Overview

- NuScale is commercializing a 40 MWe system that can be scaled to meet customer requirements of virtually any size.

- NuScale’s standard design is for a power plant with up to 12 modules generating 480 MWe.

- NuScale technology developed and tested by Oregon State University, Idaho National Lab and Nexant-Bechtel under DOE funded research. Company formed in 2007 with tech-transfer agreement from OSU.

- Design innovations simplify construction, strengthen safety, reduce costs and financial risks, and improve reliability.

- Reliance on existing commercial nuclear technology reduces regulatory risk and increases speed to market.
# Management Team

<table>
<thead>
<tr>
<th>Executive</th>
<th>Position</th>
<th>Experience / Accolades</th>
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<tbody>
<tr>
<td>Paul G. Lorenzini, PhD</td>
<td>Chief Executive Officer</td>
<td>President, Pacific Power &amp; Light&lt;br&gt;CEO, PowerCorp Australia&lt;br&gt;VP/General Manager, Rockwell Hanford Operations</td>
</tr>
<tr>
<td>Jose N. Reyes, PhD</td>
<td>Chief Technical Officer</td>
<td>Internationally recognized for leadership in developing scalable test facilities for nuclear plants&lt;br&gt;United Nations International Atomic Energy Agency (IAEA) technical expert on passive safety systems&lt;br&gt;Department Chair, Nuclear Engineering, Oregon State University</td>
</tr>
<tr>
<td>Tom Marcille</td>
<td>Chief Operating Officer</td>
<td>Chief Engineer, Advanced Reactors, Los Alamos National Laboratory&lt;br&gt;Twenty years as a contributing, managing and chief engineer in GE's advanced and terrestrial BWR business units</td>
</tr>
<tr>
<td>John “Jay” Surina</td>
<td>Chief Financial Officer</td>
<td>V.P. Financial Planning and Analysis, Boart Longyear&lt;br&gt;Executive positions, Texas Genco, Centrica North America, Sithe Energies&lt;br&gt;Co-founder and a managing partner of Cornerstone Energy Advisors&lt;br&gt;MBA, Wharton School, University of Pennsylvania</td>
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NuScale Project Organization

**Nuclear Vendor**
- Design & Engineering (NSSS)
- Licensing (Certification)
- Support services

**Suppliers**
- Fabricate Modules
- Steam Generator
- Forgings
- CRDM’s

**A/E Constructor**
- Design & Engineering (BOP)
- Project Management
- Site Preparation & Construction

**Owner (typical utility)**
- Site selection
- Licensing (ESP/COL)
- Operations
Strategic Partner - Kiewit Construction: NuScale / Kiewit MOU signed April 2008

- Employee-owned company; $6 billion annual revenue with 120 year history and 16,600 Employees
- FORTUNE’s most admired company in the engineering and construction industry in 2007
- Major power plant constructor
- Major commitment to new nuclear projects based on past nuclear construction experience
Key Industry Contractors and Partners

NuScale Power

- Product Development
- Strategic Planning
- Safety Analysis
- Core Neutronics
- NSSS Design
- Operations & Maintenance
- Training & Development
- Project Management

Studsvik
- Core Design
- Refueling
- Safety Analysis Support

OSU (Oregon State University)
- Test Facilities
- Safety Analysis Support

Creare
- Safety Analysis Support

Longnecker Enterprises
- Digital I&C
- Control Room Design

GSE

MPR
- Core Internals
- Seismic
- Licensing
- Project Management Support

Modarres Consulting
- Probabilistic Risk Analysis

SAIC
- Security
- Emergency Planning
- Safety Analysis Support

CURTIS WRIGHT

Kiewit
- Site Prep
- Plant Construction
- Engineering Support
- Balance of Plant
- Fabrication
NuScale Power: Prefabricated, simple, safe …

- Construction Simplicity:
  - **Major components prefabricated and shipped by rail, truck or barge** - Entire nuclear system is 60' x 15' / 300 tons.

- Natural Circulation Cooling:
  - **Inherently safe** – Eliminates major accident scenarios
  - **Improves economics** - Eliminates pumps, pipes, auxiliary equipment

- Below Ground:
  - **Enhances security and safety** – Critical components - reactor, control room, fuel pool - located below ground
Prototype Confirms Design

- One-third scale, electrically-heated prototype of NuScale plant confirms performance and safety.

- Plant design based on known commercial nuclear technology and operating experience offers confidence to regulators, owners and operators.
Engineered Safety Features

- High Pressure Containment Vessel
- Shutdown Accumulator System (SAS)
- Passive Safety Systems
  - Decay Heat Removal System (DHRS)
  - Containment Heat Removal System (CHRS)
- Severe Accident Mitigation and Prevention Design Features
High Pressure Containment
Enhanced Safety

- **Capable of 3.1 MPa (450 psia)**
  - Equilibrium pressure between reactor and containment following any LOCA is always below containment design pressure.

- **Insulating Vacuum**
  - Significantly reduces convection heat transfer during normal operation.
  - No insulation on reactor vessel. **ELIMINATES SUMP SCREEN BLOCKAGE ISSUE (GSI-191).**
  - Improves steam condensation rates during a LOCA by eliminating air.
  - Prevents combustible hydrogen mixture in the unlikely event of a severe accident (i.e., no oxygen).
  - Eliminates corrosion and humidity problems inside containment.
Decay Heat Removal System (DHRS)

- Two independent trains of emergency feedwater to the steam generator tube bundles.
- Water is drawn from the containment cooling pool through a sump screen.
- Steam is vented through spargers and condensed in the pool.
- Feedwater Accumulators provide initial feed flow while DHRS transitions to natural circulation flow.
- Pool provides a 3 day cooling supply for decay heat removal.
Containment Heat Removal System (CHRS)

- 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 (sump).
- Sump valves open to provide recirculation path through the core.
NuScale modules are scalable

Each module has a dedicated Steam Turbine-Generator

Modules can be “numbered-up” to achieve large generation capacities
Multiple-Module Complex – Flexible Capacity
(12 modules – 480 MWe)
Multi-Module Control Room

Plant Overview Display

Redundant High-Tier Alarming

Reactor Control Cluster A

Reactor Control Cluster B

Reactor Control Cluster C

Control Room Supervisor

User-Defined Panel (up to 4 modules)
- Alarm Interface
- Procedure Operation Interface
- Trending and Graphing

Safety Channel (SC) A

Reactor (Rx) 1 Interface
Advantages of modular scalable nuclear plants

- **Operational**
  - Eliminates single shaft risk
  - On-line refueling

- **Financial**
  - Can sequentially add modules to match load growth
  - Smaller plant size minimize financial risks, complexity and uncertainty
  - Off-site manufacturing improves productivity and mitigates construction risks
NuScale’s modular plant offers significant safety enhancements

- June 2-3, 2008, a panel of experts convened to develop a Thermal-Hydraulics/Neutronics Phenomena Identification and Ranking Table (PIRT) for the NuScale module:

- February 24-26, 2009 Severe Accidents Analysis PIRT Panel
  - Large-break Loss of Cooling Accident (LOCA) eliminated by design
  - DBA Small break LOCA’s will not uncover the core, thus do not challenge plant safety
  - Indicated that the PRA is overly conservative with regard to events that lead to core damage.

- Preliminary PRA already indicates that the overall Core Damage Frequency is extremely low
SBLOCA Transient Phases

- **Phase 1: Blowdown Phase**
  - Begins with the opening of the break and ends with the reactor vent valve (RVV) initiation

- **Phase 2: RVV Operation**
  - Begins with the opening of the reactor vent valve and ends when the containment and reactor system pressures are equalized

- **Phase 3 - Long Term Cooling**
  - Begins with the equalization of the containment and reactor system pressures and ends when stable cooling is established via opening of the sump recirculation valves
Pressure (OSU Test - 003B)

- PT 301 - Pressurizer
- PT 801 - Containment

Time (s) vs Pressure (Bars) graph showing the pressure changes over time for PT 301 and PT 801.
Core Damage Frequency by Plant Type

Source: NRC White Paper, D. Dube; Basis for discussion at 2/18/09 public meeting on implementation of risk matrices for new nuclear reactors
Additional Fission Product Barriers

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

*NOT TO SCALE*
Reduced Emergency Planning Zone

“Generally, the plume exposure pathway EPZ for nuclear power plants shall consist of an area about 10 miles in radius … The size of EPZs may also be determined on a case-by-case basis for … reactors with an authorized power level less than 250 MWt.”

10 CFR 50.47 (c) (2)
NuScale’s Security Advantages

- Safety maintained without external power
- Below-ground
  - Power Module (NSSS and Containment)
  - Control Room
  - Spent Fuel Pool
- Low profile Buildings
Summary of NuScale Advantages

- Reduces financial risks
- Reduces operational risks
- Capacity added to match load growth
- Able to meet demand for smaller sized plants
- Robust supply chain strengthens manufacturing base
- Enhanced safety and security
# Pre-Application Reviews Underway with NRC

<table>
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<th>FY2008</th>
<th>FY2009</th>
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<td>4Q</td>
<td>1Q</td>
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### 1st Meeting
- NuScale and Design Introduction

### Submit Design Description Report

### 2nd Meeting
- Codes and Methods Topical Report

### 3rd Meeting
- Online Refueling Topical Report
- Multi-Module I&C and Operations Staffing Topical Report

### 4th Meeting
- Multi-Module PRA Topical Report
- Severe Accidents Topical Report
- Dose Calculations and Emergency Planning Topical Report
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