The NuScale Reactor Design

Mohammad Modarres

Professor

Department of Mechanical Engineering

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NuScale Power History

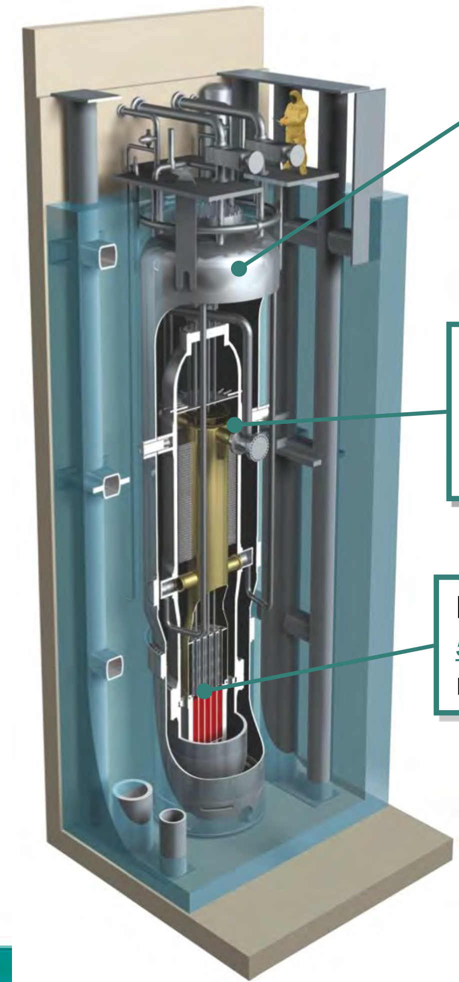
- NuScale design (MASLWR) originally developed under DOE funded program with co-sponsors in 2000-2003
- OSU refined and developed the design with proprietary improvements (2004-2007)
- NuScale Power Inc. formed in June 2007
- Tech-transfer agreement with OSU provides exclusive use of the Integral System Test facility and patents.
- November 2007
  - First meeting with NRC
  - Introduced to DOE
  - First patents filed
- First financing – January, 2008

NuScale Power

Safety Features

- **Natural Convection for Cooling**
  - Inherently safe natural circulation of water over the fuel driven by gravity
  - No pumps, no need for emergency generators
- **Seismically Robust**
  - System is submerged in a pool of water below ground in an earthquake resistant building
  - Reactor pool attenuates ground motion and dissipates energy
- **Simple and Small**
  - Reactor is 1/20th the size of large reactors
  - Integrated reactor design, no large-break loss-of-coolant accidents
- **Defense-in-Depth**
  - Multiple additional barriers to protect against the release of radiation to the environment

45 MWe Reactor Module

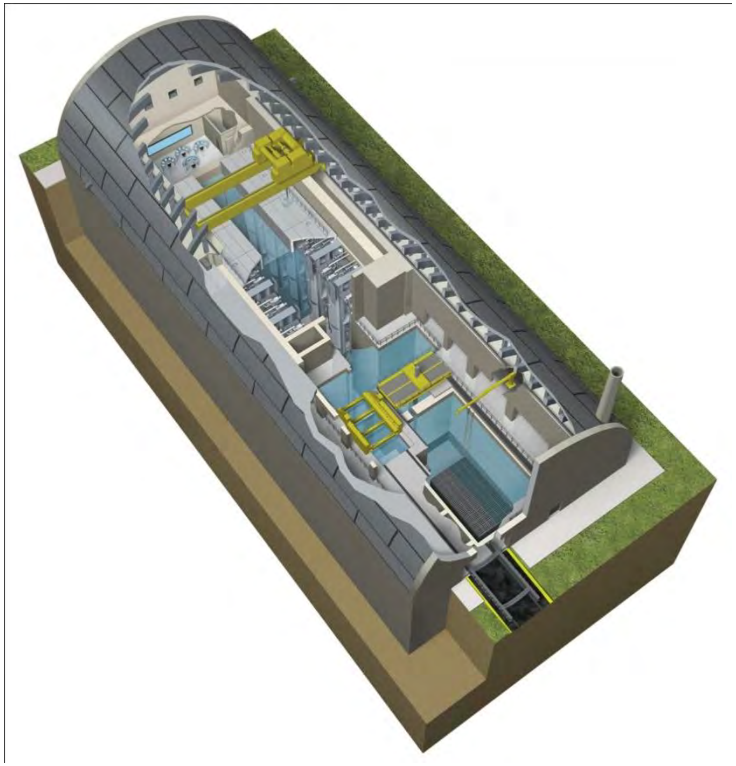


NSSS and Containment

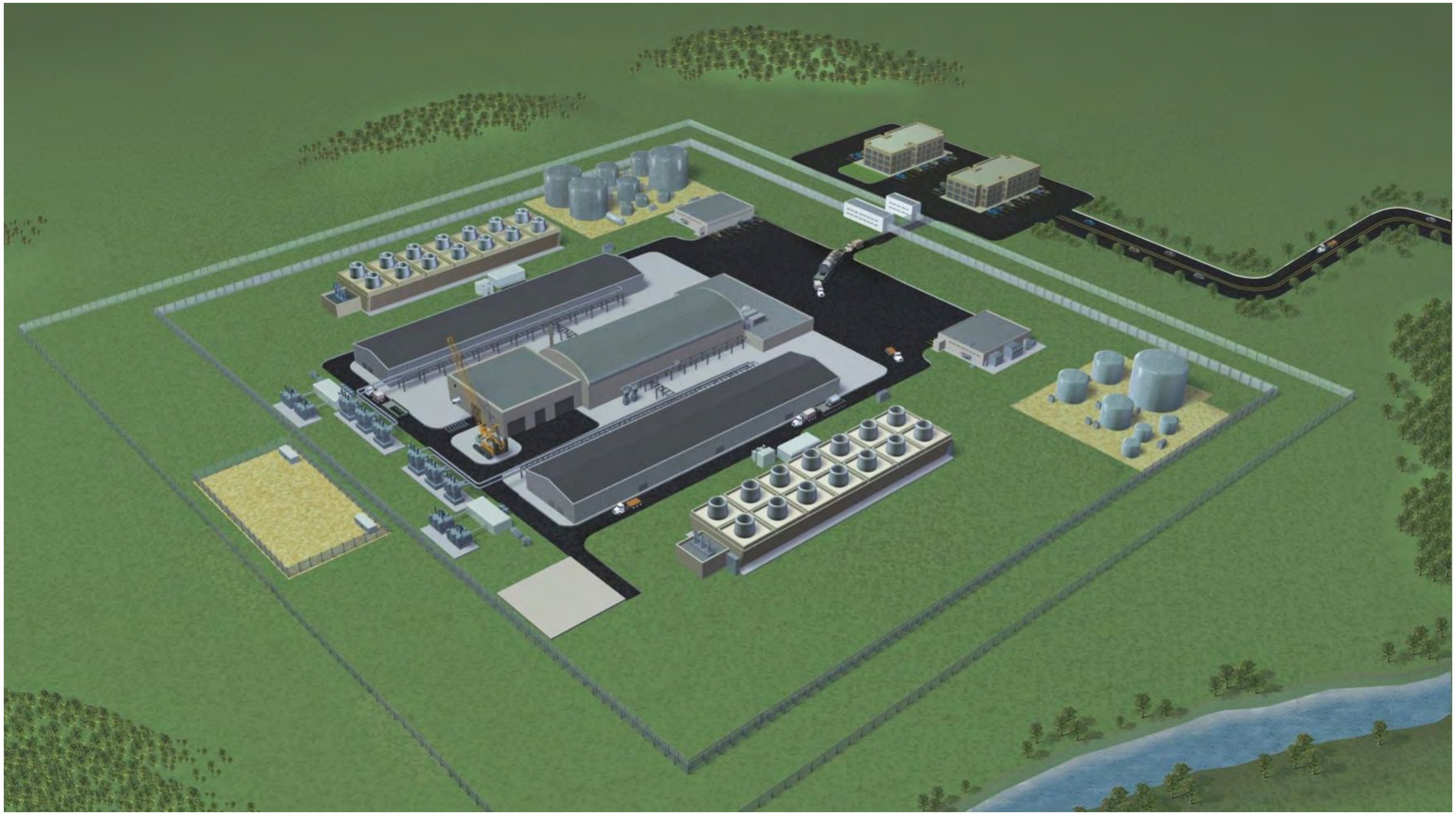
Modularity permits scaling to any

12 modules, 45 MWe each produces 540 MWe

Cross-sectional View of Reactor Building

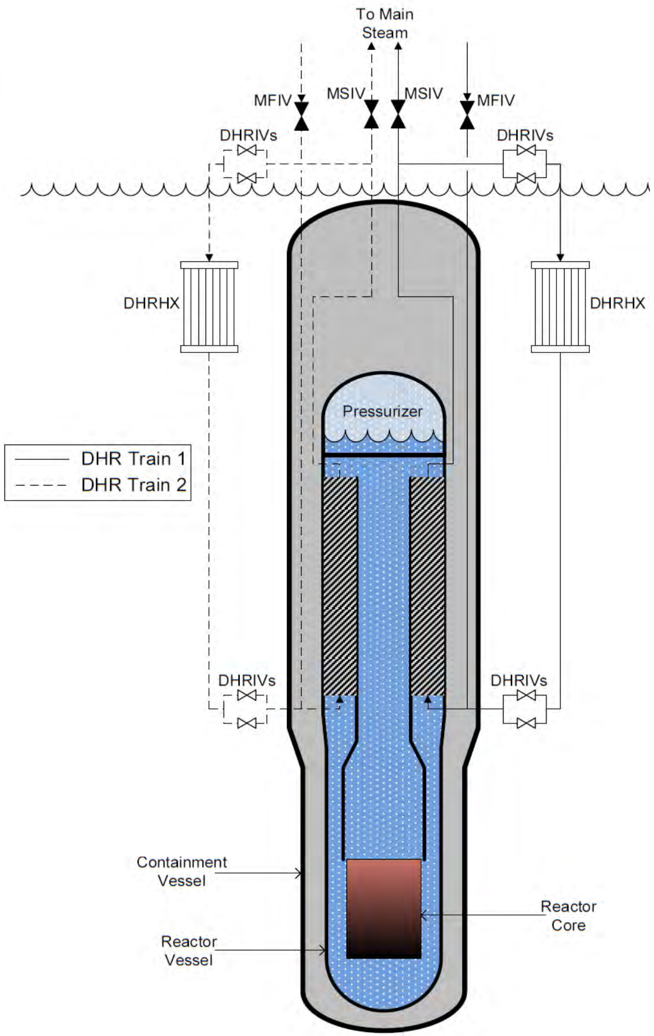


NuScale Site layout



NuScale Power

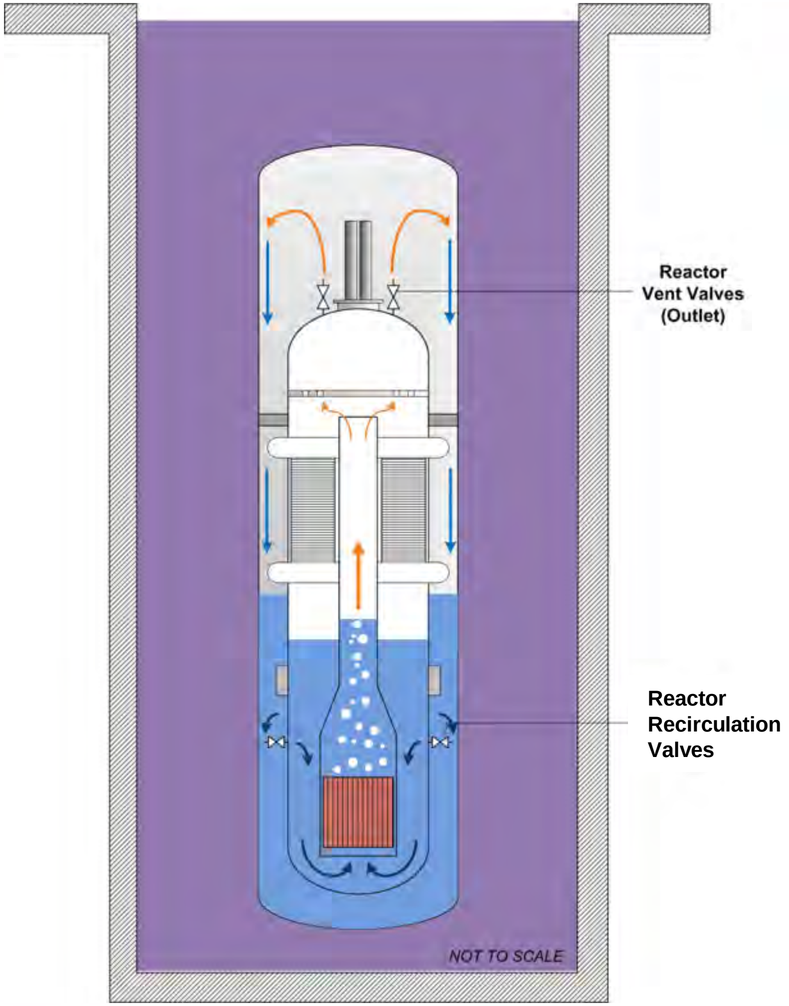
Decay Heat Removal System Using Steam Generators



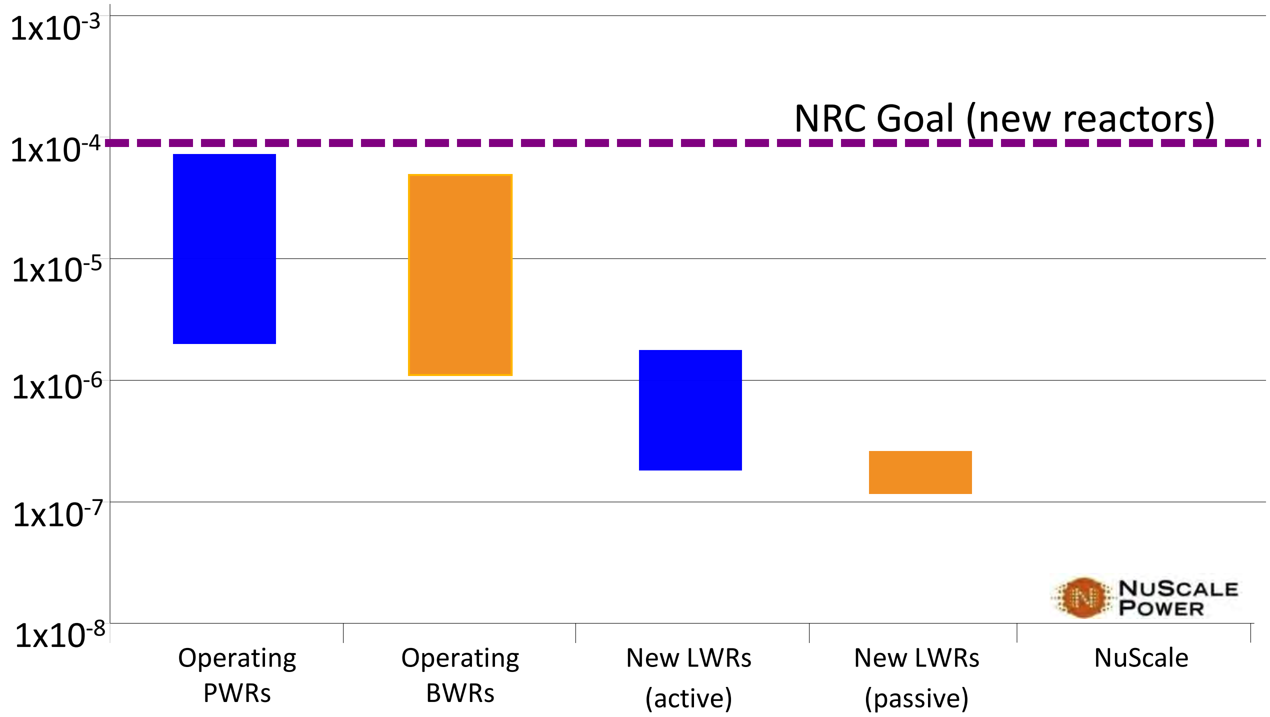
- Two independent single-failure-proof trains
- Closed loop system
- Two-phase natural circulation operation
- DHRS heat exchangers nominally full of water
- Supplies the coolant inventory
- Primary coolant natural circulation is maintained
- Pool provides a 3 day cooling supply for decay heat removal

Decay heat removal using the containment

- Provides a means of removing core decay heat and limits containment pressure by:
  - Steam Condensation
  - Convective Heat Transfer
  - Heat Conduction
  - Sump Recirculation
- Reactor Vessel steam is vented through the reactor vent valves (flow limiter)
- Steam condenses on containment
- Condensate collects in lower containment region
- Reactor Recirculation Valves open to provide recirculation path through the core
- Provides +30 day cooling followed by indefinite period of air cooling.



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

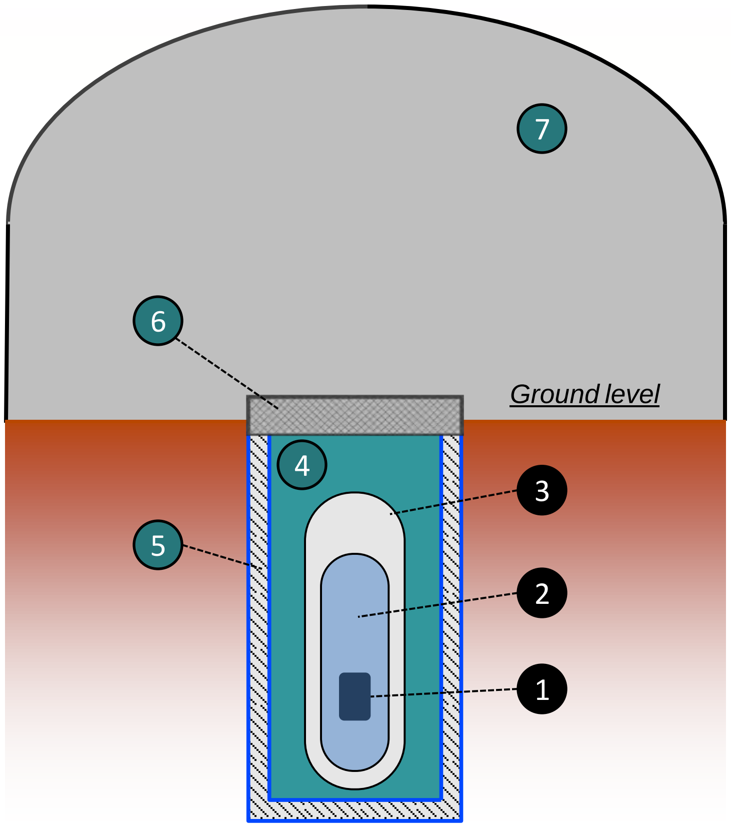
Added Barriers Between Fuel and Environment

Conventional Designs

1. Fuel Pellet and Cladding
2. Reactor Vessel
3. Containment

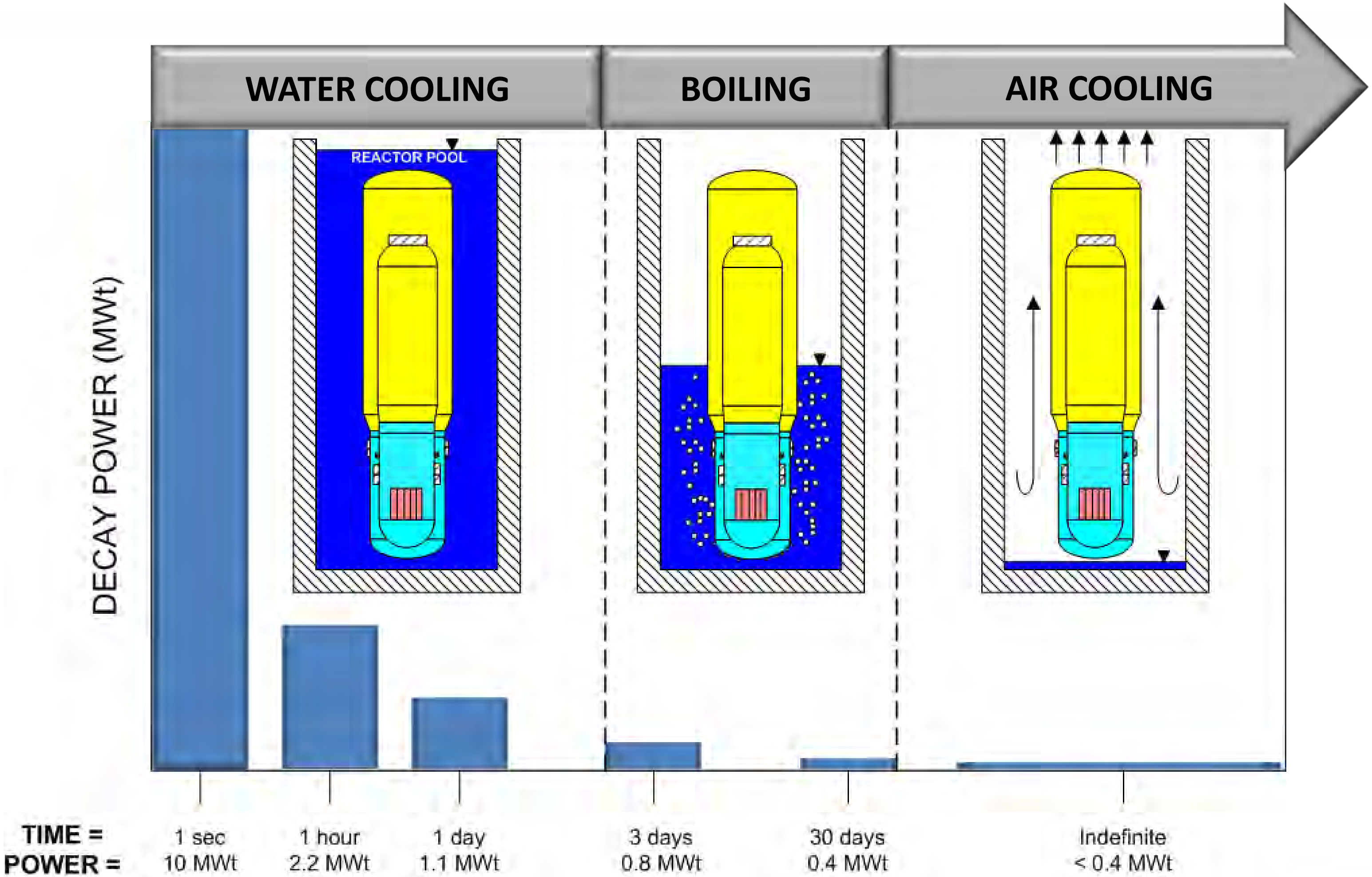
NuScale's Additional Barriers

4. Water in Reactor Pool (4 million gallons)
5. Stainless Steel Lined Concrete Reactor Pool
6. Biological Shield Covers Each Reactor
7. Reactor Building



Stable Long Term Cooling

Reactor and nuclear fuel cooled indefinitely without pumps or power



Comparison of NuScale to Fukushima-Type Plant

Fukushima	NuScale Plant
Reactor and Containment	
Emergency Diesel Generators Required	None Required
External Supply of Water Required	Containment immersed in 30 day supply of water
Coolant Supply Pumps Required	None Required
Forced flow of water required for long term cooling	Long term (Beyond 30 days) cooling by natural convection to air
Spent Fuel Pool	
High Density Fuel Rack	Low Density Fuel Racks
Water Cooling	Water or Air Cooling Capability
Elevated Spent Fuel Pool	Deeply Embedded Spent Fuel Pool
Standard Coolant Inventory	Large Coolant Inventory *4 times the water of conventional spent fuel pools per MW power*

Conclusions

- Simple, Passively Safe
- Incrementally Build-out
- Centrally Manufactured and Transported by Truck
- Expected Design Cert.: 2013-2016
- 3.5-Year Construction
- 40-year Life of Module

NUSCALE POWER

1000 NE Circle Blvd, Suite 10310
Corvallis, OR 97330
541-207-3931
http://www.nuscalepower.com

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