The Westinghouse AP1000® Plant: Passive, Proven Technology to Meet European Energy Demands

Yves Brachet
President
Europe, Middle East and African Region
Westinghouse in Europe Today
Serving our Customers Across the Region

- Offices, support centers and manufacturing units:
  - **Belgium:** Brussels* and Nivelles
  - **Bulgaria:** Sofia
  - **Czech Republic:** Prague and Temelín
  - **France:** Orsay, Marseille, Metz and Lyon
  - **Germany:** Mannheim
  - **Spain:** Madrid, Vandellós, Hospitalet del Infante and Asco
  - **Sweden:** Västeras and Täby
  - **Switzerland:** Baden
  - **Ukraine:** Kiev and Kharkov
  - **United Kingdom:** Chorley and Springfields
  - **South Africa:** Cape Town and Johannesburg

*Westinghouse EMEA Headquarters*
Westinghouse in Europe Today
Sits at the Heart of Europe’s Nuclear Industry

• **1962** First Pressurized Water Reactor (PWR) in Europe commissioned under Westinghouse license (Belgian Reactor 3 or BR3)
• **60%** of Europe’s nuclear power plants are based on Westinghouse technology
• **54** out of the **58** French reactors are based on Westinghouse licensed technology
• **25** commercial reactors designed and supplied by Westinghouse across Europe
• **4,000** highly-skilled and trained people across Europe, plus an additional **1,500** contractors
• **Two** nuclear fuel facilities (Springfields & Västeras) in Europe
• **65** PWRs (including VVERs), Advanced Gas-cooled Reactors (AGR) and Boiling Water Reactors (BWR) are currently fuelled by Westinghouse in Europe
Nearly **50 percent** of the nuclear power plants in operation worldwide are based on Westinghouse technology.

Our newest design – the AP1000 pressurized water reactor (PWR) – features innovative passive safety systems and proven technologies based on Westinghouse’s 50+ years of experience.
Westinghouse AP1000 PWR
Major Safety Advancements

**Passive Safety-Related Systems**
- Use “passive” processes only, no active pumps, diesels, ....
- One-time alignment of valves
- No support systems required after actuation
- Greatly reduced dependency on operator actions

**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
Westinghouse AP1000 PWR

Plant Value Drivers

Passive Safety, through Proven Technology

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

Delivery Certainty, through Experience

Provides a plant that is easier and less expensive to build, operate and maintain

Regulatory Certainty

Reviewed by multiple countries; first and only Generation III+ reactor to receive design certification from the U.S. NRC
Westinghouse AP1000 PWR
Regulatory Certainty

• EUR confirms the AP1000 plant can be successfully deployed in Europe (May 2007)
• AP1000 plant amended design approved by NRC (December 2011)
• UK regulators grant Interim Design approval (December 2011)
• China licensing activities on-track, with Final Safety Analysis Report (FSAR) submitted to customer (2012)
• Combined construction and operating licenses (COL) approved for Vogtle 3&4 site (February 2012) and V.C. Summer 2&3 site (March 2012)
• Canada (CNSC) Phase 2 Pre-License (2013)
Westinghouse AP1000 PWR
Global Project Delivery

- Eight AP1000 units under construction worldwide
  - Four units in China
  - Four units in the United States

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Westinghouse AP1000 PWR
China Projects

Haiyang 1&2
Shandong Province

Sanmen 1&2
Zhejiang Province
Westinghouse AP1000 PWR
Progress of China Projects: Summary

• Major equipment delivered and installed at Sanmen Unit 1 and Haiyang Unit 1 includes:
  – Reactor Vessel
  – Steam Generators
  – Reactor Vessel Internals
  – Polar Crane
  – Integrated Head Package

• Shield Building Conical Roof set at Sanmen Unit 1 and Haiyang Unit 1

• Passive Containment Cooling Water Tank set at Sanmen Unit 1 and Haiyang Unit 1

• Digital I&C turnover to Startup staff in progress

• Sanmen operator candidates have completed simulator training; Haiyang operator candidates started simulator training in July 2013

Technology transfer well advanced
Sanmen Site Progress: Time Lapse View

2009 to 2014
Westinghouse AP1000 PWR
U.S. Projects

Vogtle 3&4
Waynesboro, Georgia

V.C. Summer 2&3
Jenkinsville, South Carolina
Westinghouse AP1000 PWR
Progress of U.S. Projects: Summary

• Nuclear Island basemat concrete pours completed for V.C. Summer Units 2&3; Vogtle Units 3&4

• Containment Vessel Bottom Head (CVBH) set in nuclear island for Vogtle Units 3&4; V.C. Summer Units 2&3

• First CV Ring set for V.C. Summer Unit 2; fabrication of additional rings continues at both sites

• Component and module fabrication proceeding; CA20 module (Auxiliary Building) set at Vogtle Unit 3 and V.C. Summer Unit 2

• Reactor Vessels delivered for initial units at each site; additional equipment and component deliveries continue to proceed
Westinghouse AP1000 PWR
Requirements for a Successful New-Build Program

• Strong reference plant design established
• Licensed in the country of origin
• Commitment to sustainable localization
• Multiple plants built and operating
• Experiences captured and applied for optimized delivery of future plants
Westinghouse AP1000 PWR
Continuous Improvement in Project and Product Delivery

Achieving reduced schedule and cost, increased certainty through:
- Lessons Learned
- Optimization Concepts
- Best Practices
- Technical Advances
Westinghouse AP1000 PWR
New Build – Forward Program
Moorside 1, 2 & 3
West Cumbria, United Kingdom
Toshiba and GDF SUEZ complete NuGeneration Ltd (NuGen) deal (30 June).

NuGen plans to build three AP1000 reactors in West Cumbria (Moorside Project) - largest, single proposed nuclear power plant construction project in Europe:

- Delivering 3.4 GW of safe power at a competitive strike price, due to our modular design, fewer components and smaller footprint, enabling a shorter construction schedule.

- First AP1000 reactor targeted for operation in 2024 (each reactor will take approx. four years to build), due to our modular design, existing progress in Generic Design Assessment (GDA) and progress on site evaluation.
Westinghouse AP1000 PWR
Westinghouse New Build in the U.K.

- Providing nearly seven percent of U.K.’s projected electricity requirements; delivery enough low-carbon electricity to power six million homes.

- Creating between 14,000 and 21,000 U.K. jobs (4,000 to 6,000 at peak construction) and reinvigorating the U.K. nuclear supply chain through Westinghouse’s “We Buy Where We Build™” policy; creating sustainable, skilled manufacturing jobs.
Westinghouse AP1000 PWR
Thank You