The Future Begins…Now!

AP1000 – Simplicity and Certainty

Presented by Michael Kirst
Regional Vice President, Central and Eastern Europe
Westinghouse Electric Company
The Nuclear Renaissance is a Reality

- New build has begun
- Enhancements to current operating fleet continue
- Public acceptance at record levels
- Recognition as a clean energy source
- Demand continues to grow

Momentum is Building
Our Role is to Maintain the Momentum

- Maintain unwavering focus on current operating fleet which is primary driver of new build renaissance
- Expand supply chain and infrastructure
- Increase communications / advocacy
- Attract and retain broad range of talent
- Bring new plants on-line, on time and on budget
Unwavering Commitment to the Operating Fleet

- Maintain current high standards:
  - Safety
  - Availability
  - Financial Performance

Westinghouse continues to invest in products and services that support the operating fleet.

85% of R&D investment aimed at operating fleet.
Simplification and Standardization are Key to Future Nuclear Plant Construction

- Simplicity and standardization in **Design** through reduced number of components and bulk commodities
- Simplicity in **Safety** through use of passive safety systems
- Simplicity in **Construction** through modularization
- Simplicity in **Procurement** through standardization of components and plant design
- Simplicity in **Operation and Maintenance** through use of proven systems and components, and man-machine interface advancements

**Improved Safety, Competitive Economics and Good Performance**
All Advanced Reactors Can Achieve Low Core Damage Frequency

- **Evolutionary plants** achieve goals by **adding** redundant safety features
  - 4 Train Safety Injection
  - 4 Train Decay Heat Removal
  - 4 Train Containment Cooling
  - 4 Train Residual Heat Removal
  - 4 Train Diesel Generators

- **Passive Plants** achieve goals by **reducing active** safety features
  - No safety related pumps
  - No safety related fans
  - No safety diesels/no safety AC power
  - Small number of valves actuate passive systems
  - Natural forces provide plant safety
Simplification of Design Eliminates Components and Reduces Cost

- 50% Fewer Safety-grade Valves
- 35% Fewer Pumps
- 80% Less Safety-grade Pipe
- 45% Less Seismic Building Volume
- 70% Less Cable
Supply Management Challenges

- Abrupt, expanding demand; diminished supply chain
- Long lead times for specialty steel forgings, SG tubing
- Logistics of moving large components around the world
- Competition with supply to other industries and competitors

Standardized plant advantages - efficiency, lower costs:
- Opportunity to establish a learning curve
- Multiple standard plants = higher production volumes
Challenges

Changing Supply Chain Scenario

- First generation of plants built by integrated suppliers
- Today, our supply chain is international, and geared toward providing locally upwards of 80% of resources and materials
Supply Chain Development is Critical

- In China, we have successfully implemented a **Buy Where We Build™** approach to projects
- This approach will also be used in the U.S., India, the U.K. and other emerging markets
AP1000™ Design Simplification
Improved Construction Means Less Risk

AP1000 footprint is more compact than current PWRs
Systems are simpler
Maximum use of pre-fabricated modules
Streamlined field installation

<table>
<thead>
<tr>
<th>Concrete, m³</th>
<th>Rebar, metric tons</th>
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<tbody>
<tr>
<td>Sizewell B:</td>
<td>520,000</td>
</tr>
<tr>
<td>Olkiluoto:</td>
<td>400,000</td>
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<tr>
<td>AP1000:</td>
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## Modules Designed into AP1000 from the Beginning

### Module Type

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Number</th>
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<tbody>
<tr>
<td>Structural</td>
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<tr>
<td>Piping</td>
<td>154</td>
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<tr>
<td>Mechanical Equipment</td>
<td>55</td>
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<tr>
<td>Electrical Equipment</td>
<td>11</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>342</strong></td>
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</tbody>
</table>

### Diagrams

- **Pump/Valve Module**
- **Raceway Module**
- **Structural Module**
- **Depressurization Module**
Modular Construction

- Shortened construction schedule - 36 months!
  - >25% lower than earlier generations
  - Challenge to reduce further
- Reduced field manpower
- Increased factory-based manufacturing and assembly of modules
  - Improves quality - pre-testing and inspection of modules prior to shipment
- Reduced site congestion
- Construction validated in 3D/4D plant model

2 Weeks 1 Month 2 Months 1 Year 2 Years
Site work done in parallel with module fabrication and transportation
Certified Design

USNRC Design Certification

January 23, 2006

EUR Compliance

May 15, 2007
What’s New Since Generation II Nuclear Plants? Westinghouse’s AP1000™, 1100 MWe - class advanced, passive PWR

- Compact & simpler:
  - 50% fewer safety class values
  - 80% less safety class piping
  - 35% fewer pumps; no safety system pumps
  - 70% Less cable
- Compact: Only 61 m³ concrete/MWe.
  - Less time and money to construct.
  - Less costly to operate.

- The AP1000™ design has already been reviewed and approved by the U.S. Nuclear Regulatory Commission. Regulatory risk is less with AP1000.

- Essential for modular construction.
  - Reduce risk of field-fitting, re-work, construction delays.

- Efficiencies from a real learning curve and series production of standardized equipment.
  - Established costs and licensing status.

- AP1000 uses global supply network of manufacturers.
  - We are not vertically integrated.
  - Allows us to “Buy where we build.”

- 3-Dimensional model with time allows unprecedented optimization of the construction plan in virtual reality long before lifting a shovel.

- How AP1000 reduces investment risk
The World is Poised for Nuclear
Active Markets: Generation III and III+ Plants Underway
Four New Plants Underway in China

Haiyang

Sanmen
China: Westinghouse AP1000™ On Schedule for 2013 Operation

- Basemat concrete pour successfully completed for Sanmen Unit 1 in late March, and for Haiyang Unit 1 in late September
U.S.: 25 New Plants Announced
6 Under Contract
U.S. Progress

- **Vogtle 3 & 4**
  - Site mobilized and early construction underway

- **VC Summer 2 & 3**
  - Site preparation continues

- **Levy County 1 & 2**
  - Work partially and temporarily suspended due to licensing timeline
  - Delay will allow federal climate change policy to take shape and financial markets to stabilize
Vogtle 3 & 4 Construction
Markets Spanning the Globe

**Americas**
- Argentina
- Brazil
- Canada
- Chile
- United States

**Asia**
- China
- India
- Indonesia
- Japan
- South Korea
- Taiwan
- Vietnam

**Europe**
- Belgium
- Bulgaria
- Croatia
- Czech Republic
- France
- Germany
- Hungary
- Italy
- Lithuania
- Netherlands
- Poland
- Romania

**Oceana**
- Australia

**Africa**
- South Africa
- Egypt
- Morocco
- Nigeria

**Slovakia**
**Slovenia**
**Spain**
**Switzerland**
**United Kingdom**
**Finland**
**Sweden**
**Ukraine**
Beyond the Renaissance

- The energy issues we face today have never been more critical
- Technology providers, utilities and government all have vital roles to play in making this a reality
Westinghouse Electric Company and its consortium are currently building four AP1000s in China. Additionally, five U.S. utilities have chosen the AP1000 for possible nuclear plant construction.
Thank you