Meeting with Dukovany Region Mayors, ČEZ and Nuclear Project Stakeholders

Westinghouse, Cranberry Woods Headquarters May 4, 2017



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Welcome and Safety Brief



Building Layout



<u>Global</u> NSC Trait for May 2017: Continuous Learning

ATTRIBUTES:

- CL.1 Operating Experience
- CL.2 Self-Assessment
- CL.3 Benchmarking
- CL.4 Training

Opportunities to learn about ways to ensure safety are sought out and implemented. Operating experience is highly valued, and the capacity to learn from experience is well developed. Training, self-assessments, and benchmarking are used to stimulate learning and improve performance. Nuclear safety is kept under constant scrutiny through a variety of monitoring techniques, some of which provide an independent "fresh look."

Human Performance Tool

Post-Job Review

Westinghouse

Use PowerUP to Recognize and Reward Nuclear Safety Culture Excellence



Nuclear Safety Culture Recognition

Everyone is personally responsible for nuclear safety. Recognize your colleagues for exemplifying the traits of a healthy Nuclear Safety Culture at Westinghouse.

Itinerary

Approximate Time	Description						
8:00 – 9:00 AM	Leave Hotel, Travel to Westinghouse Headquarters and Clear Security						
9:00 – 9:15 AM	Safety Brief and Introductions, Review Itinerary						
9:15 – 10:00 AM	Executive Introduction to Westinghouse, Global Projects Update Summary, Delivery Model						
15 minute coffee break							
10:15 – 10:45	Czech Presentation of Nuclear Expansion Plan, Key Project Requirements and Meeting Objectives						
10:45 – 11:15 AM	Introduction to AP1000 [®] Plant						
11:15 – 11:45 AM	Supply Chain Opportunities						
	Tour Party 1	Tour Party 2					
11:45 – 12:30 PM	Lunch in Westinghouse cafeteria	Visit to AP1000 Project Command Center and AP1000 Control Room Simulator					
12:30 – 1:15 PM	Visit to AP1000 Project Command Center and AP1000 Control Room Simulator	Lunch in Westinghouse cafeteria					
1:15 – 2:00 PM	Recap, Questions, Closing Remarks						
2:00 – 2:30 PM	Travel to Building 5 and check in through security						
2:30 – 4:00 PM	Tour of Building 5 Nuclear Automation Assembly and Test Facility						
4:00 – 5:00 PM	Depart Westinghouse and Return to Hotel						



Westinghouse Team

- **Rick Easterling**
- Mike Waite •
- Mike Corletti
- Chris Srock Director, I&C Production
- Carl Schwarz
- Matt Engle
- Randy Miller
- Cestmir Houska
- Mike Sutton estinghouse

- Vice President, Technical Services and Licensing
- Director, New Plant Market Development
- **Director, Technical Integration & Licensing**

- Program Manager, Global Supply Chain
- PCC Operations Manager
 - Program Manager, PWR&BWR Simulators
 - AP1000 I&C Product Manager
 - AP1000 Program Manager

Westinghouse Overview and **AP1000[®]** Plant Projects Update



Westinghouse Electric Company

- Founded in 1886 in Pittsburgh, Pennsylvania, by George Westinghouse
- Responsible for some of the world's most important achievements:
 - Alternating current technology
 - First commercial radio broadcast (KDKA-1920)
 - USS Nautilus nuclear submarine
 - First camera on the moon
 - Commercial nuclear power











Westinghouse Vision

Our vision is to be the *first to innovate the next* technology, practice or solution that helps us help **customers** generate safer, cleaner, more reliable energy for more people and a better planet.



AP1000 Plant Value Proposition

Proven Technology and Innovative Passive Safety Systems

Passive safety replaces mechanical and electrical systems – harnesses natural forces like gravity, convection and condensation to achieve safe shutdown

AP1000

Delivery Certainty

Standard design, experience from current projects and modular construction enable "Nth of a Kind" delivery performance



Regulatory Certainty

Reviewed by multiple countries; first Generation III+ reactor to receive design certification from the U.S. NRC Westinghouse Proprietary Class 3

AP1000 Plant Experience Is Driving Global Delivery Certainty

- Eight AP1000 units under construction
 - Four units in China (Sanmen and Haiyang)
 - Four units in the United States (Vogtle and V.C. Summer)
- First-of-a-kind (FOAK) challenges resolved
 - Future AP1000 plant builds benefiting from experience from first plants



Establishing an efficient and standard delivery platform from eight units' worth of experience



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Continuous Improvement

AP1000 Plant Optimization Continuum



China AP1000 Plant Projects



Sanmen Site Progress: Time Lapse View 2009 to 2016





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China AP1000 Plant Progress







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The Path to Completion for Sanmen 1 and Haiyang 1





U.S. AP1000 Plant Projects



U.S. AP1000 Plant Progress: Vogtle

Recent achievements:

- Unit 3 second containment vessel ring set in December
- Unit 3 reactor vessel set in November
- Unit 4 CA01 module set in November
- Unit 4 CA20 module set in August
- Unit 4 CA05 module set in June









U.S. AP1000 Plant Progress: V.C. Summer

Recent achievements:

- Unit 2 second containment vessel ring set in February
- Unit 2 steam generator set in January
- Unit 3 CA01 module set in December
- Unit 2 reactor vessel set in August
- Unit 3 CA20 module set in August
- Unit 2 CA02 module set in August



Unit 2 Steam Generator Placement – January 2017





Business Development – Growing the AP1000 Plant Fleet

Moorside – United Kingdom

- U.K. regulators completed Generic Design Assessment review of AP1000 plant design in March
- Major milestone in development of three-unit Moorside Project
- Toshiba seeking new equity shareholder for NuGen Kovvada – India
- Offer prepared for Government of India
- Financing and technical assessments continue





Proposed three-unit Moorside Project in West Cumbria



Pictured, from left: Stephen Hardy, Nuclear Regulation Group Manager at the Environment Agency; Richard Savage, Chief Nuclear Inspector at the Office for Nuclear Regulation; and Ash Townes, Moorside Project Director at Westinghouse

Delivery Models



Westinghouse Proprietary Class 3

Delivery Models – Engineering and Procurement for Whole Plant plus Construction by Others - Preferred



Advantages of EP +C Model

- Nth of a kind delivery certainty and efficiency
- Benefits from completed detail design of whole plant
- Proven equipment and system interfaces
- Defined vendor project risk firm price acceptable
- High customer control over plant constructor(s)



Best value for experienced nuclear customer

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Westinghouse **AP1000[®]** Nuclear Power Plant



Generations of Nuclear Power



AP1000 Plant Technology



- 2-loops, 2 steam generators reactor coolant system
- Familiar but improved reactor coolant system
 - Larger pressurizer to eliminate the power operated relief valves
 - Seal-less reactor coolant pumps
 - Simplified reactor coolant loops
- Compact 3415 MWt / 1117 MWe Plant
- Passive safety systems supplemented with simple, active defense-in-depth systems and equipment to provide multiple lines of defense

Safe, simple and standard



Passive Safety Through Proven Technology

Passive Safety-Related Systems

- Use "passive" processes only, no active pumps, diesels,
 No Reliance on AC Power
- Designed to meet Station Blackout
- Meets Post-Fukushima requirements
- Reduced reliance on operators no operator actions required to assure plant safety for 72 hours
- No support systems required after actuation

Active Defense in Depth-Related Systems

- Reliably support normal operation
- Redundant equipment powered by onsite diesels
- Minimize challenges to passive safety systems
- Not necessary to mitigate design basis accidents

Severe accident scenario effects are mitigated by in-vessel retention of the melted fuel



The **AP1000** plant is designed to reduce or eliminate the chances of a core meltdown and explosion in situations where the plant experiences a total loss of power, similar to the accident at Fukushima.



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Passive Safety Systems Passive Core Cooling System at Work





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Example of Passive Safety System and Affect on Simplification



- Eliminates components and reduces construction times and costs
- Reduces maintenance costs and downtime
- Reduces decommissioning costs



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The AP1000 PWR: A Case Study Modules Designed into the AP1000 Plant From the Beginning



<u>Module Type</u>	<u>Number</u>		
Structural	122		
Piping	154		
Mechanical Equipment	55		
Electrical Equipment	11		
TOTAL	342		

Raceway Module

Structural Module

Depressurization Module



AP1000 Plant Modular Construction An Innovative Approach Unique in our Industry



Improved Quality Control and Efficiency Reduced Construction Schedule and Optimized Costs

Localization



Typical AP1000 Standard Plant Total Cost Breakdown

Standard Plant (60% - 70%)



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Site Specific (15% - 35%)

- Site specific design
- Site development
- Temporary construction facilities
- Cooling water system
- Cyber security (vendor portion)
- Simulator

Owner (10% - 30%)

- Switchyard
- Infrastructure upgrades
- Project insurances
- Admin, training and other Owner provided facilities
- Licensing and environmental impact
 assessment
- Cyber security (owner portion)
- O&M procedures, Eng./Ops Programs
- Land
- Financing
- Fuel Supply
- Licensed operator training

Localization Potential

- Approximately 60% of the total AP1000 Project cost (Standard Plant + Site Specific+ Owner) supports the site activities. This includes:
 - Security personnel
 - Craft labor, supervision, and project management
 - Construction materials (civil, structural, piping, mechanical, electrical, etc.)
 - Mobile/construction equipment
 - Site Quality and Engineering
 - Equipment Warehousing
- Approximately 30% of the total AP1000 Project cost (Standard Plant + Site Specific+ Owner) is made up of manufactured equipment needed for the operation of the plant.
- The remainder is financing, insurance, training, etc.



The largest localization opportunities come activities that support site construction

Lessons Learned

Utilize previous experience and lessons learned through existing AP1000 plants to guide sourcing decisions which ensure equipment quality, reduce project cost, maintain budgets and reduce risk while increasing schedule certainty. Westinghouse has created the risk informed sourcing model to apply analytical tools to these decisions.

Risk Informed Labor Model

- High-risk project labor
- Medium-risk project labor
- Low-risk project labor

Risk Informed Commodities Model

- High-risk commodities
- Medium-risk commodities
- Low-risk commodities

Local Czech suppliers, supplemented by suitable training and investment, could provide some of the Low and Medium Risk items



Westinghouse Proprietary Class 3

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Risk Informed Sourcing Model Charts – Commodities and Labor

		Total Project Manhours	Labor Codes			Commodity Codes
	HGH	~11%	 Design & Site Engineering Logistics & Supply Chain Training Construction Engineering Support Licensing 		GH	~20%
	E D		 Site Engineering Construction Engineering Support Licensing Quality Assurance 	ode Level	Ī	20 //
MEDI	~23%	 Plant Start Up Project Management Construction Management & Supervision Construction Labor 	ed Commodity C	MEDIUM	~13%	
	LOW	~66%	 Project Management Construction Supervision Construction Labor 	Risk Informe	ROW	~67%

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Westinghouse Internal Manufacturing

Newington:

- Control Rod Drive Mechanism ASME Section III
- Reactor Internals
- Squib Valves
- Spargers Rx Coolant Depressurization
- VES Air Tank Packages
- Fuel Transfer Tubes

Mangiarotti:

- PXS Passive RHR Heat Exchanger
- PXS Core Makeup Tanks
- PXS Accumulator Tanks
- Pressurizer
- Pipe Anchors







Westinghouse Internal Manufacturing

FHE&CM (PaR Nuclear):

- Refueling Equipment: Refueling Machine, Fuel Handling Machine, New Fuel Elevator & Hoist, Fuel Transfer Conveyor
- Nuclear Island:

Containment Polar Crane, Cask Handling Crane, Equipment/Hatch Hoists, SG Jib Cranes



• Bridge Cranes:

Rail Car Bay Crane, Hot Machine Shop Crane, Annex Building Staging Area Crane, Turbine Main/Secondary Cranes, Mobile Systems Facility Crane



Westinghouse I&C Systems

Engineering, production and delivery

- Control rooms (MCR, RSR)
- Safety systems (PMS Common Q)
- Non-safety systems (DAS – ALS; DDS,PLS, TCPS - Ovation)
- Special systems (SMS, NIS, IIS, RMS)
- Full scope plant Simulator (STS)
- Sensors & Transmitters

Digital I&C Systems Integration

• HW, SW and Applications

I&C Systems Licensing

Equipment Qualification

NPP Operator Training

Life cycle support

- Spare Parts, Services
- Cyber Security
- o Upgrades, Replacements







A complete suite of world class I&C Systems solutions

Nuclear Fuel Products

Westinghouse manufactures more types of fuel than any other supplier



• Sanmen 1 first AP1000 core successfully delivered to China 2012



Summary

- Westinghouse has a long history of localization and development of local nuclear sector expertise.
- Westinghouse has a horizontal supply chain with no "nationalized industry" obligations to maximize its own national supply chain.
- Passive systems mean many nuclear island components are high quality, but nonnuclear safety rated, which can make them more accessible to local industry.
- There is a growing fleet of AP1000 plants worldwide, giving many opportunities for Czech companies to compete in a global marketplace.
- The Czech project will benefit by leveraging the localization experience obtained from the India Project, currently in process, as well as recent experience learned during the UK Project.



Thank you!

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