



NUSCALE[™]
Power for all humankind

NuScale Power Overview Future Vision of Nuclear R&D Webinar - SMR

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Who is NuScale Power?

- NuScale Power was formed in 2007 for the sole purpose of completing the design and commercializing a small modular reactor (SMR) – the NuScale Power Module™
- Initial concept was in development and testing since the 2000 U.S. Department of Energy (DOE) MASLWR program
- Fluor Corporation, global engineering and construction company, became lead investor in 2011
 - In 2013, NuScale won a competitive U.S. DOE Funding Opportunity for matching funds, and has been awarded over \$450M in DOE funding since then
- 628 patents granted or pending in nearly 20 countries
- >430 employees in 5 offices in the U.S. and 1 office in the U.K.
- Rigorous design review by the U.S. Nuclear Regulatory Commission (NRC)—NuScale received Design Approval in August 2020
- Total investment in NuScale to date is greater than US\$1.3B



NuScale Engineering Offices Corvallis

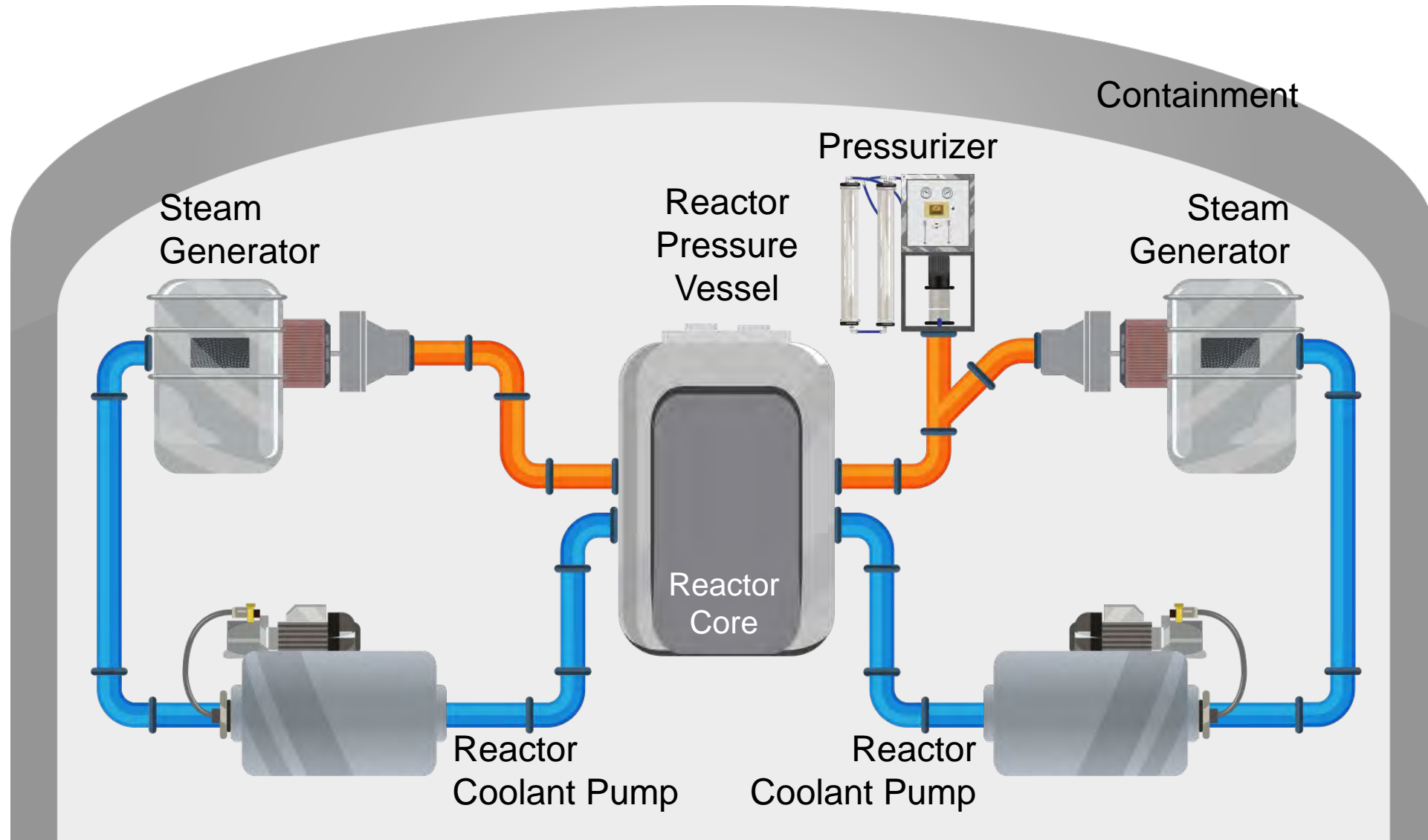


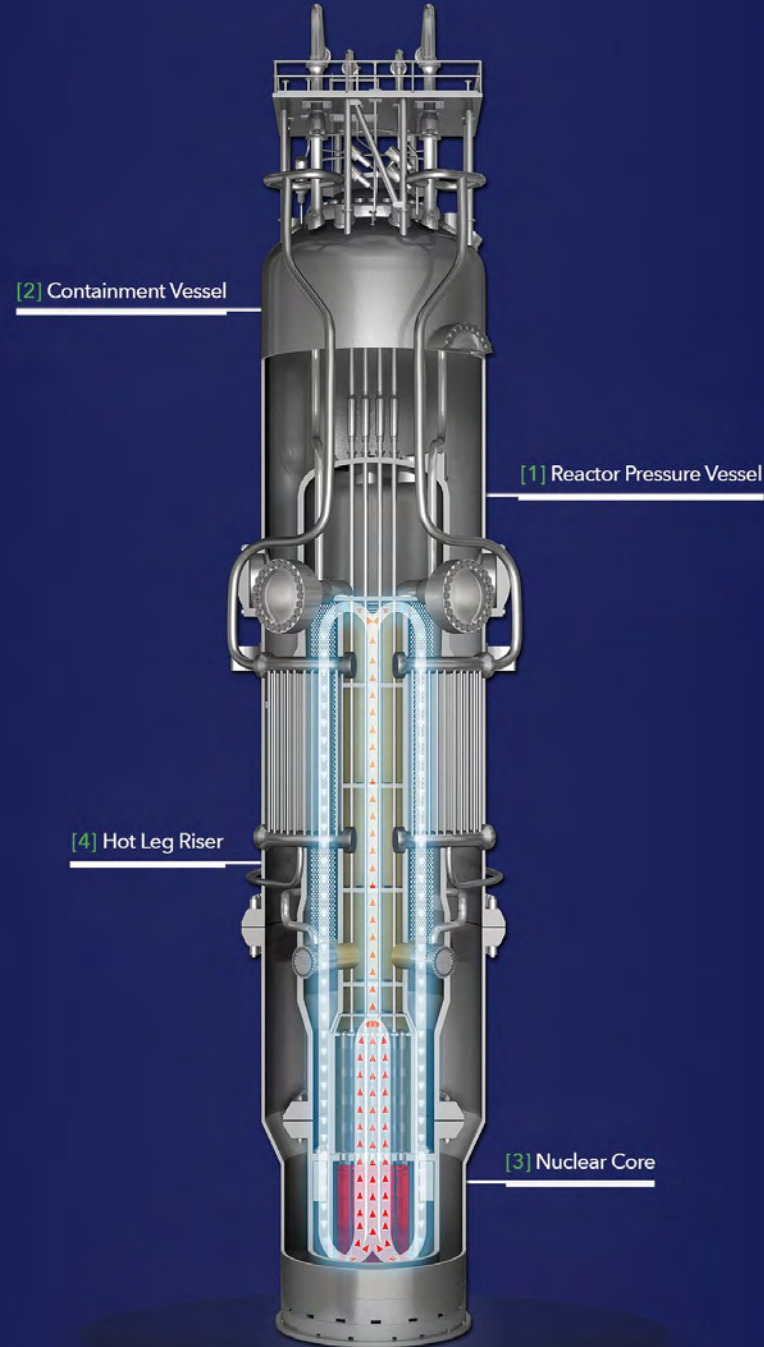
One-third Scale NIST-2 Test Facility



NuScale Control Room Simulator

Typical Pressurized Water Reactor

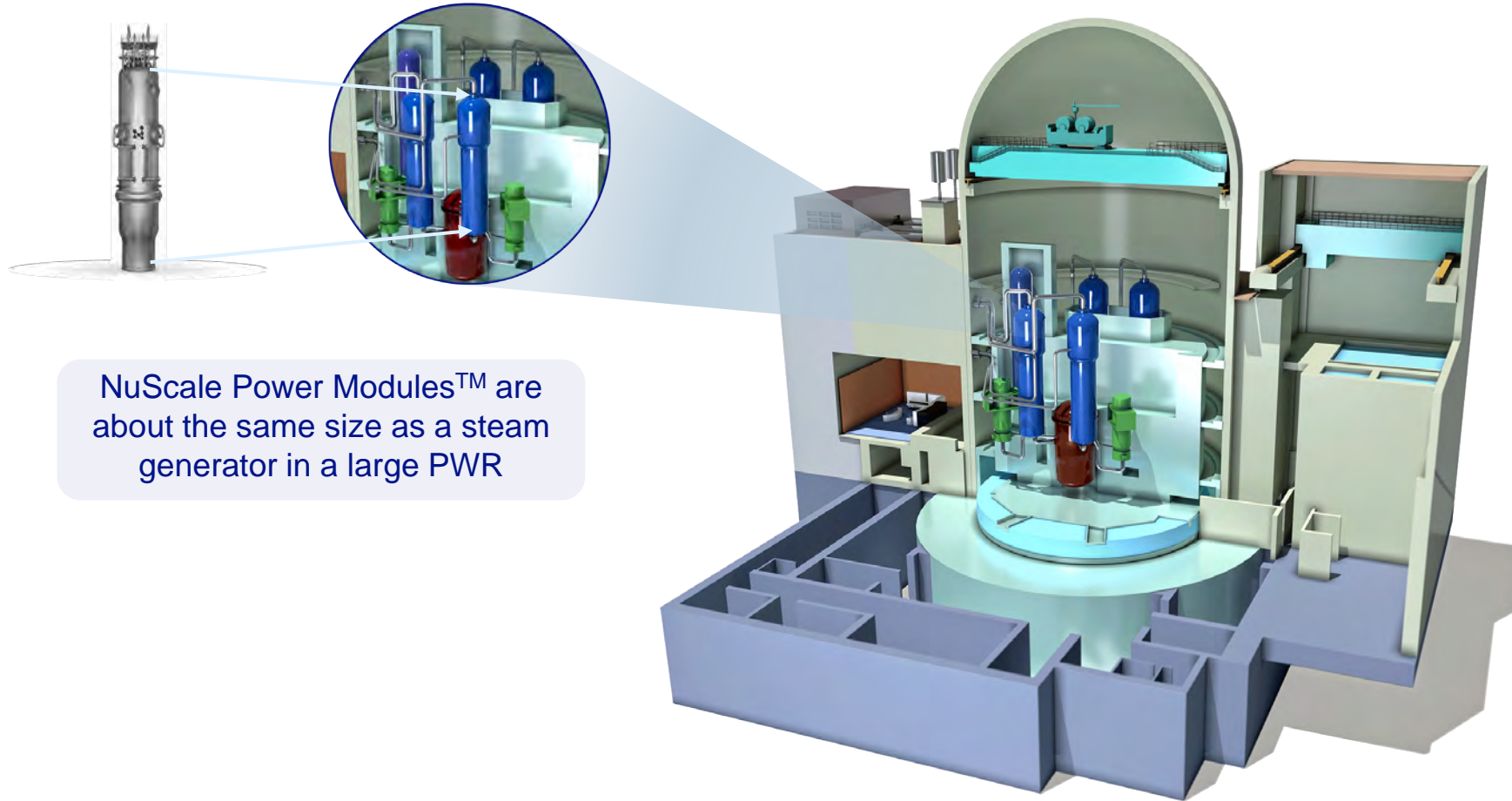




Core Technology: NuScale Power Module™

- A NuScale Power Module™ (NPM) includes the reactor vessel, steam generators, pressurizer, and containment in an integral package – simple design that eliminates reactor coolant pumps, large bore piping and other systems and components found in conventional reactors
- Each module produces up to 77 MWe
 - Small enough to be factory built for easy transport and installation
 - Dedicated power conversion system for flexible, independent operation
- Modules are incrementally added to match load growth
 - Up to 12 modules for 924 MWe gross output
 - Smaller power plant solutions available for 4-module (308 MWe) and 6-module (462 MWe) VOYGR™ plants

Comparison to a Large Pressurized Water Reactor (PWR)



NuScale Power Modules™ are about the same size as a steam generator in a large PWR

Typical Large PWR

Design Simplification

- **New systems**

- Containment evacuation
- Containment flooding and drain

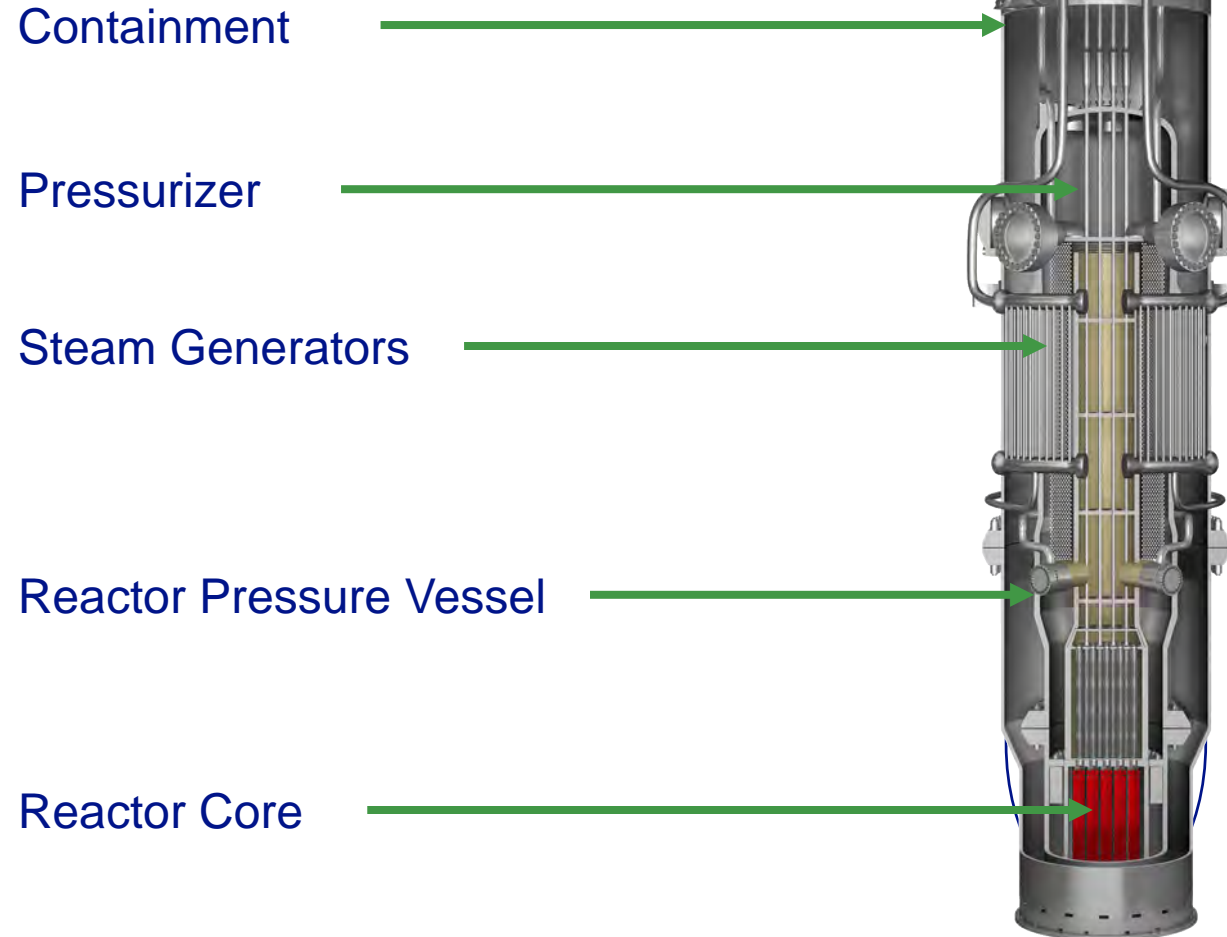
- **Eliminated systems**

- Containment spray
- Auxiliary Feedwater
- ECCS injection and recirculation
- Steam generator blowdown
- Electrical generator hydrogen supply
- Safety-related electrical systems

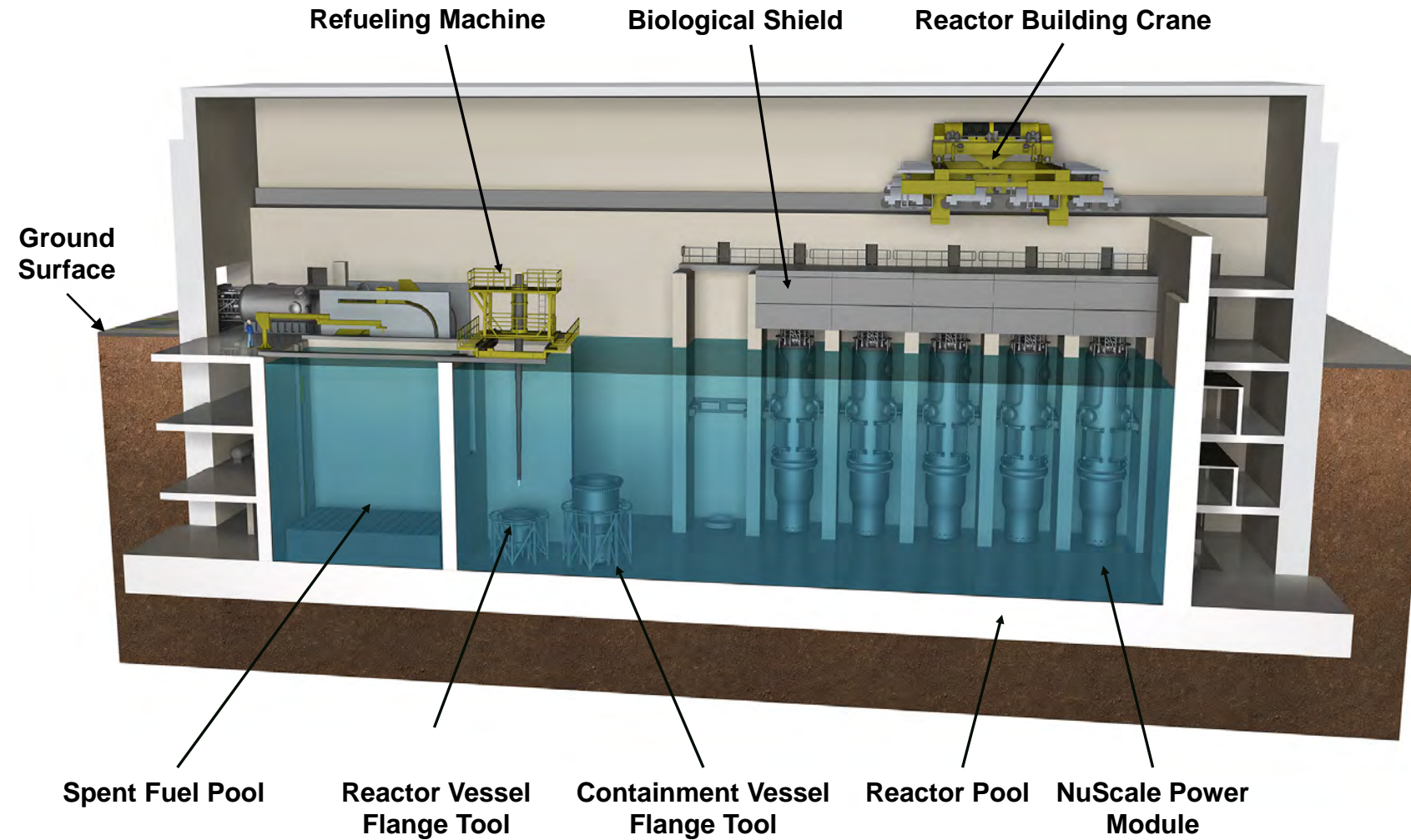
- **Eliminated components**

- Reactor coolant pumps
- ECCS pumps, tanks, and RPV injection lines
- Containment sumps and tanks
- Refueling water storage tank
- Reactor coolant hot leg and cold leg piping
- Pressurizer surge line and relief tank
- Reactor vessel and primary coolant system insulation
- Safety-related emergency diesel generators

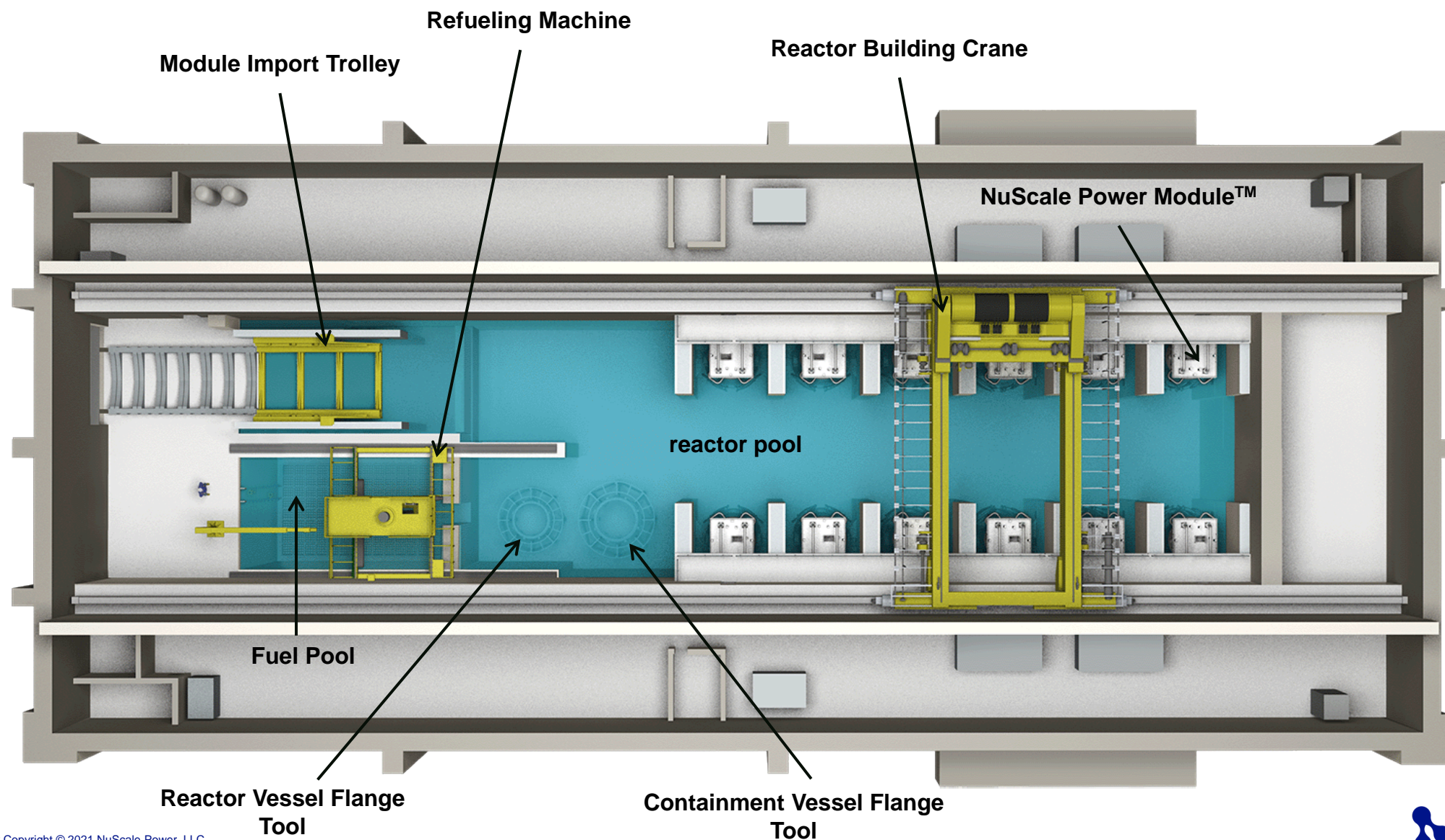
NuScale Power Module™ Components



Reactor Building Houses NuScale Power Modules™, Spent Fuel Pool, and Reactor Pool



Reactor Building Overhead View

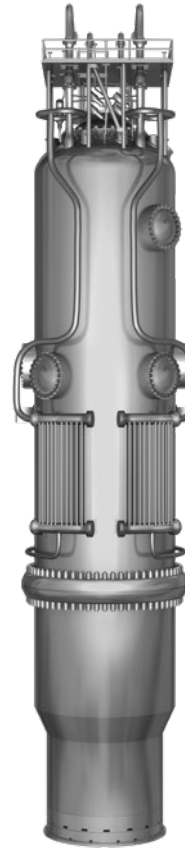


Providing Identical Technology for Every Implementation

6-module VOYGR-6
plant

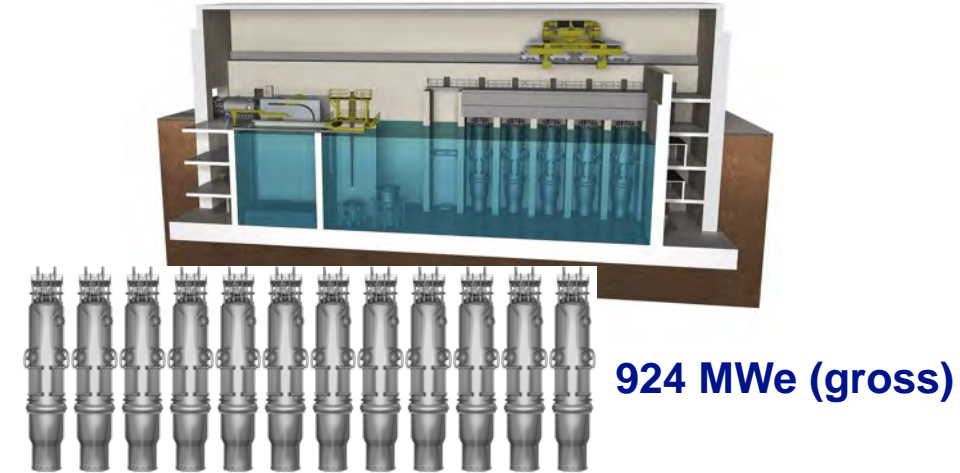


4-module VOYGR-4
plant



NuScale Power Module™
77 MWe (gross)

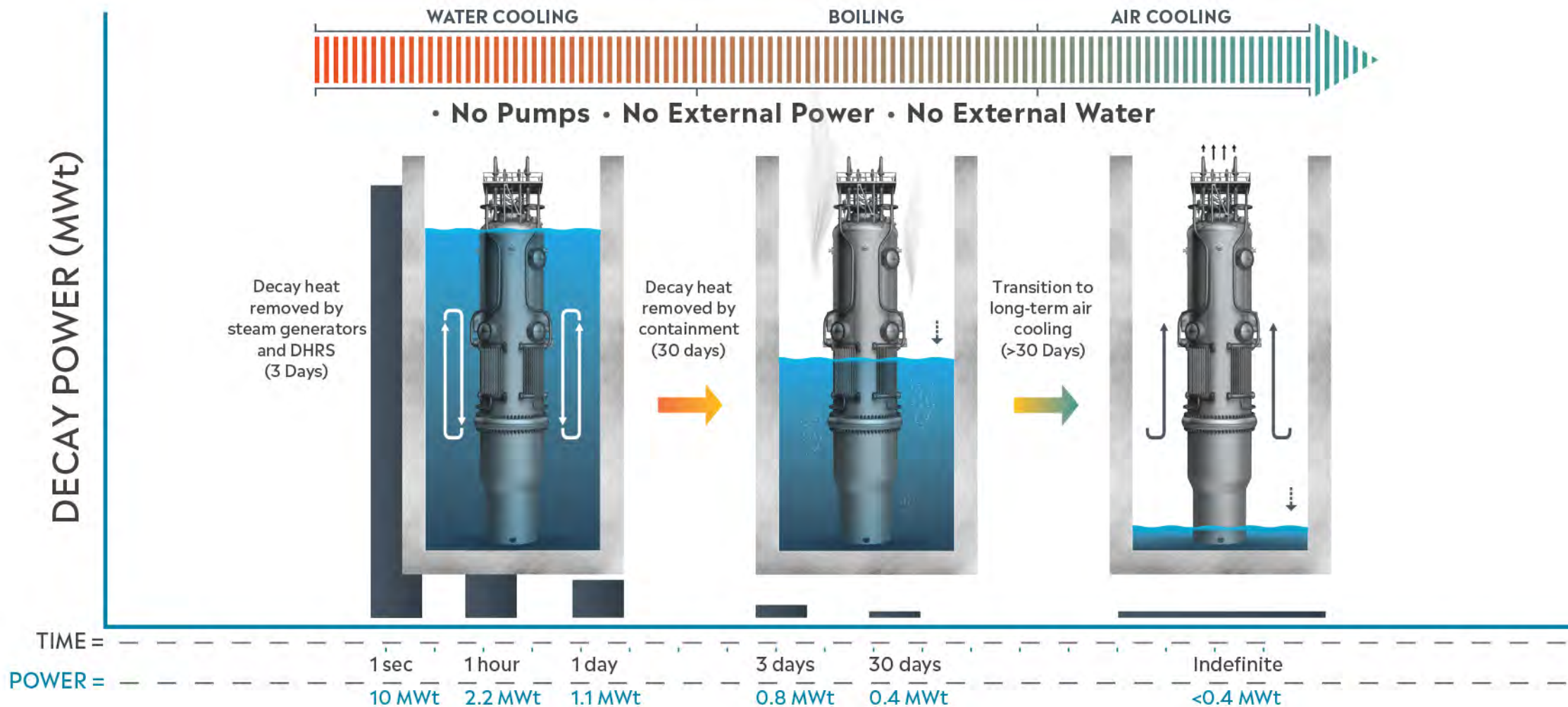
12-module VOYGR-12
plant



- Flexibility in size and cost advantages, with the same operational flexibility and unparalleled safety case.
- Each module feeds one turbine generator train, eliminating single-shaft risk.
- Demonstrated resiliency for every configuration (black-start, island mode, seismically robust, cyber secure, etc.)

Innovative Advancements to Reactor Safety

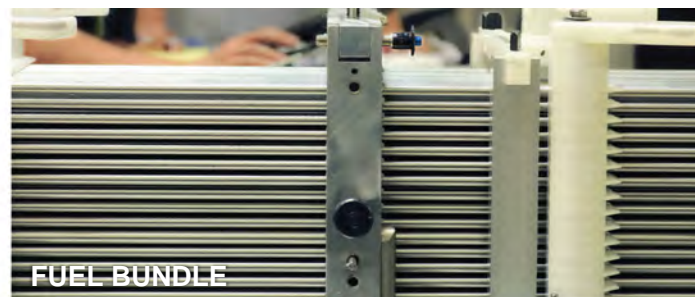
*Nuclear fuel cooled indefinitely without AC or DC power**



*Alternate 1E power system design eliminates the need for 1E qualified batteries to perform ESFAS protective functions – Patent Pending

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Manufacturing and Testing of Real Components





Vessel cladding testing at Doosan



Automated cladding machine at Doosan

Supply Chain Development and Manufacturing of NPM

- Design for Manufacturing
 - Manufacturer feedback to optimize design and lower costs
 - Manufacturing plan development
 - Forging procurement drawings
 - Performed by Doosan and BWXT (performing same scope)
- Manufacturing Trials (Doosan)
 - Cladding distortion (2 sided) of reactor pressure vessel
 - Steam generator tube bending
 - F6NM material (martensitic stainless steel) use for containment vessel



NPM flow sensor testing chamber at Cameron



Crane module lift adapter proof of concept testing

Supply Chain and Manufacturing Development

- Instrumentation & Controls
 - Distributed control system supplier selection in final negotiation phase.
 - Scope includes design, testing and manufacturing.
 - Pressure, level and flow sensor technology development.
 - NPM sensors in harsh environment – high temperature and pressure.
 - Development contracts with Sensia and Ultra.
- Refueling and remote handling
 - Reactor building crane detailed design in progress.
 - PaR Systems
 - 3 of 5 design phases complete.
 - 3 additional design scopes to be awarded in 2021.
- Other manufacturing related activities
 - Equipment Qualification Test Chamber deployment.
 - Manufacturing Readiness Level assessments.
 - Product Lifecycle Management implementation for manufacturing module.

Official Name of NuScale's Small Modular Reactor Power Plants – VOYGR™



- Pronounced *voyager*, VOYGR represents the brand name of our power plant product offerings.
- A new, simplified naming structure across NuScale products as we branched into new size configurations and output (4-, 6-, 12-module plants).
- Aligns with our brand's aspirational “**Power for All Humankind**” positioning and evokes the spirit of innovation that is the hallmark of our company.

12-Module (924 MWe)	6-Module (462 MWe)	4-Module (308 MWe)
VOYGR™-12	VOYGR™-6	VOYGR™-4



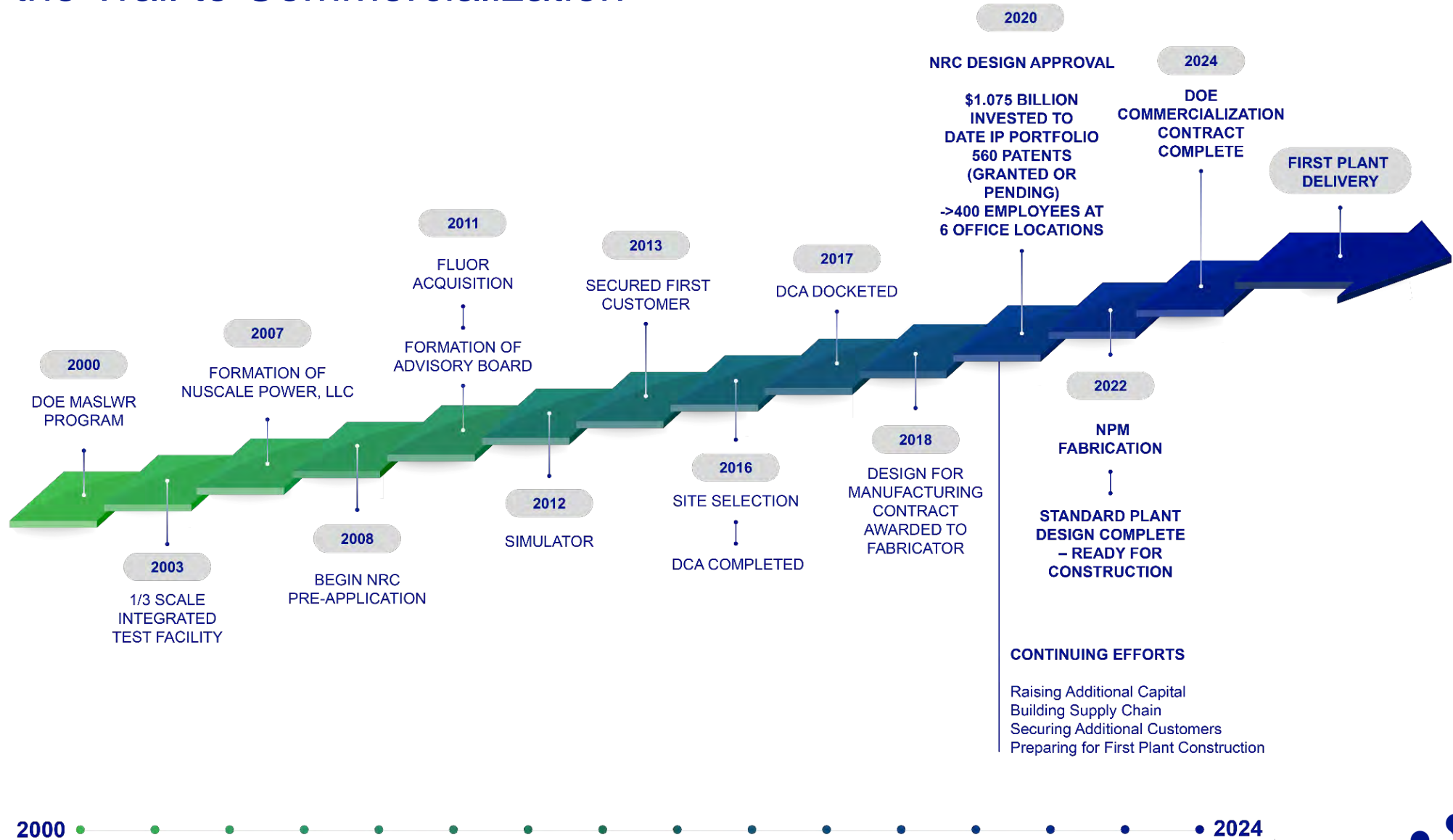
- *Why now?*
 - We are seeing an inflection point in the market where we will be able to benefit from a more unified branding strategy.
 - Disrupt industry generic naming “norms”.
 - Lead the SMR industry across the world on a power plant naming approach.
 - Reinforce the emotional-higher purpose connection of the NuScale brand.
 - Create synergy between the NuScale product (plant size offerings) and the NuScale brand.

Reduced Operator Staffing

- Integrated System Validation (ISV) completed using simulator.
 - Verifies the integrated system that supports safe operation (NUREG-0711).
 - Performance based evaluation of hardware, software, and personnel using three crews of six licensed operators.
 - Operators trained similar to an operating plant license class.
 - 12 full-scope, evaluated scenarios over 11 weeks.
 - NRC approved six licensed operator staff minimum.
 - Topical Report for a three licensed operator minimum staff and elimination of Shift Technical Advisor position approved by the NRC May 2021.



Blazing the Trail to Commercialization





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