NuScale Power

Technology & Commercialization Overview

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Director, NuScale Power, Inc.

NuScale Power

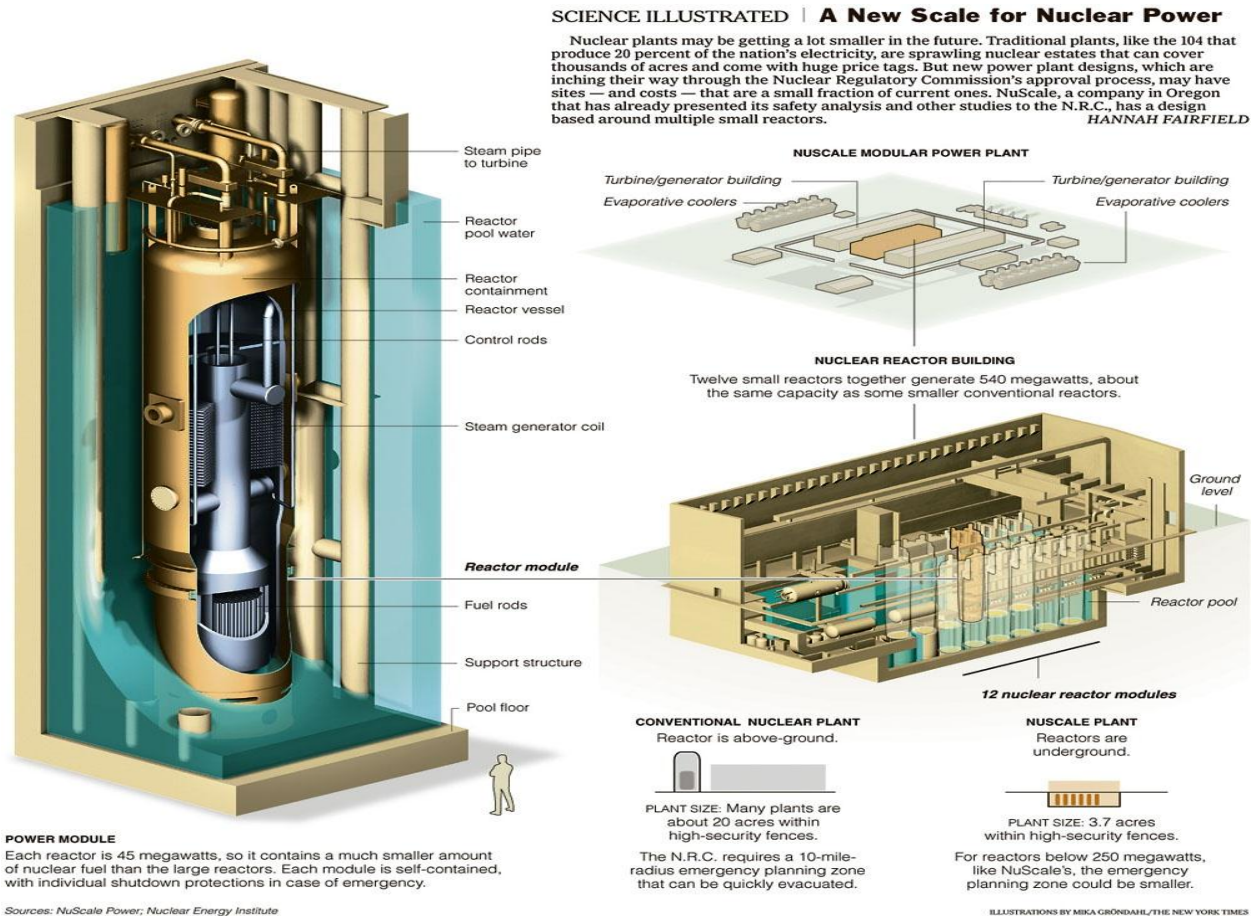
NuScale has Changed the Game

- Modular, scalable nuclear power plant design reduces financial risks
  - Factory manufacturing lowers costs and on-site construction risks
  - Multiple domestic suppliers available to provide major components
  - New capacity can be added to match load growth. Incremental build out lowers initial investment. Eliminates single-shaft risk.
  - Simplicity enhances safety
- DOE budget includes $50-55 Million in FY 2011 for cost sharing on two light water SMR designs
- Media articles in *The New York Times, The Wall Street Journal, National Geographic, Discover Magazine* and numerous others have highlighted NuScale and the potential of SMRs

Greentech Media named "Modular Nuclear Power" as Number 1 on its list of "Top Ten High Concepts" for 2009

Major Media Following NuScale's Progress

The New York Times Highlights NuScale: Dec. 1, 2009



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USDOE Sees Strategic Importance

America's New Nuclear Option

Small modular reactors will expand the ways we use atomic power.

By Steven Chu

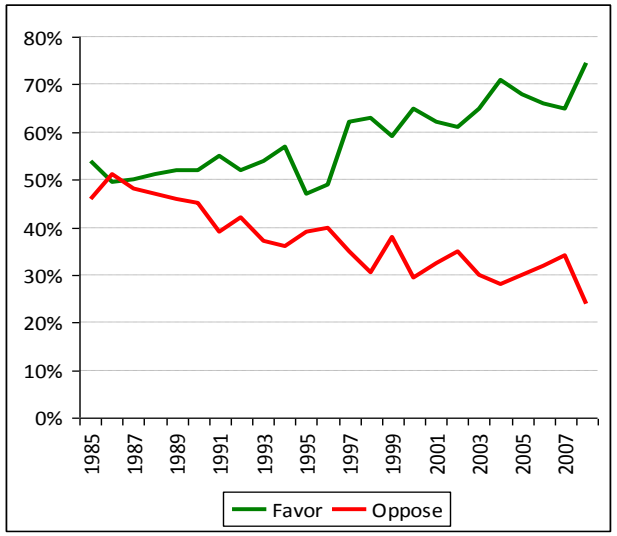
Wall Street Journal, March 23, 2010

"If we are serious about cutting carbon pollution then nuclear power must be part of the solution. Countries such as China, South Korea and India have recognized this and are making investments in nuclear power that are driving demand for nuclear technologies. Our choice is clear: Develop these technologies today or import them tomorrow."

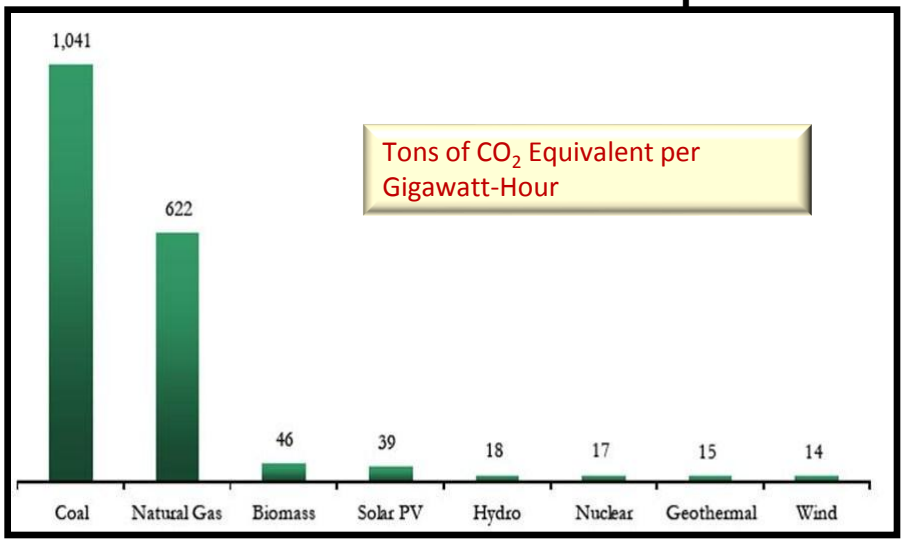
"As this paper recently reported, one of the most promising areas is small modular reactors (SMRs)."

Market fundamentals reinforced by public support and climate change are driving a nuclear resurgence

Nuclear power attitudes



Low carbon emission baseload power

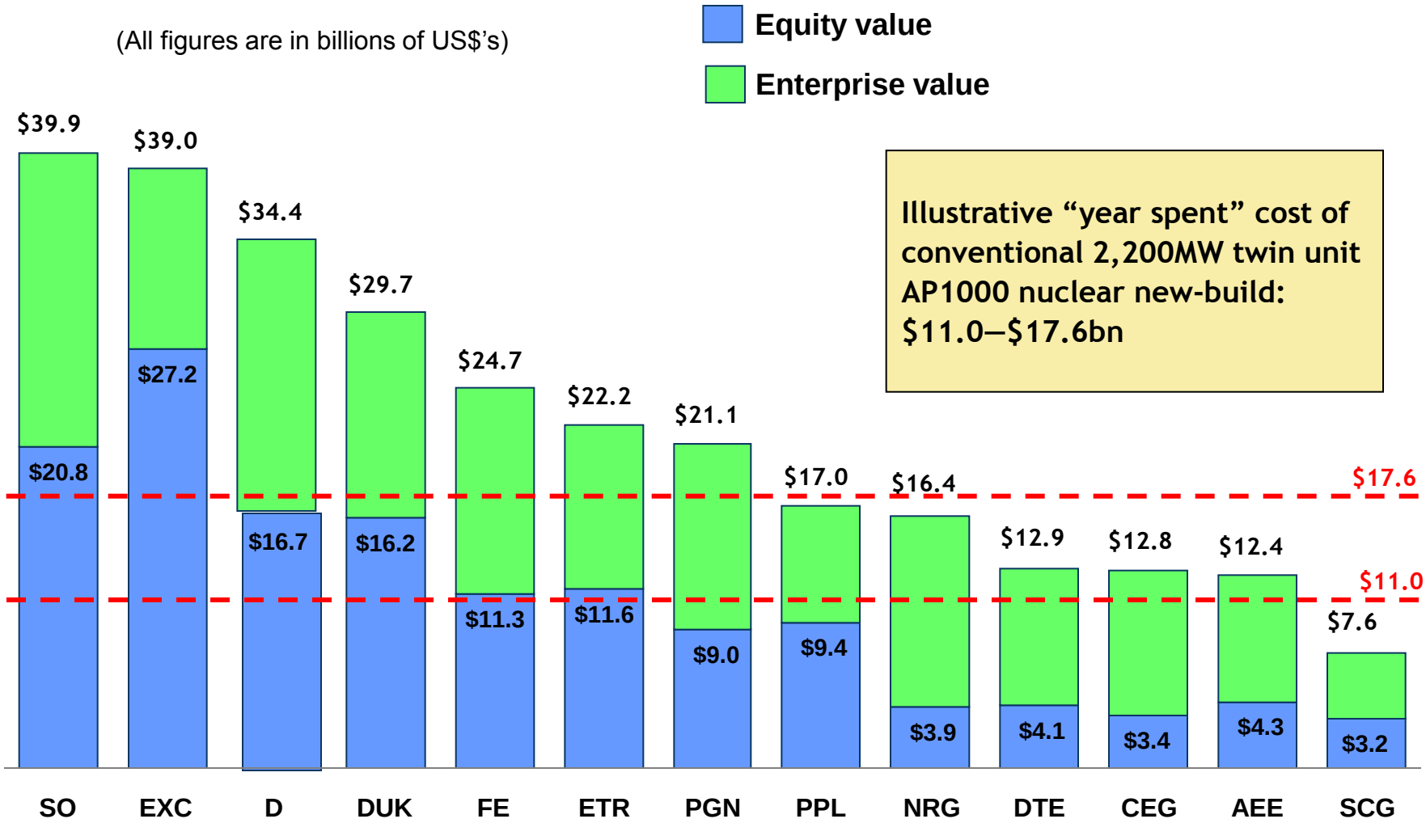


Source: "Life-Cycle Assessment of Electricity Generation Systems and Applications for Climate Change Policy Analysis,"
Paul J. Meier, University of Wisconsin-Madison, August, 2002

Market fundamentals

- Non-carbon base load needed for sustainable climate change
- Energy security – locally sourced power
- Performance of existing plants exceeding 90% capacity factor
- Streamlined regulation
- Standardized designs

The financial risks of large nuclear plants



Source: JPMorgan; FactSet as of 3/13/09

Experienced Executive Team

Executive	Position	Experience
Paul G. Lorenzini, PhD, JD	Chief Executive Officer	President, Pacific Power & Light CEO, PowerCor Australia VP & General Manager, Rockwell Hanford Operations
Jose N. Reyes, PhD	Chief Technical Officer	Internationally recognized leader in developing scalable test facilities for nuclear plant certification Designed and built AP 600 & 1000 certification facility at OSU. United Nations International Atomic Energy Agency (IAEA) technical expert on passive safety systems Department Chair, Nuclear Engineering, Oregon State University Ten years, US Nuclear Regulatory Commission. Member of Three Mile Island Accident investigation Team
Tom Marcille	Chief Operating Officer	Chief Engineer, Advanced Reactors, Los Alamos National Laboratory Twenty years as a contributing, managing and chief engineer in GE Nuclear's advanced and terrestrial BWR business units

Experienced Executive Team

Executive	Position	Experience
Jay Surina	Chief Financial Officer	Fifteen years in Power Plant Finance : Boart Longyear, Texas Genco, Centrica North America, Sithe Energies, Cornerstone Energy (co-founder), VP Former lieutenant, US Navy Nuclear Submarine Force; Recent Commanding Officer in the US Naval Reserve Intel Program; Rank of Navy Captain. MBA , Wharton; BS, US Naval Academy
Bruce Landrey	Chief Marketing Officer	VP Corporate Relations, Tennessee Valley Authority Assistant to CEO & Director Investor Relations, Portland General Corp. Extensive national involvement in nuclear issues and initiatives.
Ed Wallace	Senior VP, Regulatory Affairs	TVA, Senior Manager, Regulatory Affairs. Founder and President, GNBC. General Manager, Pebble Bed Modular Reactor Pty. Ltd. MBA, Univ. of Tennessee; BS, US Naval Academy

Robust Supply Chain

NUCLEAR VENDOR

Design & Engineering (NSSS) - Licensing (Certification) - Support services

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EPC PARTNER

Design & Engineering (BOP) - Project Management - Site Preparation & Construction

Kiewit

SUPPLY CHAIN

CDRM --Vessels –Turbines -- Fuel assemblies

General Dynamics Electric Boat

Precision Pride

Northrop Grumman

GE

Curtiss Wright

CUSTOMER ADVISORY BOARD

Energy Northwest

Tri-State — The Power Behind Your Local Electric Co-op — A Touchstone Energy® Cooperative

Exelon

OPPD — Omaha Public Power District

Ameren UE

Southern California Edison — An Edison International Company — San Onofre Nuclear Generating Station

Entergy — The Power of People

OglethorpePower

MidAmerican Energy — Obsessively, Relentlessly At Your Service.

Dairyland Power Cooperative

History and Technology

NuScale Power History

- Oregon State University builds ¼ scale test facility to support Certification of the AP600 and AP1000 without requiring a “prototype”
- NuScale design (MASLWR) originally developed under DOE funded program with co-sponsors in 2000-2003
- OSU refined and developed the design with proprietary improvements (2004-2007)
- NuScale Power Inc. formed in June 2007. Tech-transfer agreement with OSU provides exclusive use of the Integral System Test facility and patents.
- 2008 – 2010

– Establish Executive Team and staff of world-class engineers

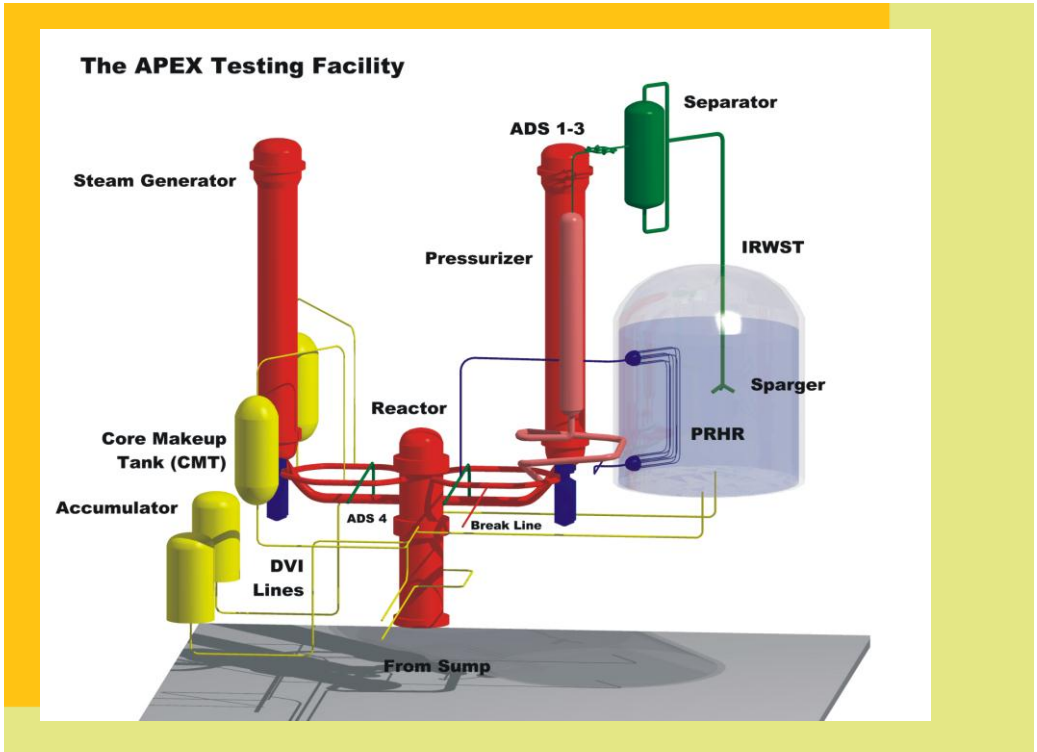
– Gain commitment from US NRC to support licensing

– Secure support from US Congress and US DOE

The Evolution of the NuScale Design

APEX Test Facility at Oregon State University

- Oregon State University integral system testing for Westinghouse and NRC code validation in support of AP600 and AP1000 design certification:
  - 76 Qualified Tests for AP600 (1995-1999)
  - 22 Qualified Tests for AP1000 (2002-2004)



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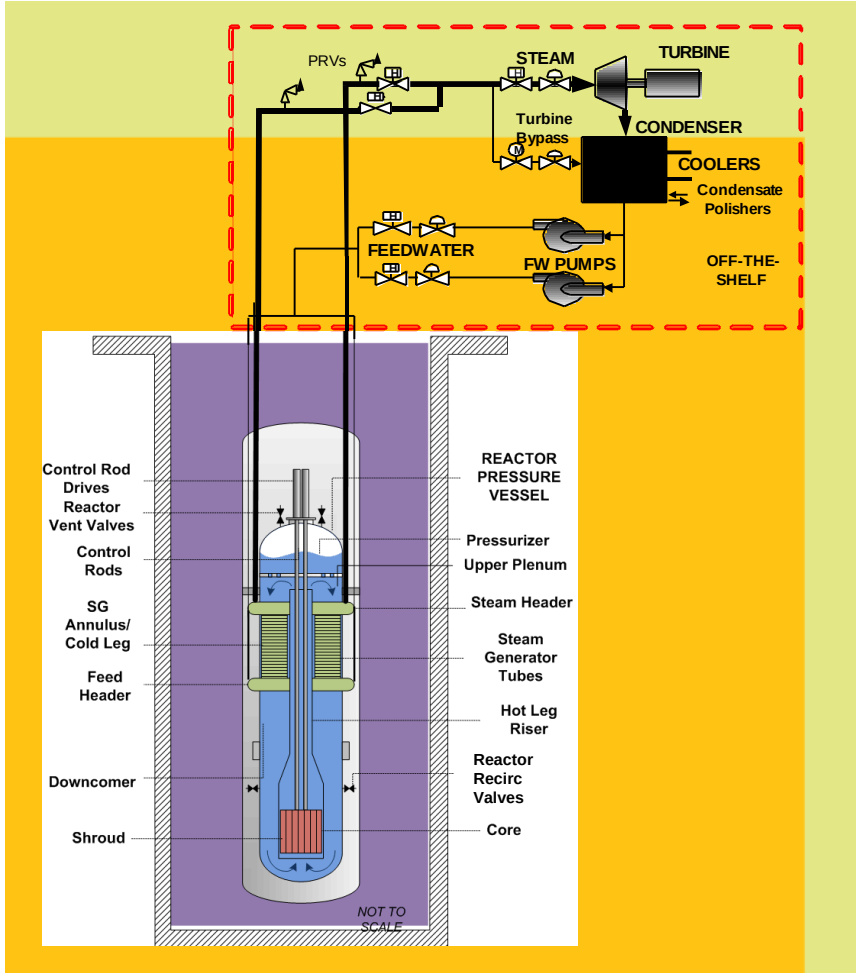
Test Facility Confirms Safety & Performance

- Integral test facility provides R&D support required for NRC Certification without the need for a prototype
- NuScale's approach replicates Certification of the AP1000 using an integral test facility also built by Oregon State University

NuScale: Prefabricated, Simple, Safe

- NSSS is Factory Built:
  - *Entire NSSS prefabricated and shipped by rail, truck or barge*
- Natural Circulation Cooling:
  - *Inherently safe – Eliminates major accident scenarios*
  - *Improves economics - Eliminates pumps, pipes, valves*
- Large natural heat sink
  - *Simplifies and enhances safety case*
- Proven Technology
- Below Ground
  - *Enhances security and safety*



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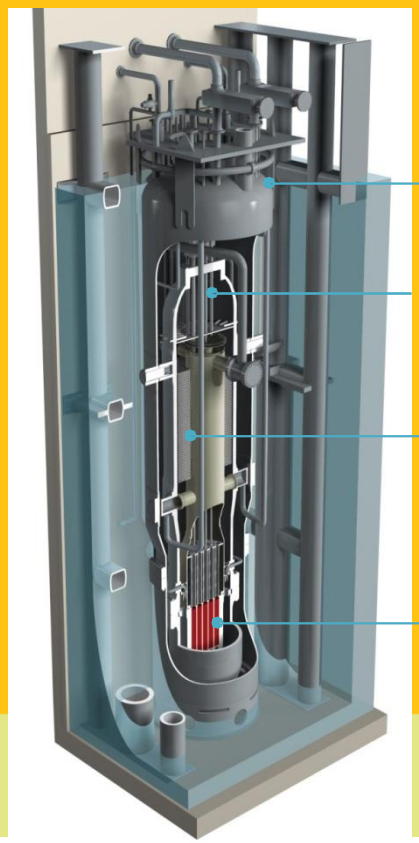
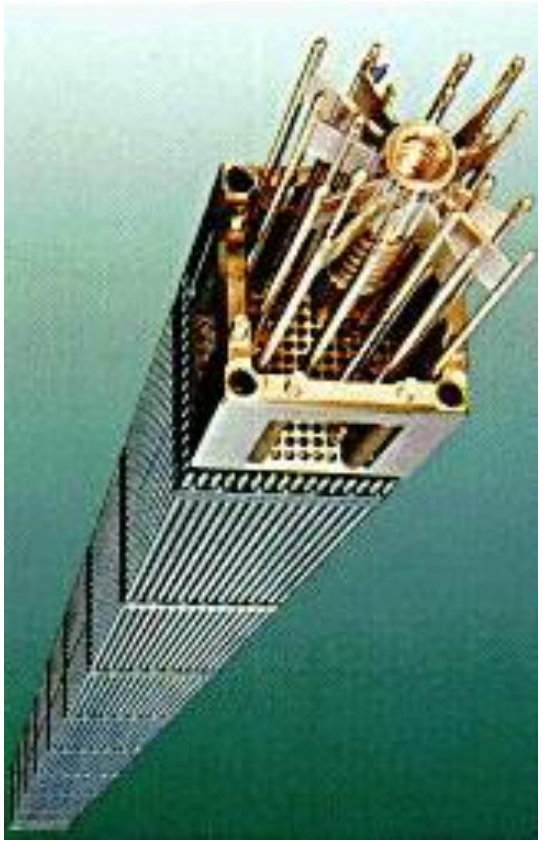
NSSS and Containment



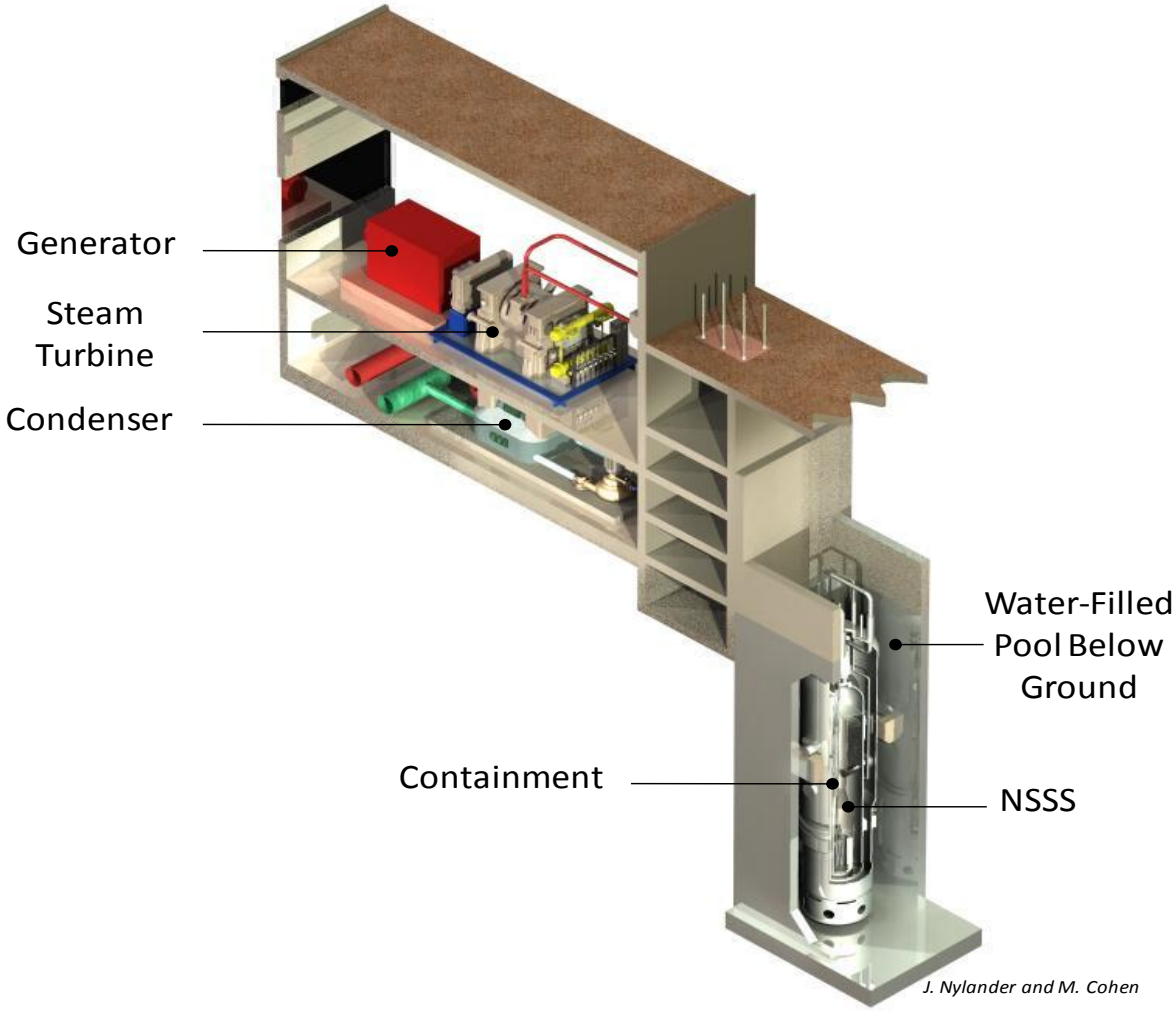
Standard LWR Fuel

Fuel

- Half Height
- 17x17 Lattice
- UO2 fuel pellets
- Clad Material – Zirc-4 or Advanced Clad
- Negative Reactivity Coefficients
- 24 Month Cycle Length at 95% capacity factor
- U235 Enrichment < 5.0 %

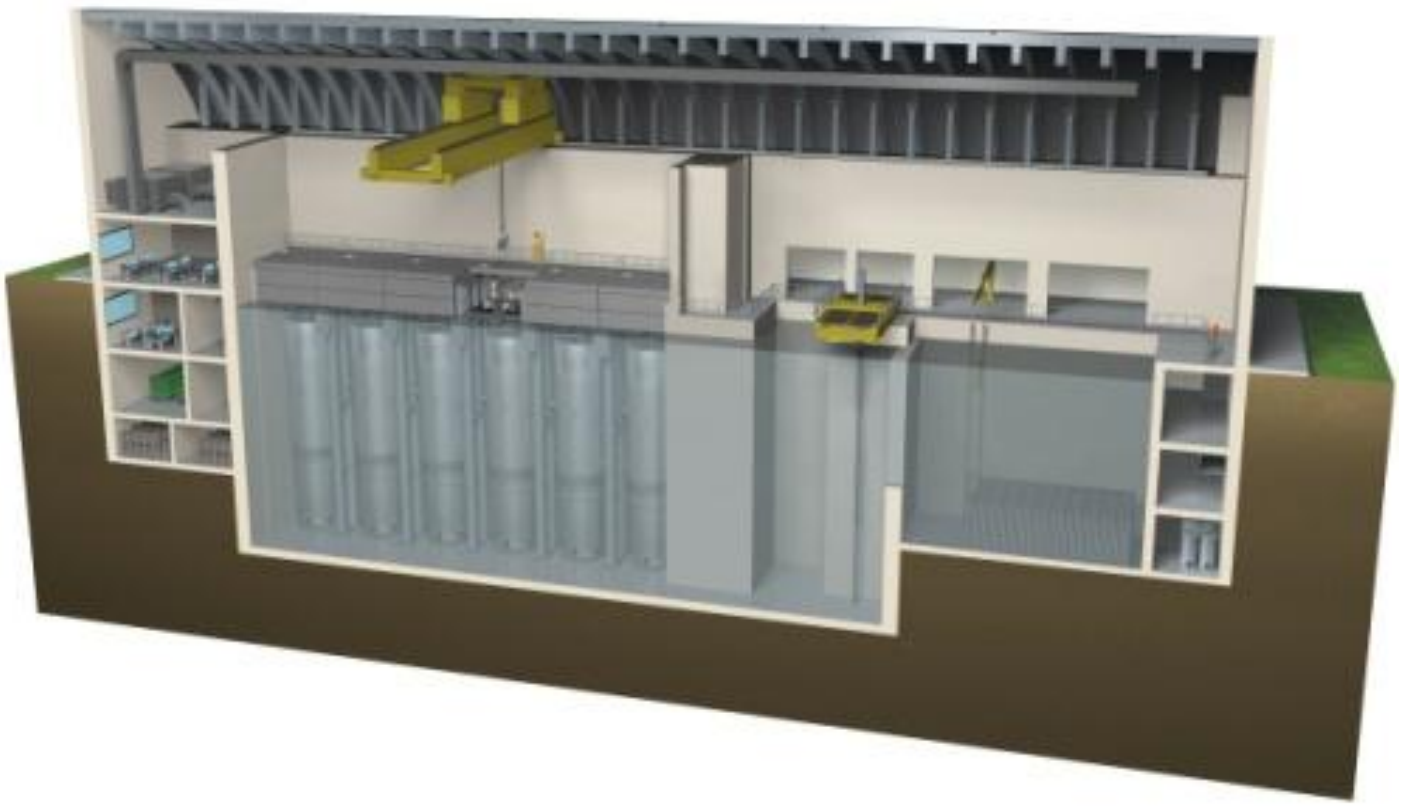


Each Module is Independent



Modularity Permits Scaling to Any Size

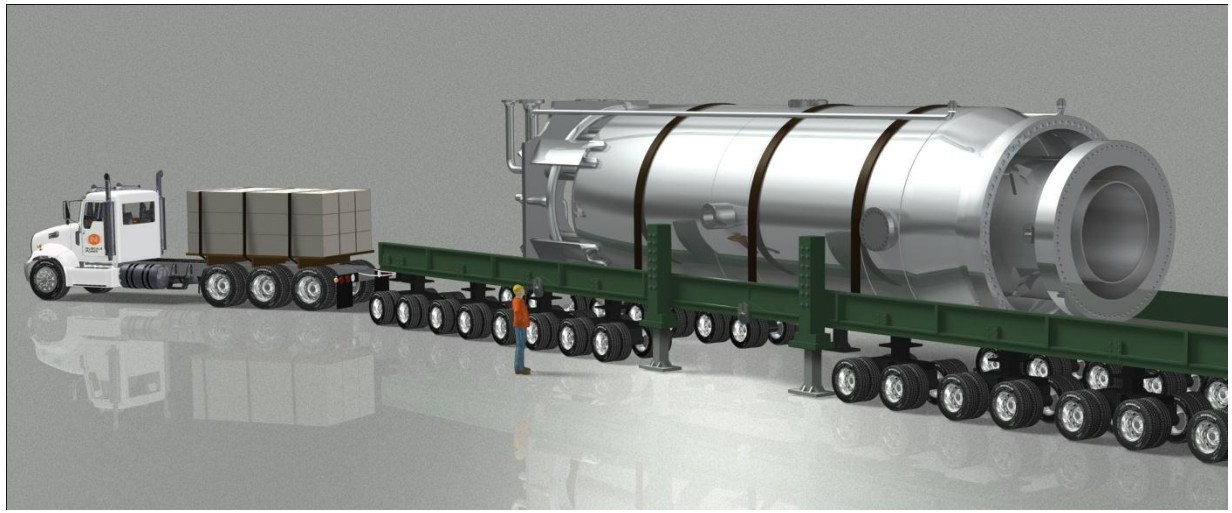
12 modules, 45 MWe each produces 540 MWe



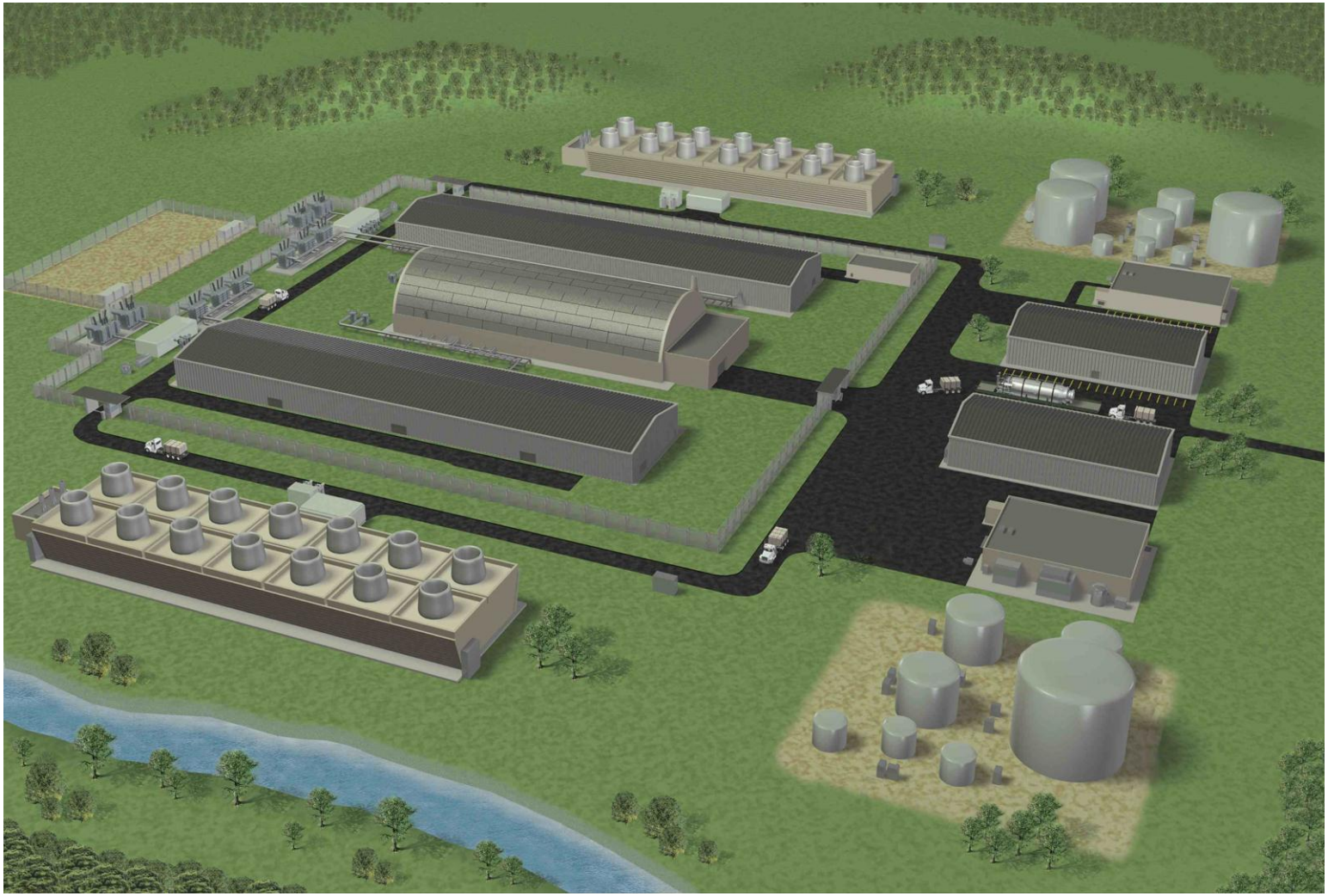
Multi-module control room layout

Ship by Truck, Rail, Barge

- Integrated Reactor Module
- Factory manufactured
- Transportable by rail, truck or barge
- 15 meters x 4.5 meters
  - 400 tonnes



Site Perspective



THE ECONOMIES OF SMALL©

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Achieving the “Economies of Small”

Keys include:

- Off-site manufacturing and fabrication
  - Improves modular component manufacturing productivity by as much as 8:1
  - Continuous improvement in quality from “learning by doing”
- Robust US supply chain
- Safety margins and siting advantages
- Shorter construction timeline and less uncertainty
- Scalability - capacity added as needed
- Simplified operations

Simplicity = Greater Safety, Lower Costs and Risks

- Proven technology
- Fewer systems and components than traditional plants

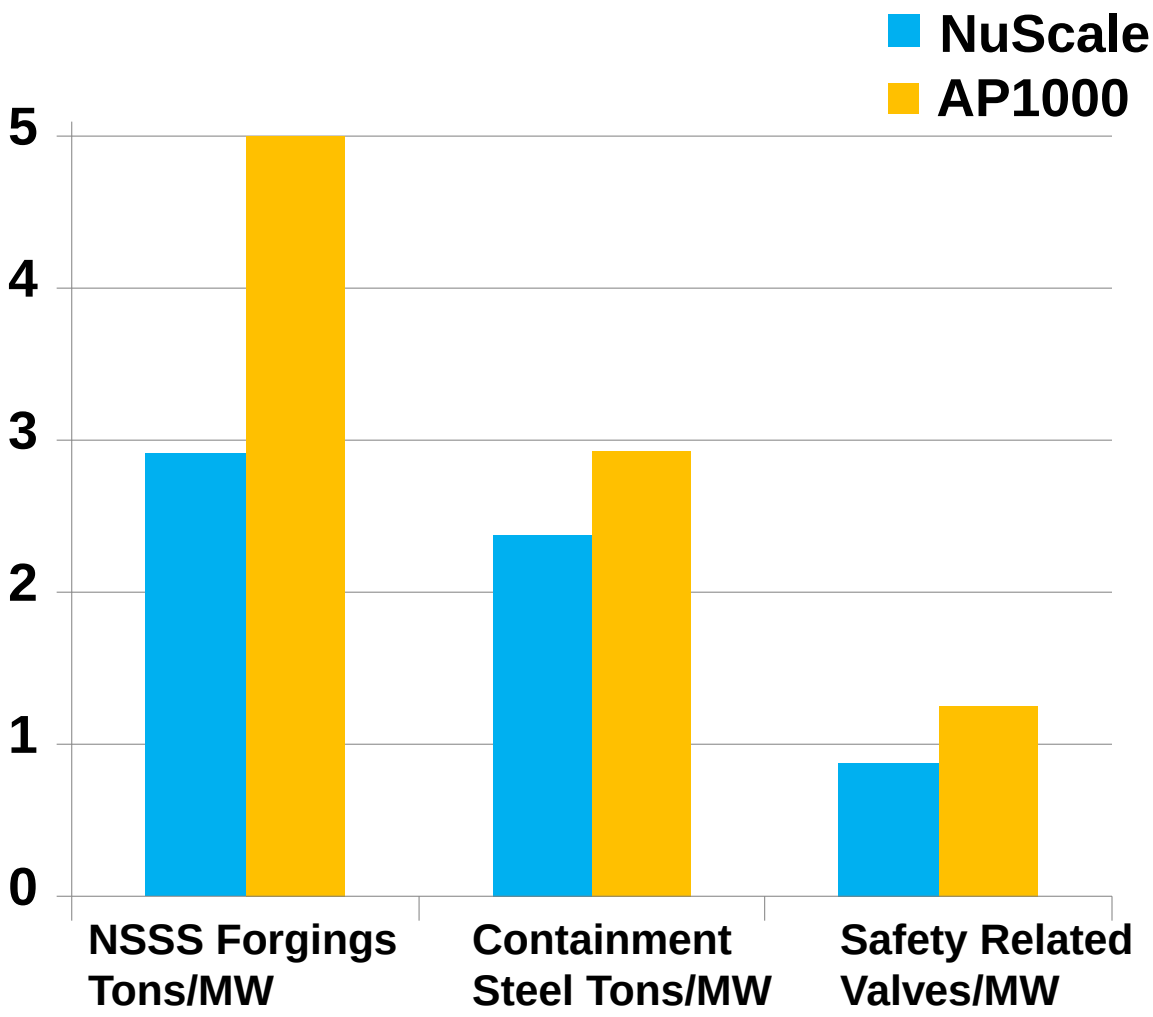
- ✓ Less to **Develop**
- ✓ Less to **Design**
- ✓ Less to **License**
- ✓ Less to **Build**
- ✓ Less to **Operate**
- ✓ Less to **Maintain**

Simple: Fewer Engineered Systems = faster, lower cost licensing and construction

	AP1000	NuScale
NSSS Components	4 Reactor Coolant Pumps	**None**
	4 Cold Legs	**None**
	2 Hot Legs	**None**
	1 Pressurizer Surge Line	**None**
Passive Safety Systems	2 Core Make-up Tanks and Piping (2000 ft^3 each)	**None**
	2 Direct Vessel Injection Lines	**None**
	2 Passive Residual Heat Removal Heat Exchangers	**None**
	In-Containment Storage Tank	**None**
	Hydrogen Recombiners	**None**

How Can Smaller Be Cheaper?

- Simplicity eliminates equipment
- Modularity reduces size
- Smaller sizes less costly to manufacture



SAFETY & LICENSABILITY

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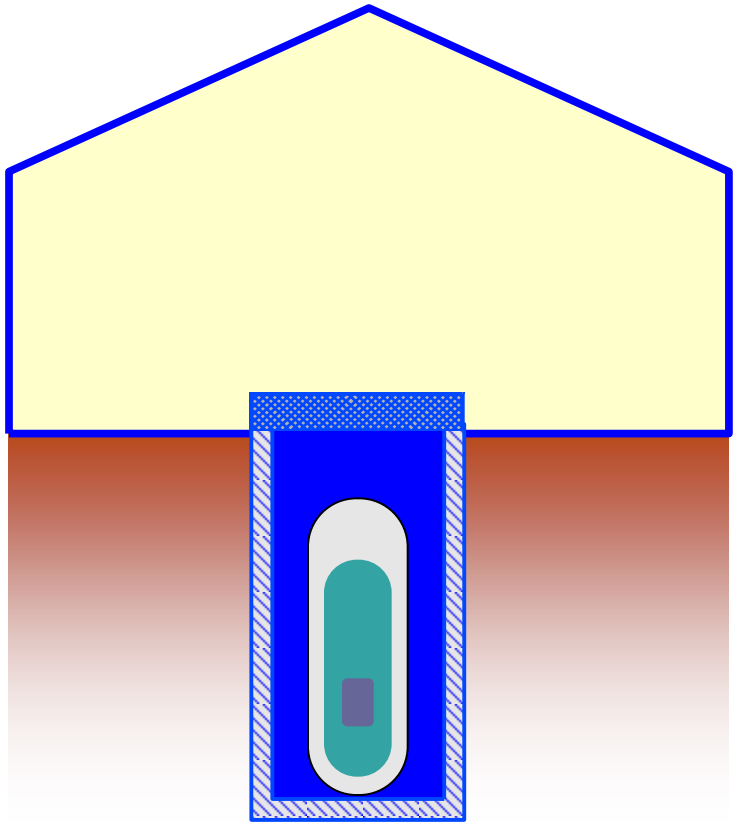
Additional Fission Product Barriers

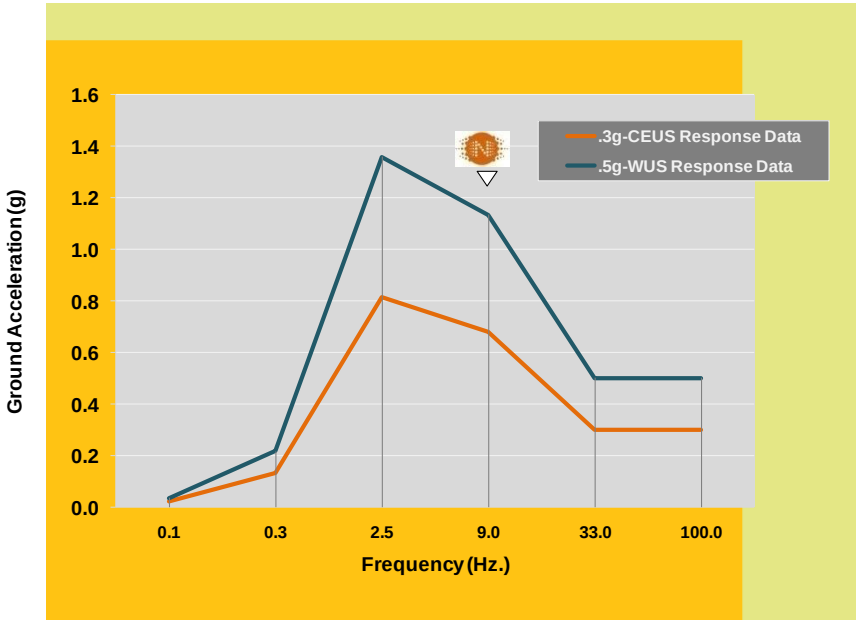
- Fuel Pellet and Cladding
- Reactor Vessel
- Containment
- Containment Cooling Pool Water
- Containment Pool Structure
- Biological Shield
- Reactor Building

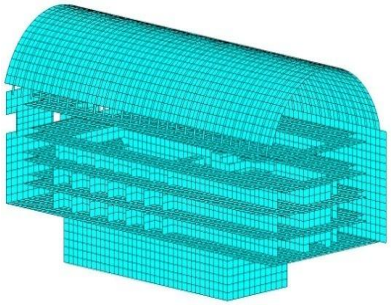


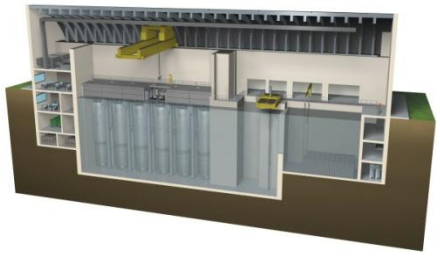
Low CDF, Increased Fission Product Barriers, Small Source term means potential for smaller EPZ

Robust Seismic Design

- Designed for East and West Coast US seismic activity
- Structure composed almost entirely out of concrete, with well arranged shear walls and diaphragms which provides for high rigidity
- Significant portion of the structure
  located below grade partially supported by bedrock
- Large pools filled with water will dampen seismic forces







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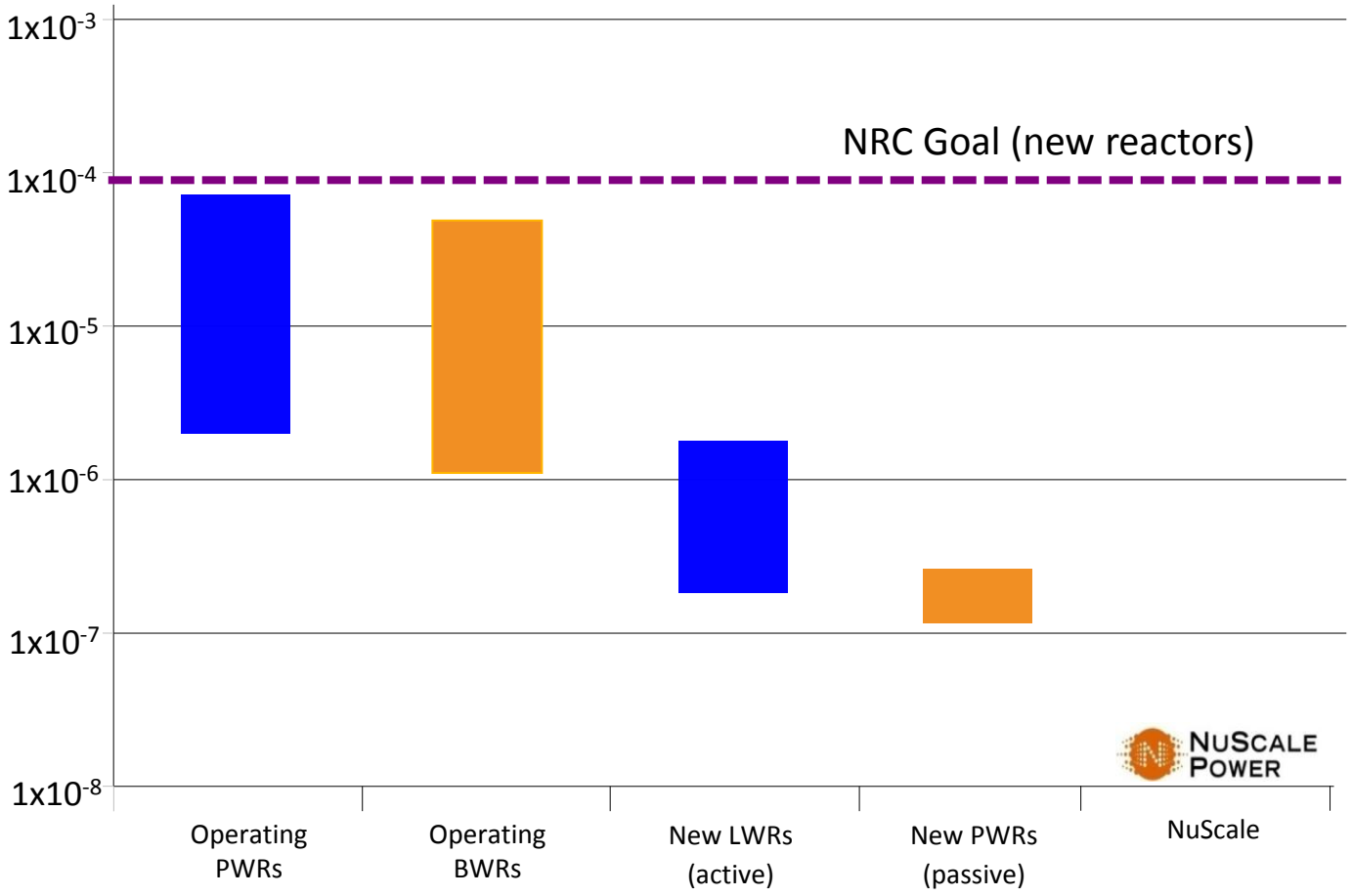
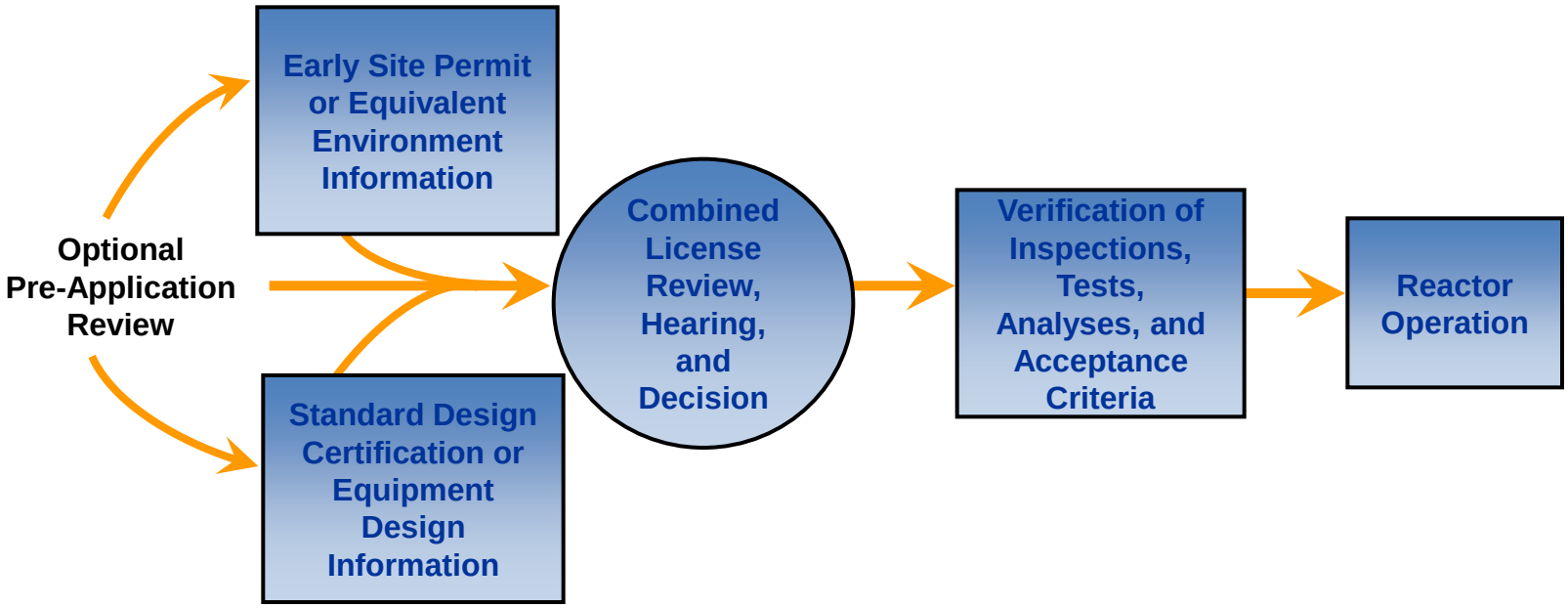
Core Damage Frequency Significantly Reduced



Source: NRC White Paper, D. Dube; basis for discussion at 2/18/09 public meeting –on implementation of risk matrices for new nuclear reactors

Summary of NRC Licensing



NuScale Features Summarized

- **Factory manufacturing** of entire NSSS fully captures the “economies of small”
- **Natural convection** cooling offers simplicity. enhanced safety
- **Proven light water** principles reduce technology risks and shorten regulatory path.
- **Integral test facility** built and operating – reduces regulatory risks and confirms design.
- **Seismically robust** to serve wide variety of sites
- **Established supply chain** relies on proven nuclear industry leaders
- **Economics validated** by detailed design estimates

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