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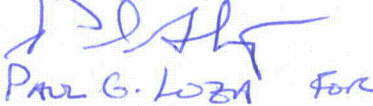
April 10, 2013

Subject: Transmittal of Final Slides for Public Session of the April 11, 2013 meeting with the NRC

Please find attached the slides that will be presented at the April 11, 2013 NRC Public Meeting on the Westinghouse Small Modular Reactor (SMR).

If you have any questions or desire further information, please contact the undersigned.

Very truly yours,

A handwritten signature in blue ink, appearing to read 'Paul G. Loba'.

Robert B. Sisk
Acting Director, Small Modular Reactor

/Enclosure

cc:	Arlon Costa	U.S. NRC
	Anna Bradford	U.S. NRC
	Jill Monahan	Westinghouse
	Cory A. Stansbury	Westinghouse

D104
NRC

ENCLOSURE 1

“Westinghouse Small Modular Reactor Overview”

Nuclear Regulatory Commission Open Forum

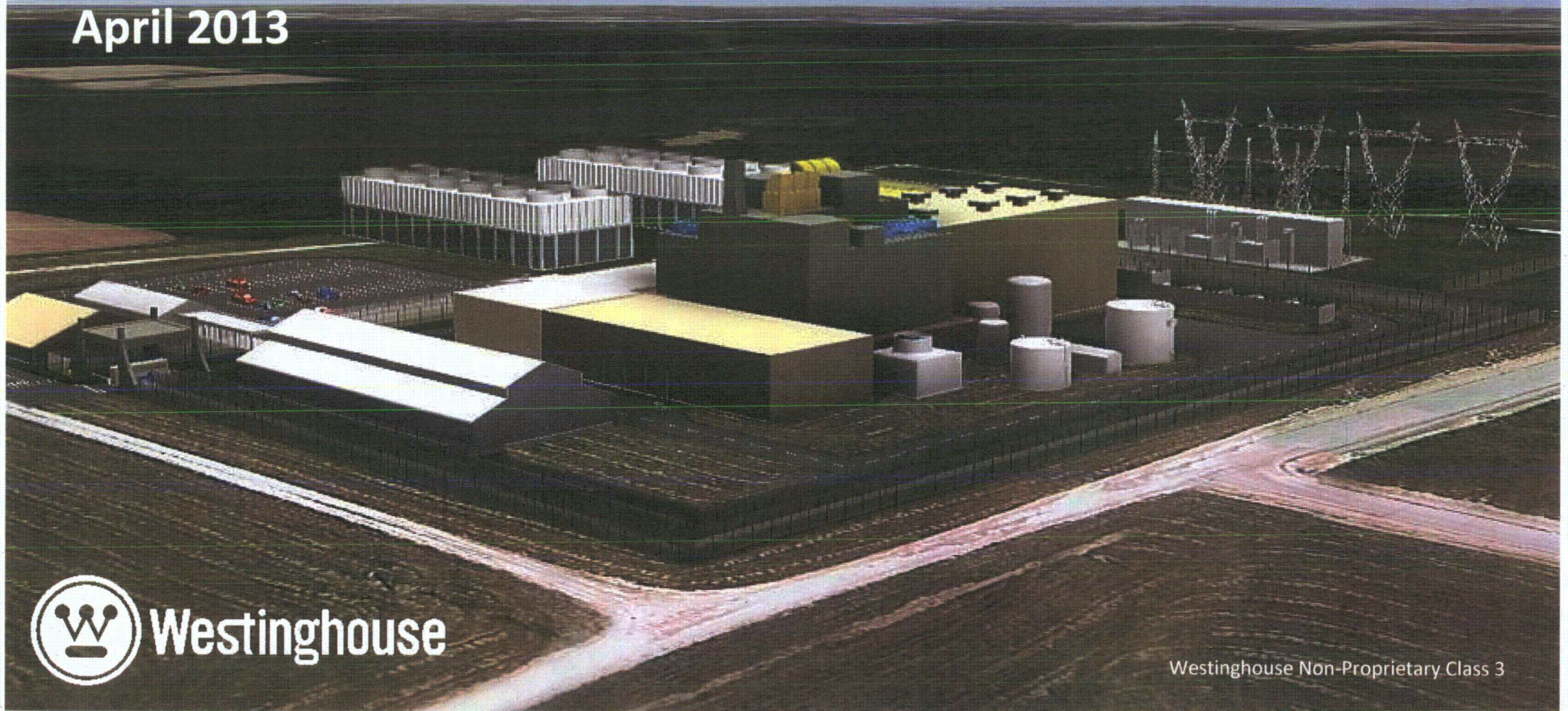
April 2013

Westinghouse Small Modular Reactor Overview

Presented to

Nuclear Regulatory Commission Open Forum

April 2013

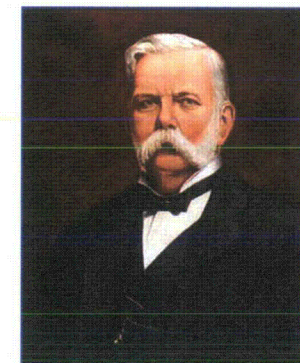
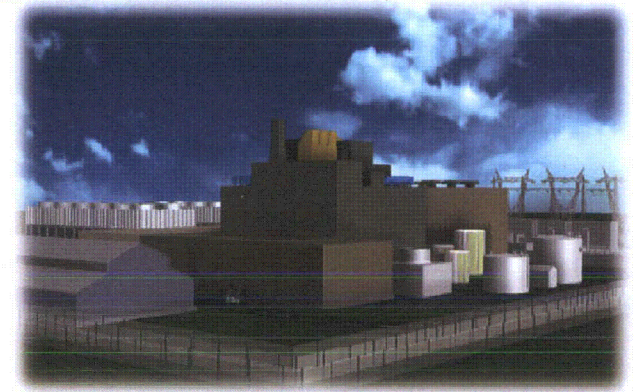


Westinghouse

Westinghouse Non-Proprietary Class 3

Westinghouse Electric Company

- Westinghouse Electric Company provides fuel, services, technology, plant designs and equipment to utility customers in the worldwide commercial nuclear electric power industry
- More than 60 years of nuclear experience
- Nearly 50 percent of the nuclear power plants in operation worldwide, and nearly 60 percent in the United States, are based on Westinghouse technology
- We are only company operating under the name of George Westinghouse's original company



The Global Nuclear Industry in 2013

- **30 countries** worldwide operating **436 nuclear reactors** for electricity generation
- **65 new nuclear plants** under construction in **14 countries**

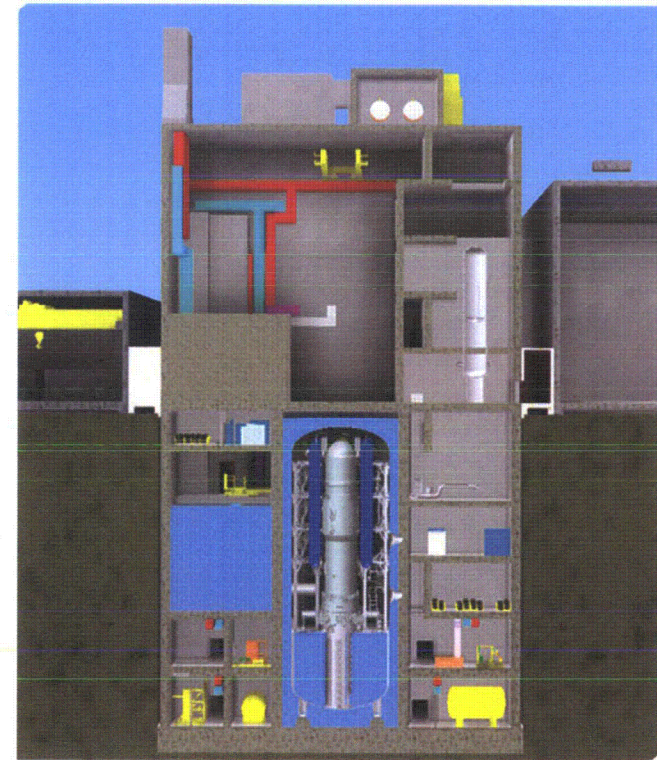


Sanmen AP1000® Nuclear Plant Site, China

The Next Phase of Nuclear Energy...

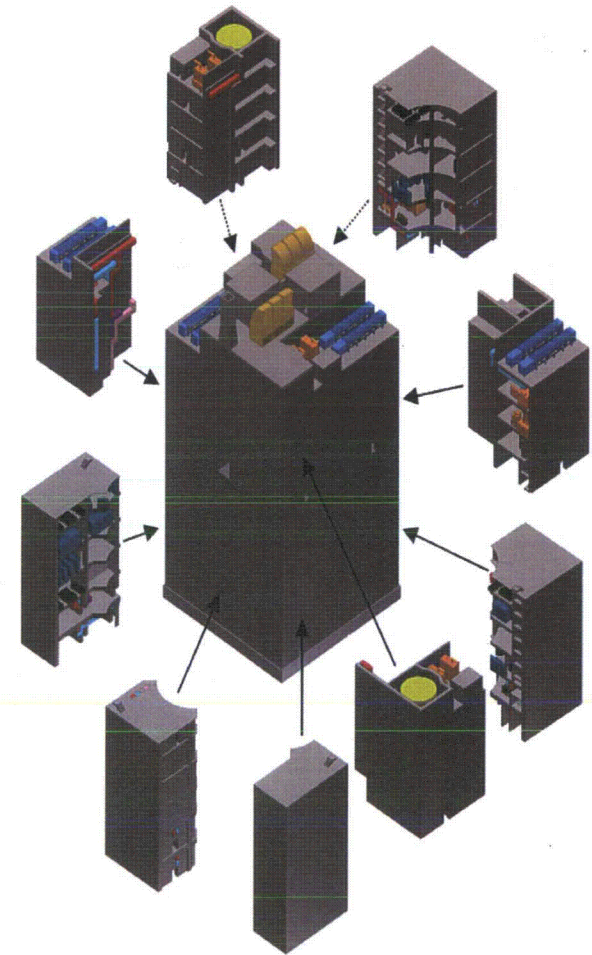
Small Modular Reactors

- Nuclear energy provides nearly 70 percent of the emissions-free generation in the U.S.; SMRs will increase this percentage
- The Westinghouse SMR is sized for increments that match the market demand, extending the benefits of nuclear to more customers
- Standardization and modularization are the key to new economics
- SMRs represent a ***new*** U.S. industry



Competitive Advantages of the Westinghouse SMR Design Philosophy

- **Enhanced safety and security**
 - Tested licensed Passive Safety Systems
 - Reactor & safety systems below ground
- **Best opportunity for cost competitiveness**
 - Most power with the least amount of material
 - Entirely modular design
 - Rail, truck and barge transportable
- **Speed to market**
 - Proven ability to design, license and deploy reactors
 - Existing technical skills, licensed technologies and fuel supply
 - Designing to eliminate supply chain bottlenecks



Westinghouse SMR Value Proposition

- **Regulatory competency and experience** from mature staff and deep bench
- **Recent nuclear plant licensing experience** and insight to safety factors with company commitment
- Westinghouse business plan for **U.S. job-creation**
- **U.S.-made** parts, components, modules
- **Strength and reach** in the global marketplace
- **Fuel developed** and set for licensing
- Complete **fuel manufacturing capabilities**
- **Highly developed** U.S. and Global supply chain

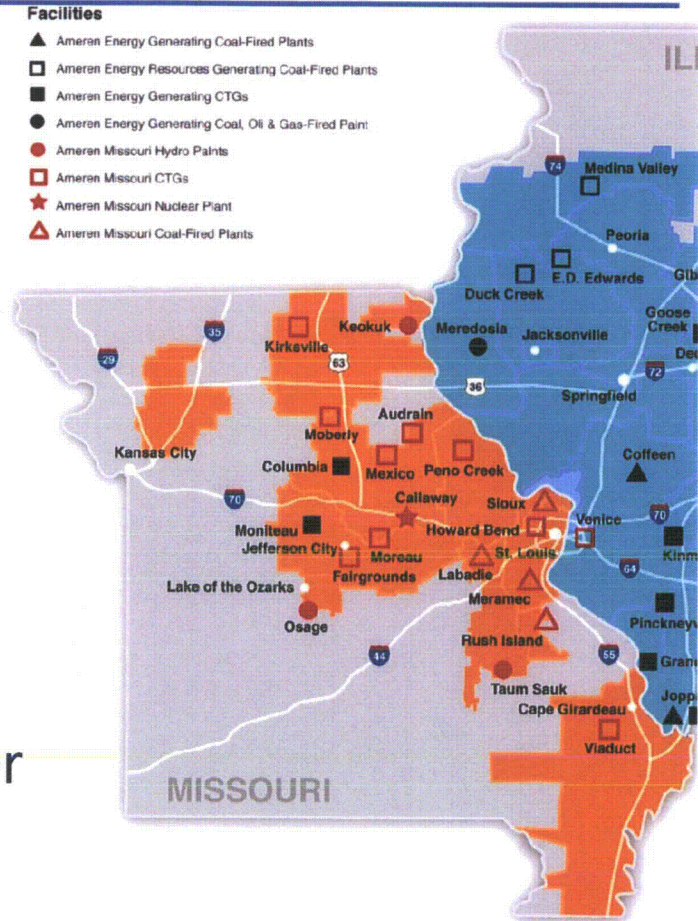
Ameren Missouri Commitment



The Ameren Missouri and Westinghouse Partnership

Objectives

- Submit a COLA for deploying the Westinghouse SMR at the Callaway Energy Center
- Design, license and deploy the first to market Westinghouse SMR
- Create American jobs for American workers
- Locate the hub of a global export cluster in Missouri



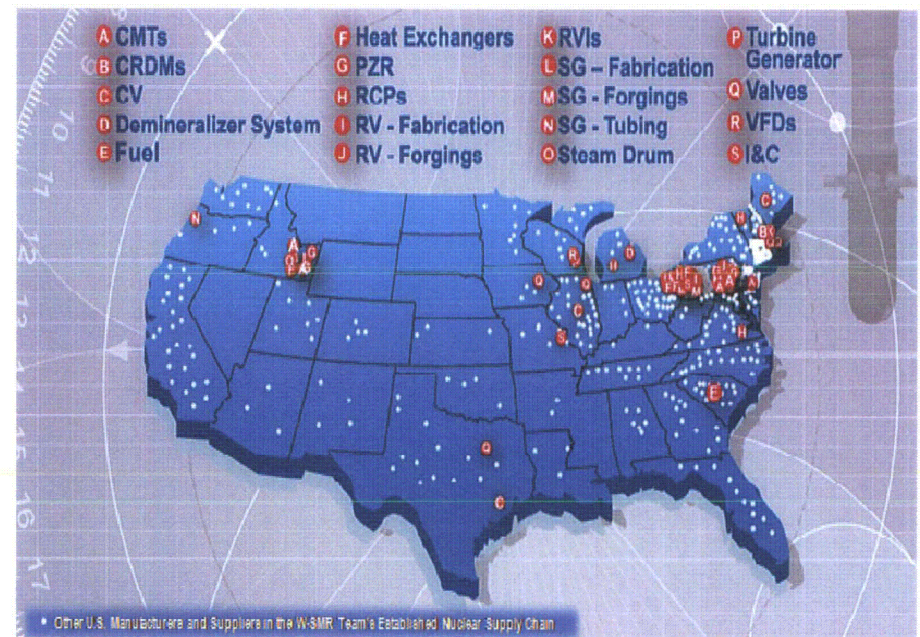
Ameren Missouri (orange)

1.2 million Electric customers
 126,000 Natural Gas customers
 500 communities served
 24,000 square mile territory
 4,000 Employees



Economic Development Created by New SMR Industry

- Estimated economic impact of nearly \$3 billion in greater than 15 states*
- Alignment with University of Missouri Research and Workforce Development
- Sustain greater than 9000 indirect U.S. Jobs*
- Stimulate greater than 9500 direct U.S. Jobs*
- Employs 250-300 permanent jobs at the plant site
- Supply chain opportunities for Missouri manufacturers
- Building the SMR Industry Cluster



*Based on independent economic impact analysis on U.S. economy for single SMR unit

-- Development Strategies, May 2012

Missouri's Callaway Energy Center

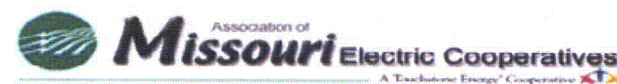
- Operating safely and reliably since December 1984
- 4th highest lifetime generation among the 104 U.S. nuclear power plants
- Key Site Factors:
 - Well-suited for construction of additional nuclear units
 - Central location in state
 - Access to multiple off-site water and power sources
 - Stable geology over 250 ft above flood plain



Strong Industry Team



Westinghouse Electric Company LLC



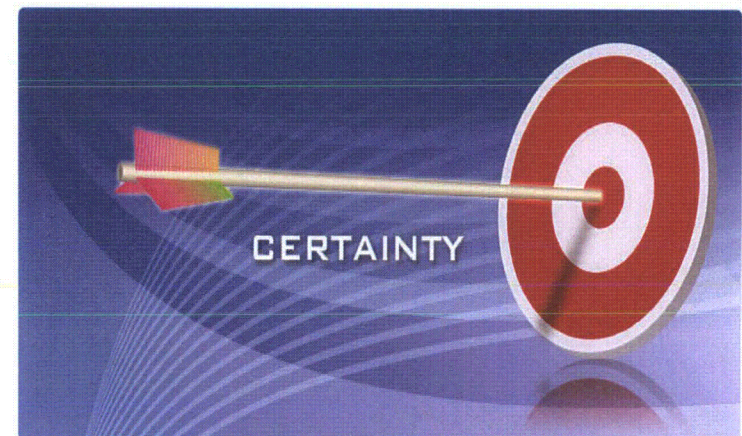
Customer Benefits of SMRs

- **Affordability**

- SMRs are more compatible with the needs and financial capabilities of mid-sized utilities like Ameren
- Incremental increase in system capacity as demand grows
- Most power with least amount of material and equipment

- **Project Certainty**

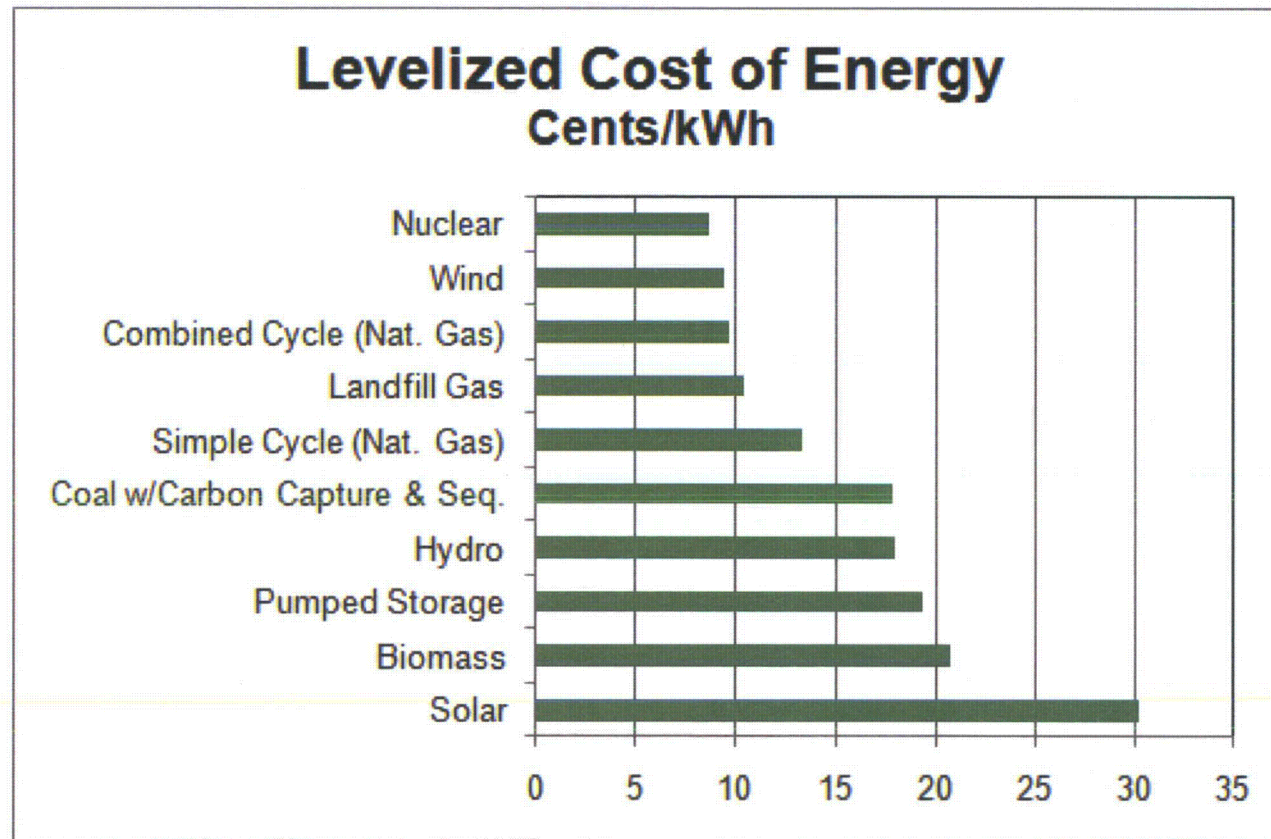
- Only SMR designer with approved fuel design
- Proven ability to design, license & deploy reactors
- Leveraging **AP1000®** plant design experience and lessons learned
- Multitude of licensed topical reports significantly reduces schedule risk



Customer Benefits of SMRs

- **Westinghouse SMR Design**
 - Passive safety systems are conceptually similar to **AP1000®** plant design (proven design)
 - Digital I&C systems based on **AP1000®** plant design (proven design)
 - One reactor with no shared systems (less operating risk)
 - Pump-Driven RCS flow at power
 - Large, predictable thermal margin of safety
- **Licensing**
 - Only SMR vendor to design, certify and license an ALWR
 - Regulatory requirements understood
 - Long, established relationships with the U.S. NRC

Nuclear—The Most Cost-Effective Source of Energy for the Future



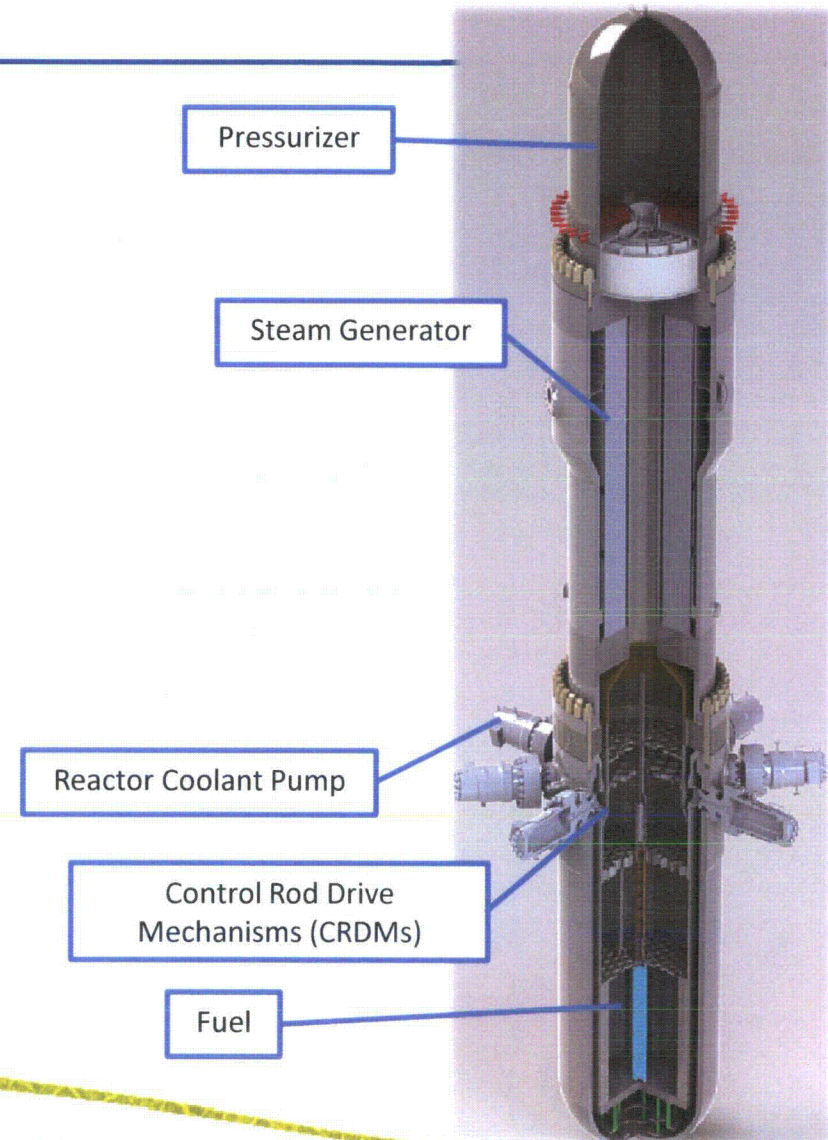
Source: Ameren Missouri Integrated Resource Plan 2012

Westinghouse SMR Technology Overview

What is the Westinghouse SMR?

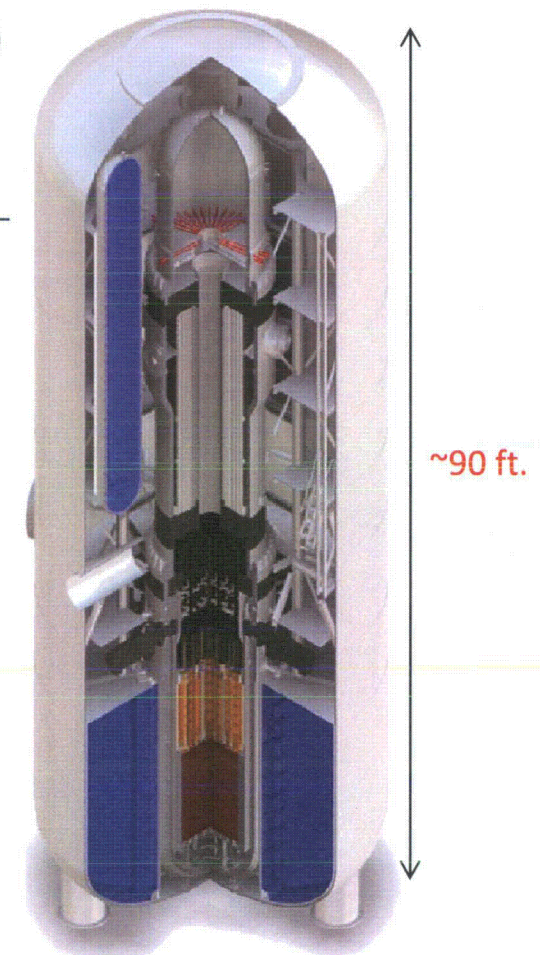
- An integral pressurized water reactor—single >225 MWe reactor
- Innovative packaging of proven components
- The highest levels of safety with fewer accident scenarios
- Industry-proven system designs
- Compact reactor coolant system and containment
- An engineered solution for today's clean energy challenges

The most power, with the least amount of material

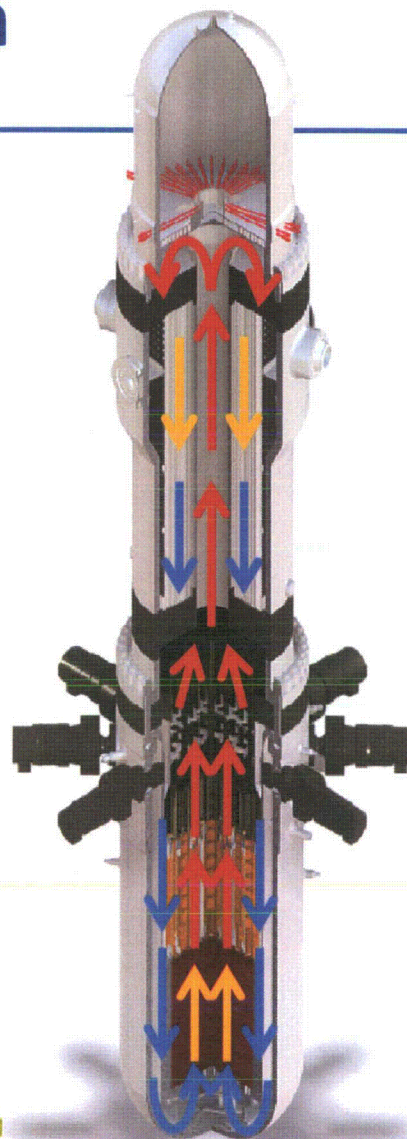


Westinghouse Plant Design

- Single reactor site (standalone)
- Fuel – Modification of standard Westinghouse product (17x17 RFA)
- Forced flow with 8 reactor coolant pumps
- Internal control rod drive mechanisms
- Compact/high pressure containment vessel below grade
- Recirculating straight tube steam generator with steam drum location outside containment vessel
- Nuclear Island is 110'x110'
- Embedment is 110' deep
- 24-month cycle length
- Load follow capability
- Total site area: ~15 acres
- Instrumentation and Control:
Ovation®-based Digital Control System

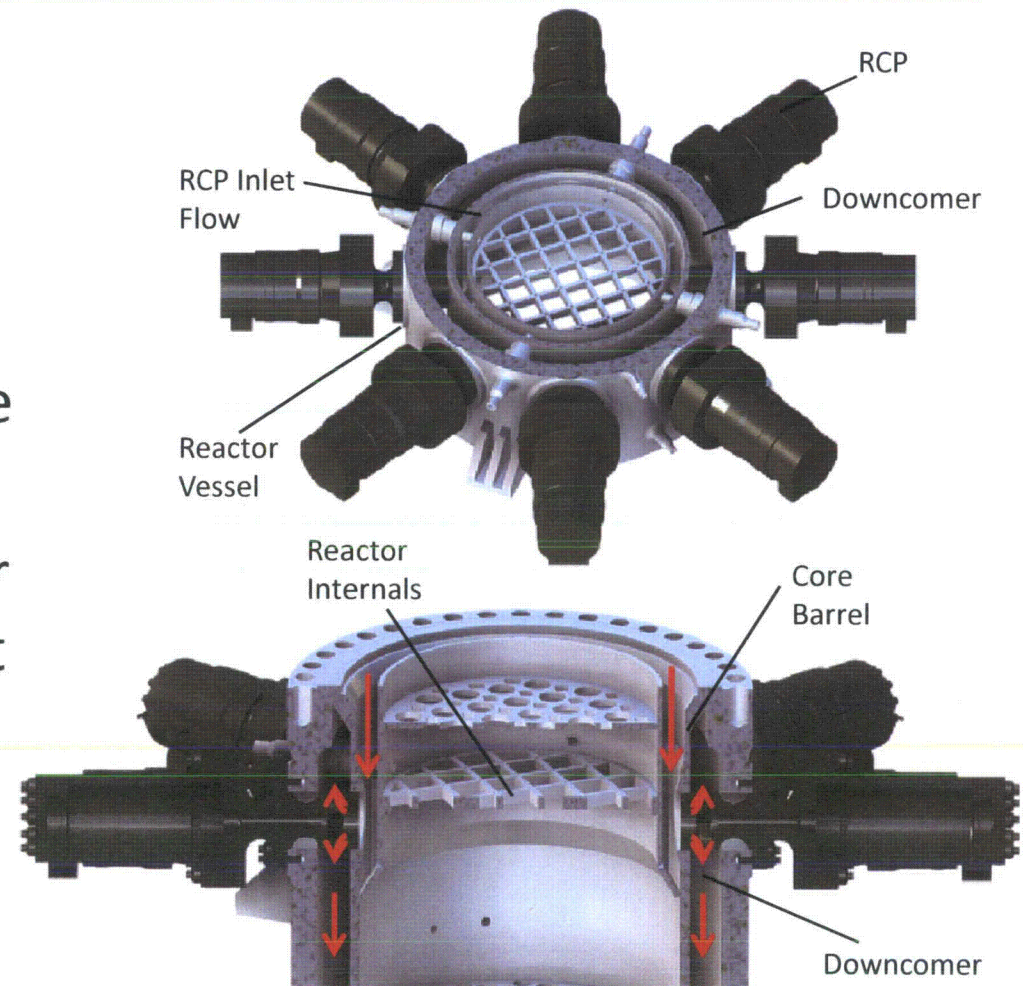


Coolant Flow Path



Reactor Coolant Pumps Overview

- Seal-less pump design
- Driven with variable frequency drives (VFD)
- Mounted horizontally to reactor vessel below closure flange
- Internally circulating reactor coolant removes pump heat via heat exchanger to plant component cooling water system

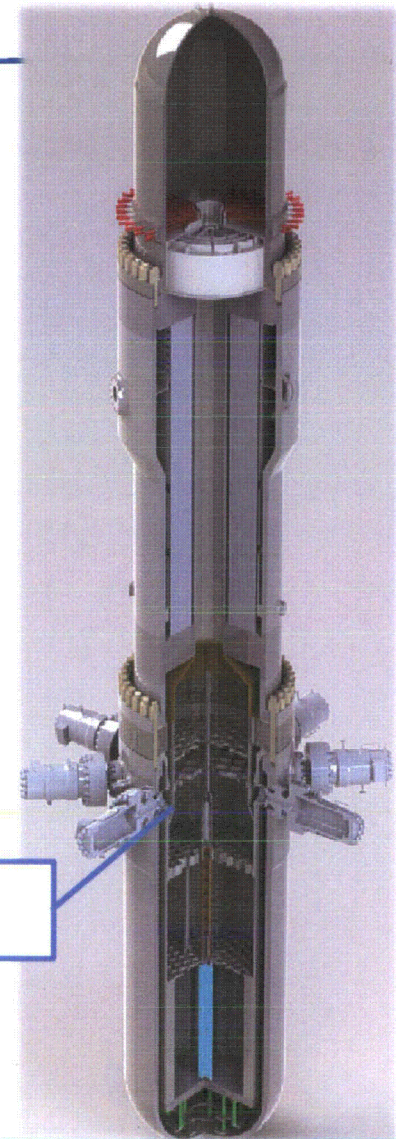


Internal Control Rod Drive Mechanism (CRDM) Design

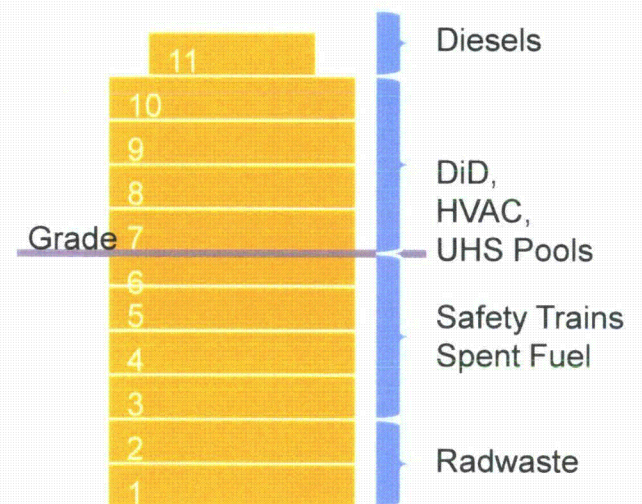
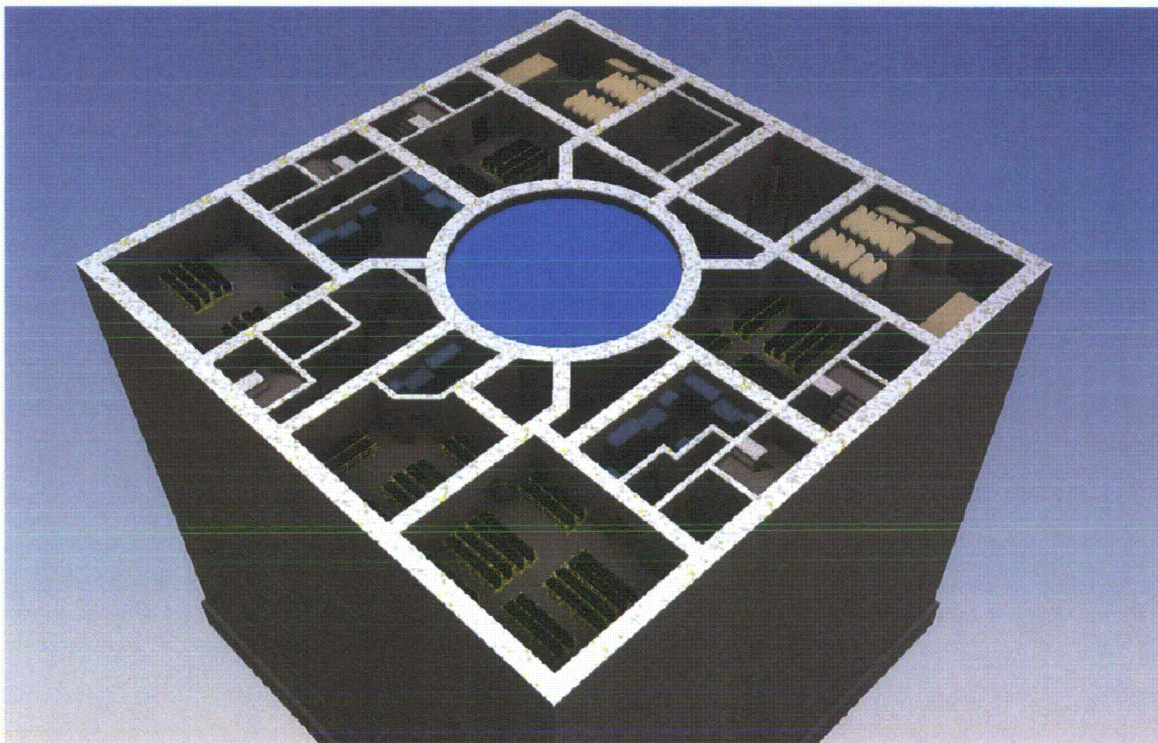
- Current PWR loop designs have external CRDMs
- The internal CRDMs eliminate an accident scenario
- Three-coil, magnetic jack based on **AP1000®** plant design with modifications:
 - *High-temperature* coil winding design
 - Sealed, stainless steel coil stack housing
 - Sealed power conduit with leak detection
- Testing program under way



Control Rod Drive Mechanisms (CRDMs)



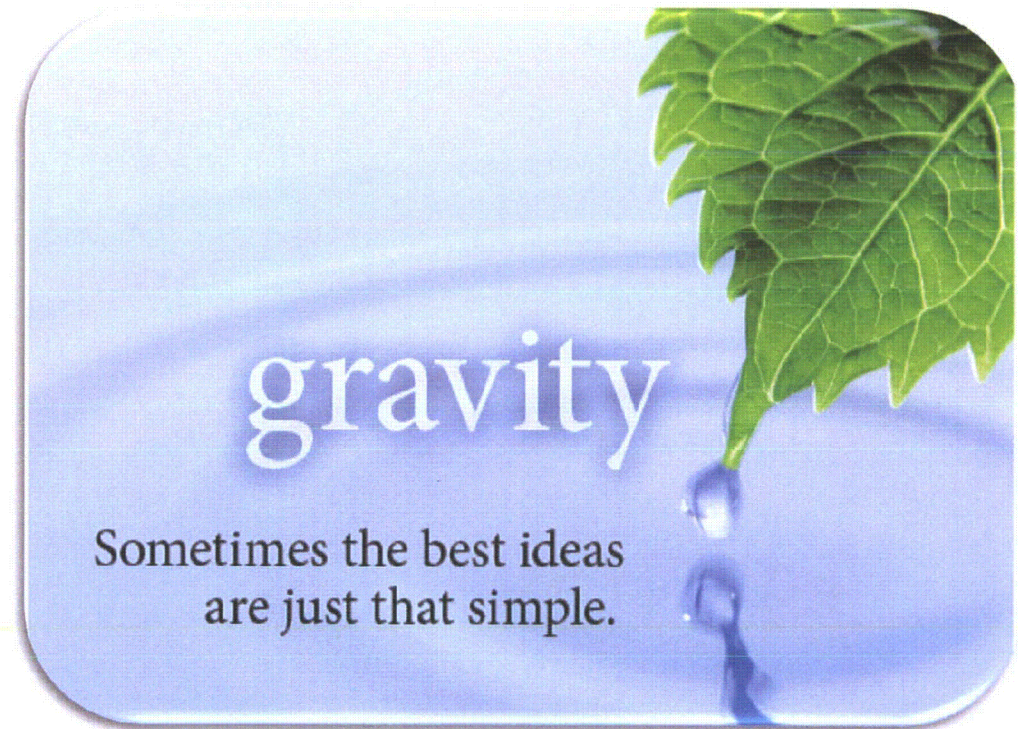
Nuclear Island Layout



**Compartments isolate safety system components
for enhanced safety and security**

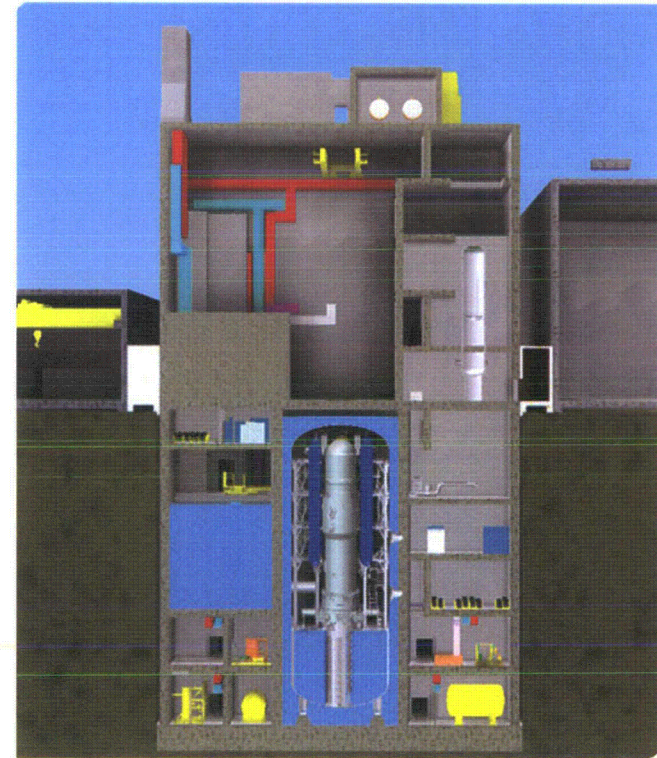
SMR Safety

- **7 Days of Passive Heat Removal in Ultimate Heat Sink (UHS)**
 - Capability to add additional inventory to UHS tanks for indefinite cooling
- **100% reliance on natural forces**
 - Evaporation, condensation, gravity
- **No AC Electric Power Required for Plant Safety for 7 Days**



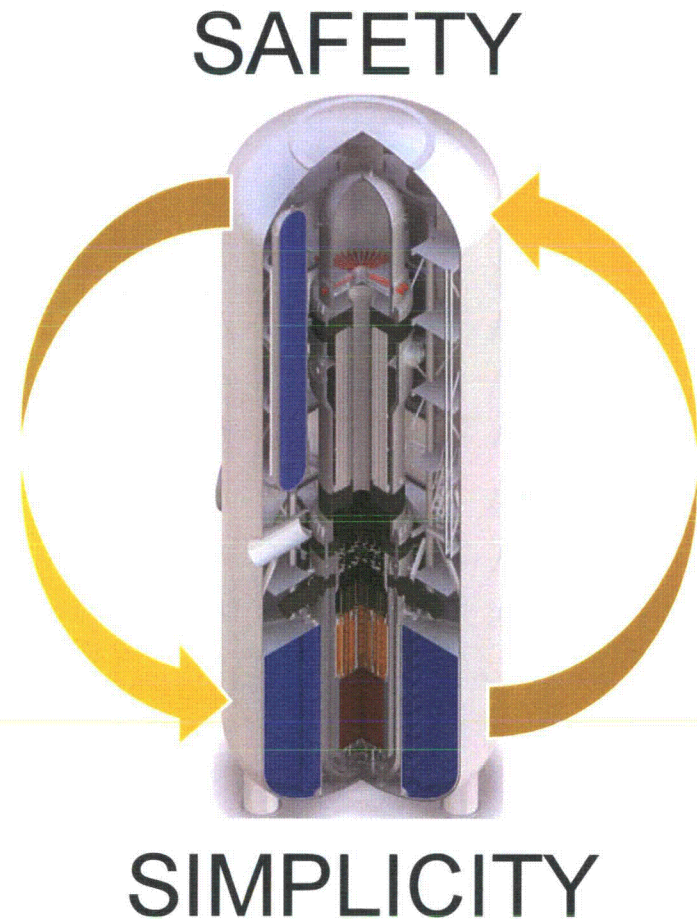
Safety System

- **Reactor shutdown**
 - Control rods
 - Boric acid injection from Core Makeup Tanks (CMTs)
- **Reactor decay heat removal**
 - Steam Generator with gravity feed from steam drum
 - Core Makeup Tank closed circuit cooling to UHS tank
 - Reactor Coolant System (RCS) feed and bleed



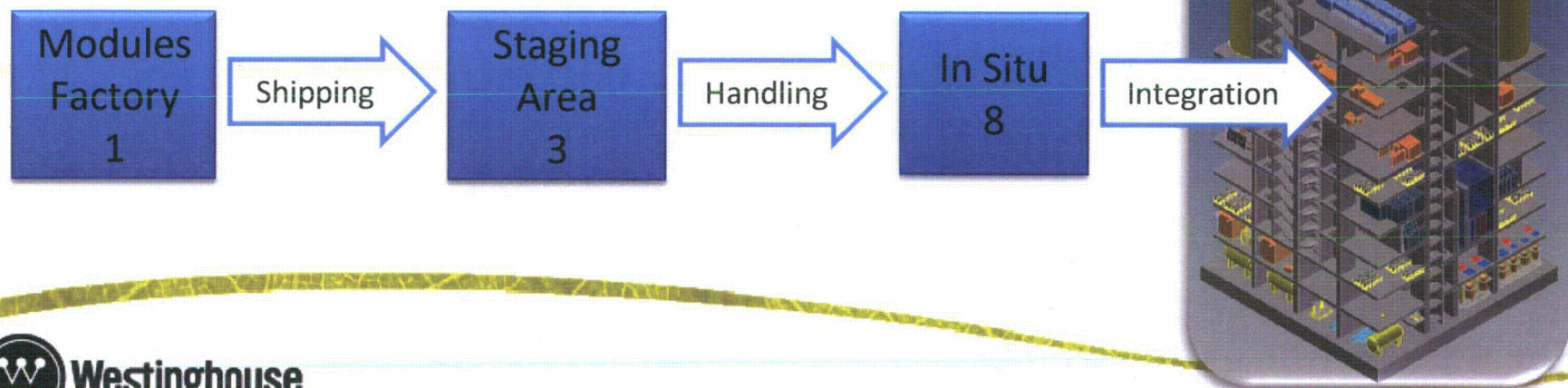
Safety System

- **Reactor inventory addition**
 - Core Makeup Tank injection
 - In-Containment Pool (ICP) injection
 - Long-term recirculation
- **Containment heat removal**
 - Convection and condensation of steam inside containment
 - Heat transfer through Containment wall to an external pool
 - External pool automatically refilled by UHS tanks



Modular Construction

- Traditional large scale reactor economies of scale can be countered through application of modular construction techniques
- SMR maximizes modular design in all aspects of plant
- Modular design drives work normally completed at the construction site to the factory where quality is better controlled, overall cost are reduced and schedule certainty increased
- Modules are designed for road and rail transport to site and scalable to other forms of transport



Conclusion

- The Westinghouse SMR provides a clean energy solution with enhanced safety, security and affordability
- Westinghouse and our utility partner Ameren Missouri will be the first to license and deploy an SMR at a U.S. site
- The new SMR industry will provide manufacturing opportunities and jobs across the U.S. and help to maintain U.S. technology leadership

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