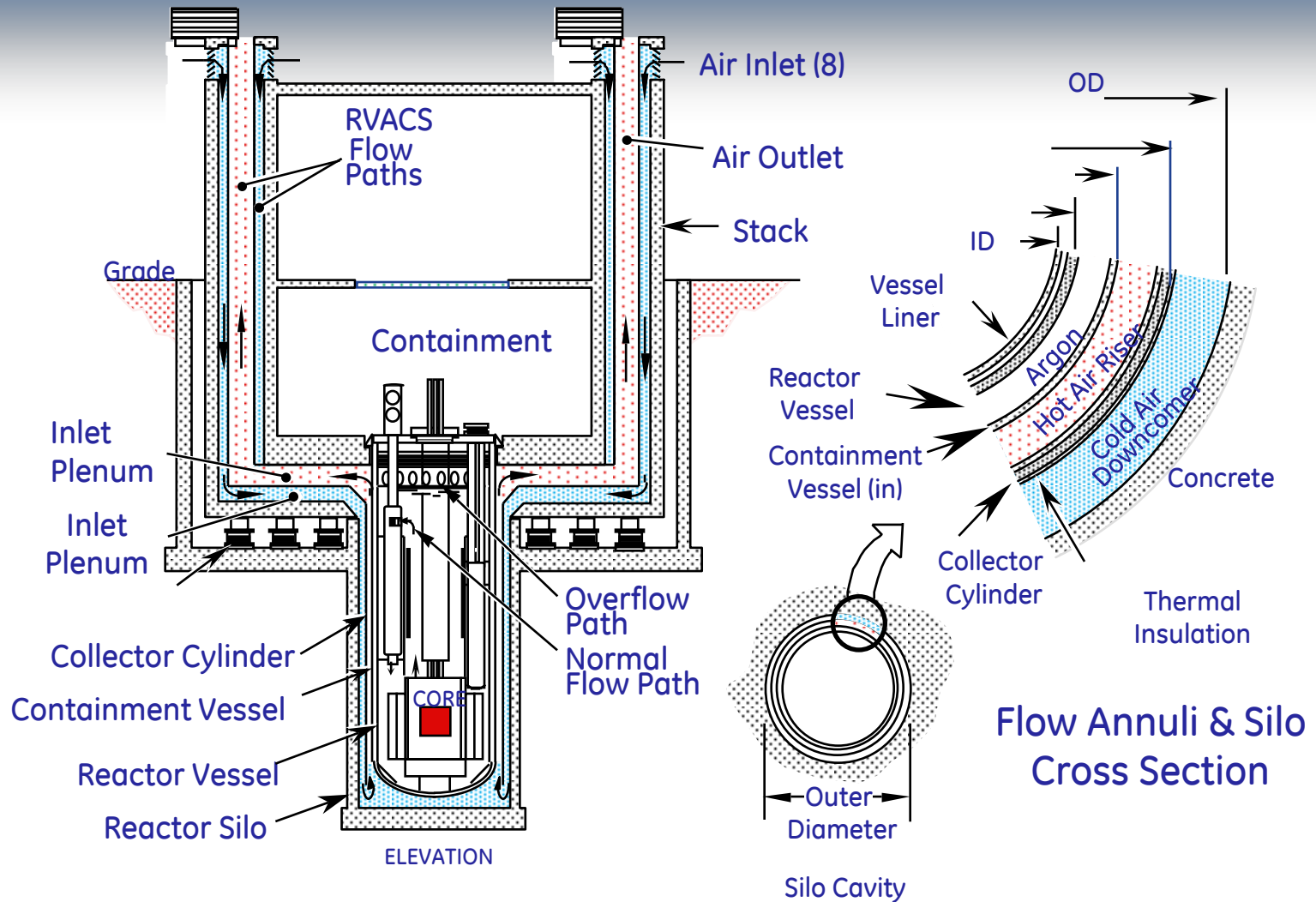


# PRISM: 3 independent heat transfer loops - inherent feedback controls reactor power



HITACHI

# Passive safety - air cooling: Direct removal of decay energy without external power

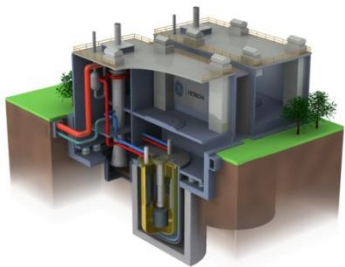


# Licensing the first advanced reactor... affordably

## 3 Parallel Paths

### Engineering Design

Status:  
Preliminary design complete ... NRC initial review complete



### Path 1

#### Licensing

- Update Licensing Strategy
- Start Pre-Application Meetings
- Submit application & receive license

### Path 2

#### Simulation

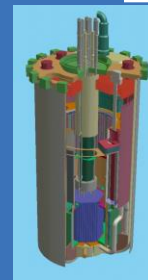
- Build Analytical Simulator
- Start Design Optimization
- Select Component Scale Model Testing



### Path 3

#### Component Testing

- Fabricate Select Components
  - ❖ Reactor Vessel
  - ❖ Fuel Handling Equipment
  - ❖ EM Pump
- Test Components



## Recycling Reactor Deployment

- Integrate simulation into design process
- Optimize, validate, and iterate prior to construction

#### Benefits:

- Reduced time to deploy prototype
- Take advantage of existing LWR processes
- Optimize design through iteration



HITACHI

Thank You



HITACHI