New Nuclear Technology

NuScale Power
Safe. Clean. Economic. Simple
Small Modular Reactors

Congressional Briefing
February 25, 2013

Michael S. McGough
Chief Commercial Officer
• NuScale created the concept of a commercial SMR, others entered in 2010 and 2011, competition is good
• NuScale technology in development and design since 2000 (DOE) MASLWR program, lessons from AP1000 scaling
• Integral test facility first operational in 2003
• Began NRC design certification (DC) pre-application project in April 2008
• ~245 FTE’s currently on project, ~$130MM spent project life-to-date
• Twelve-reactor simulated control room operational in May 2012 for Human Factors Engineering development
Fluor-An American Company

• Acquired majority interest in NuScale in October 2011
• One of the world’s leading publicly traded engineering, procurement, construction, maintenance, and project management companies
• #124 in the FORTUNE 500 in 2011
• More than 1,000 projects annually, serving more than 600 clients in 66 countries
• More than 42,000 employees worldwide
• Offices in more than 28 countries on 6 continents
• Nearly 100 years of experience

Fluor Corporate Headquarters
Dallas, Texas

Revenue $20.8 billion
New awards $27.3 billion
Backlog $34.9 billion

Investment Grade Credit Ratings:
S&P A-
Moody’s A3
Fitch A-
What is a NuScale Small Modular Reactor?

- Factory Manufacturing
- Module includes Containment and Reactor Vessel
- Shipped by Truck, Rail, or Barge
- Skid-Mounted Steam Turbine/Generator
- Below-Ground Control Room provides enhanced security and state-of-the-art controls
- Each Module is refueled underwater while the remainder of the plant produces power
  - Refueled once every 24 months
  - 5-day refueling outage target
- Each Module is installed in its own seismically isolated bay
  - Natural Circulation (No Reactor Coolant Pumps)
  - Standard 17x17 PWR Fuel
  - Standard Magnetic Jack Control Rod Drives
  - Internal Steam Generator and Pressurizer
  - 45 MWe Net Power
Elegantly Simple Innovative Design

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• Top of roof: 82.5’ above grade
• Top of concrete for lowest level: 87’ below grade
• 443’ E-W, 137.5’ N-S
Incremental Build Out

- Initial Installation (270 MWe)
- Turbine Building and 6 Turbine Generators
- Cooling Towers
- Power Modules
- Incremental Expansion (540 MWe)
- Installed: 12
The NuScale Safety Case

• NuScale is specifically designed for safety in a Fukushima-like event
• Stable long-term cooling without pumps or motors
• Common pool ultimate heat sink
• Pool provides Seismic Dampening and Radiation Shielding
• Station blackout
• Large Break LOCA (Loss Of Coolant Accident)
• Underground Installation
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

NRC Goal (new reactors)

Operating PWRs
Operating BWRs
New LWRs (active)
New PWRs (passive)
NuScale
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
5. Stainless Steel Lined Concrete Reactor Pool
6. Biological Shield Covers Each Reactor
7. Reactor Building
NuScale Patents

NuScale has a robust patent development and protection that actively identifies and protects its designs and innovations in nuclear technology.

NuScale currently has 71 patents granted or pending in 15 countries in North America, Europe, and Asia.

81 additional patentable concepts in IP protection process, will yield ~300 new patents.

These patent filings are focused on key innovations for SMRs and the existing nuclear fleet. The portfolio includes filings related to:

- Advanced Safety Features
- Enhanced Fuel Performance
- SMR Scalability and Modularity
- Many other nuclear innovations
Site Layout

~ 44 acres (17.8 Hectares) inside exterior security fence

Buildings in italics will be left, as much as possible, owner/operator configurable in the DCD.
US DOE FOA Process

• FOA Issued March 22\textsuperscript{nd}
• Total FOA value $452MM over 5 years
• FOA stated DOE may make “up to two awards”
• Proposals Submitted May 21\textsuperscript{st}, with 85-page limit.
• Nov 20 Decision Announced to make 1 award to B&W
• FOA 2 Scheduled for issue shortly
• Expected 1 or 2 additional awards
• VERY important to complete FOA2 in timely fashion to ensure level playing field and competitive products
Where we Stand Today

• NuScale development underway since 2000
• Working with ASME sections III and XI on SMR code issues
• 1/3-scale prototype in testing since 2003
• 12-module control-room simulator May 2012
• Potential initial site and interest investigations underway in 20 states and 12 countries
• 22-member company customer advisory board
• First Project to be sited at SRNL for SCANA
NuScale Representative Timeline

**NSSS - NuScale**

- Year 1: Continue DCA Prep
- Year 2: Submit DCA
- Year 3: Order Modules
- Year 4: Start Module Fabrication
- Year 5: NRC Issue DCD
- Year 6: Deliver Module 1
- Year 7: Deliver Module 12

**Owner/Operator**

- Year 1: Site Characterization and Data Collection
- Year 2: Submit R-COLA
- Year 3: Start R-COLA
- Year 4: NRC Issue COL
- Year 5: Complete Operational Readiness Program
- Year 6: Operator Training Program Accreditation
- Year 7: Site Preparation

**EPC - Fluor**

- Year 1: Start Standard Plant Design
- Year 2: Complete Standard Plant Design
- Year 3: Begin Module Installation
- Year 4: Unit 1 COD
- Year 5: Unit 12 COD
- Year 6: Site Mob
- Year 7: First Safety Concrete Pour
- Year 8: NuScale Representative Timeline

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**Additional Notes:**

- NuScale
- Owner/Operator
- EPC - Fluor
- Year 1 to Year 11
- Timeline chart details specific milestones and timelines for each year.
NuScale Laser-Focus