

The Nuclear Renaissance Begins Construction & Supply Chain Focus



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Europe, Middle East & Africa

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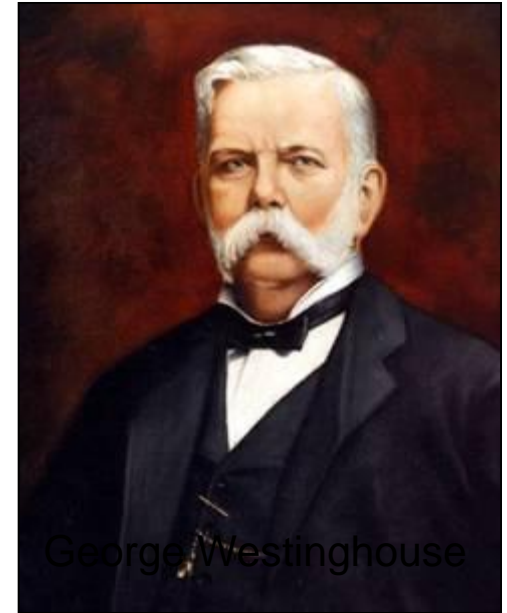
Outline

- Overview
- Construction Focus
- Supply Chain Focus
- Summary

Westinghouse Electric Company

Founded on Technology...

- Incorporated in 1886 by George Westinghouse
- Responsible for some of the world's important achievements:
 - AC technology
 - 1st commercial radio broadcast (KDKA-1920)
 - USS Nautilus
 - 1st camera on the moon
 - Commercial nuclear power



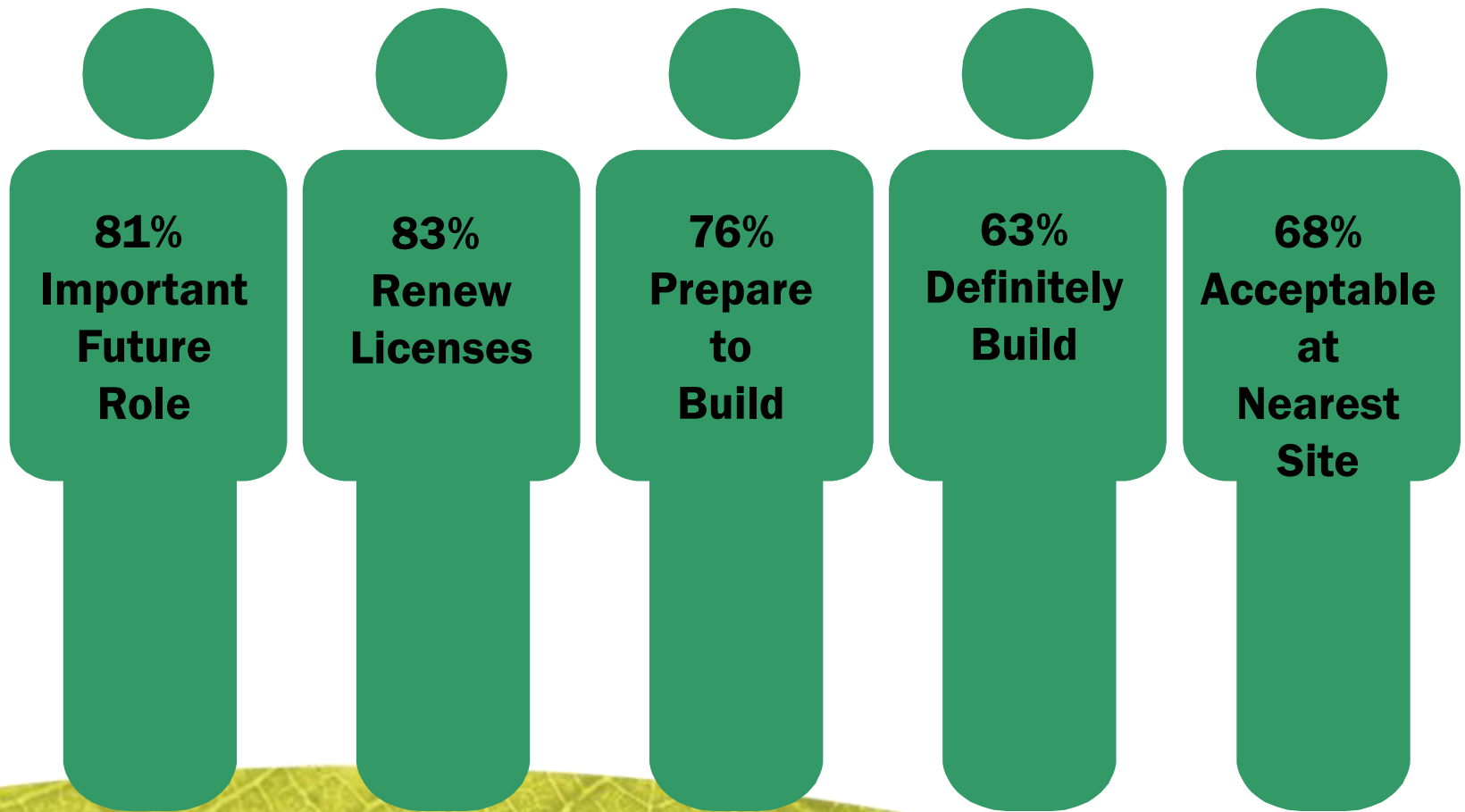
George Westinghouse



Today's Nuclear Power Industry

- Supplies nearly 20% of the world's electricity needs
- Streamlined nuclear regulatory process
- Greatly improved plant designs
- Proven track record of safe, efficient operation
- Modular construction, digital controls, scheduling software help to control costs, increase efficiency, and reduce construction time

Strong Public Support Continues



Source: Bisconti Research Inc.

September 2006 poll of 1,000 U.S. adults; margin of error is +/- 3%

Why Nuclear?

- Meets needs to reduce GHG emissions
- Highest capacity factors
- Low cost per kilowatt hour
- More stable fuel sources, less fluctuation in price
- Public acceptance at all-time high
- Proven high standards in:
 - Safety
 - Availability
 - Financial Performance



New Designs Must Deliver

- Cost basis that can compete with other energy sources
 - High degree of certainty for schedule
 - Reduced construction time and cost
- Increased levels of safety
- Easier to operate and maintain
- Standardised plants

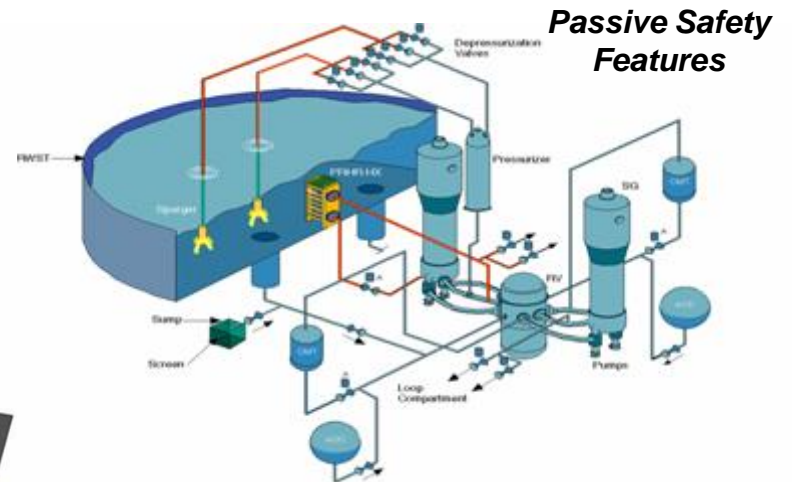
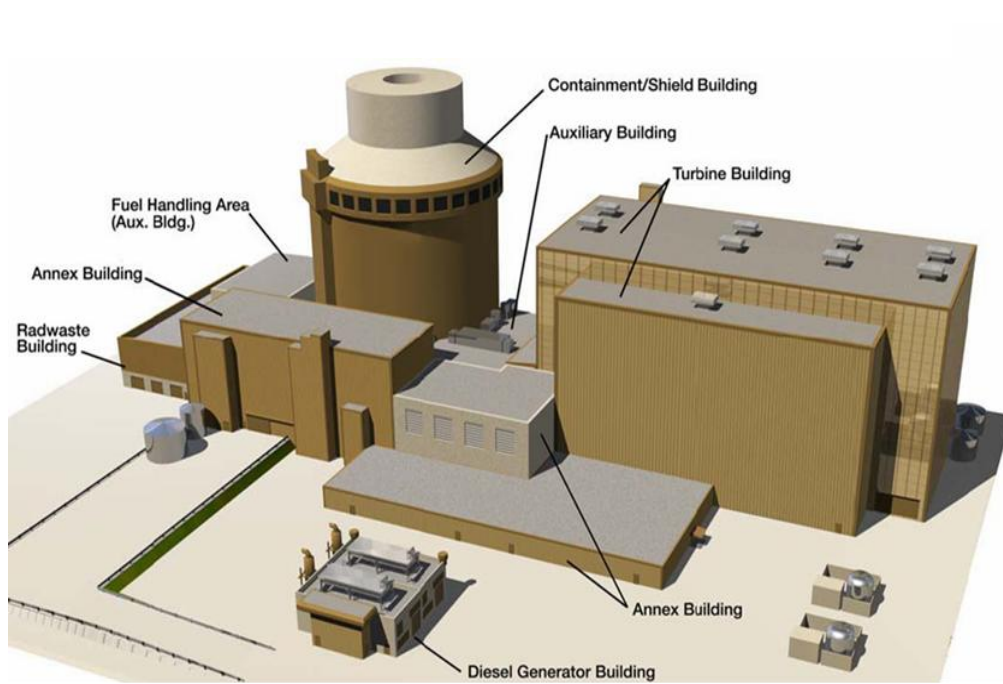


Simplification and Standardisation...

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

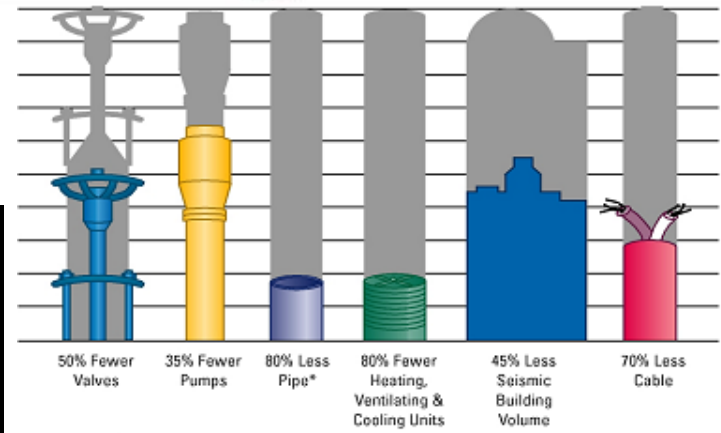


First Build of a New Standard Advanced Passive Gen III Plant



Passive Safety Features

The concept of standardised plants, aligns with the Technology Transfer principles, and assists supply chain.



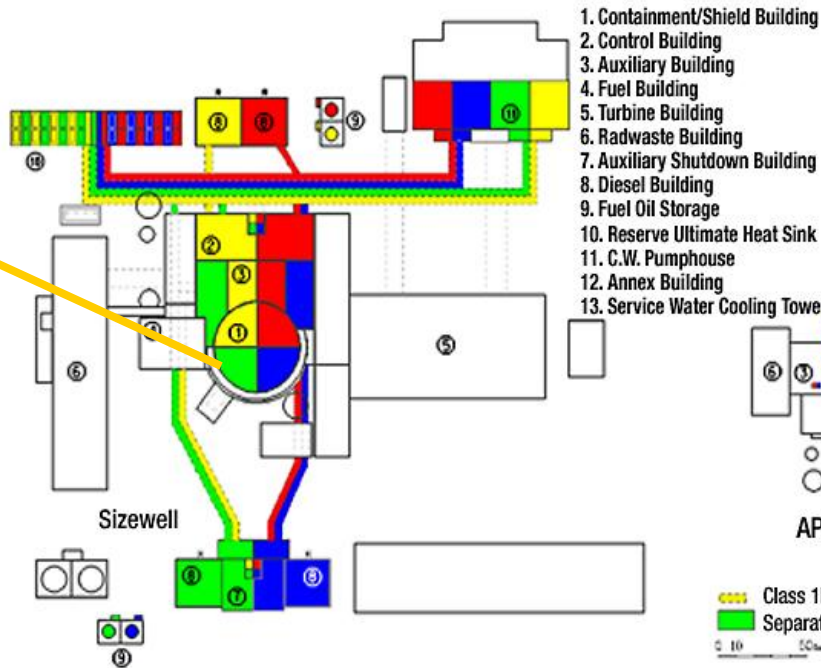
* No safety grade pumps
** Safety Grade

Fewer components & reduced footprint

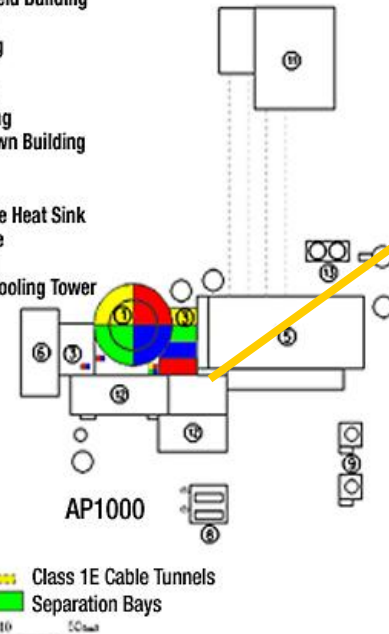
AP1000 Footprint

	Power	Concrete, m ³	m ³ /MWe	Rebar, MT	MT/MWe
Sizewell B	1188 MWe	520,000	438	65,000	55
AP1000	1117 MWe	< 100,000	90	< 12,000	11

Sizewell B



AP1000



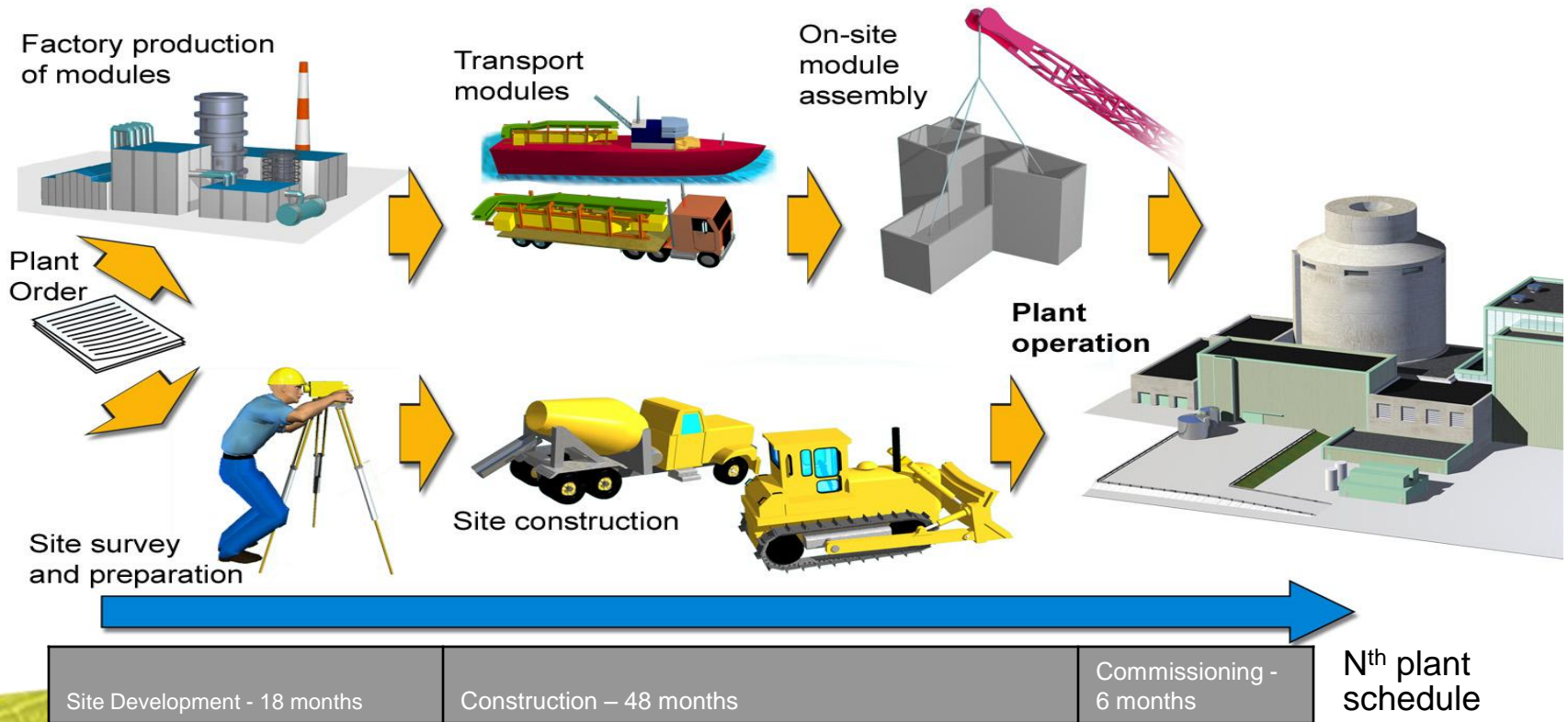
Reduced Construction Risk

AP1000 Modular Construction

- 300+ modules
- 150+ structural
- 150+ mechanical



- Factory fabricated under repeatable quality control.
- In parallel with construction providing reliable, short schedule.



Constructible → reliably short schedule → lower capital costs

AP1000 China Projects Progress



**Sanmen 1 - Commercial
Operation 2013
Four units operational by 2015**

Modular Build Experience



Fabrication Facilities located at Haiyang capable of producing modules and CVs for 4 AP1000s per year



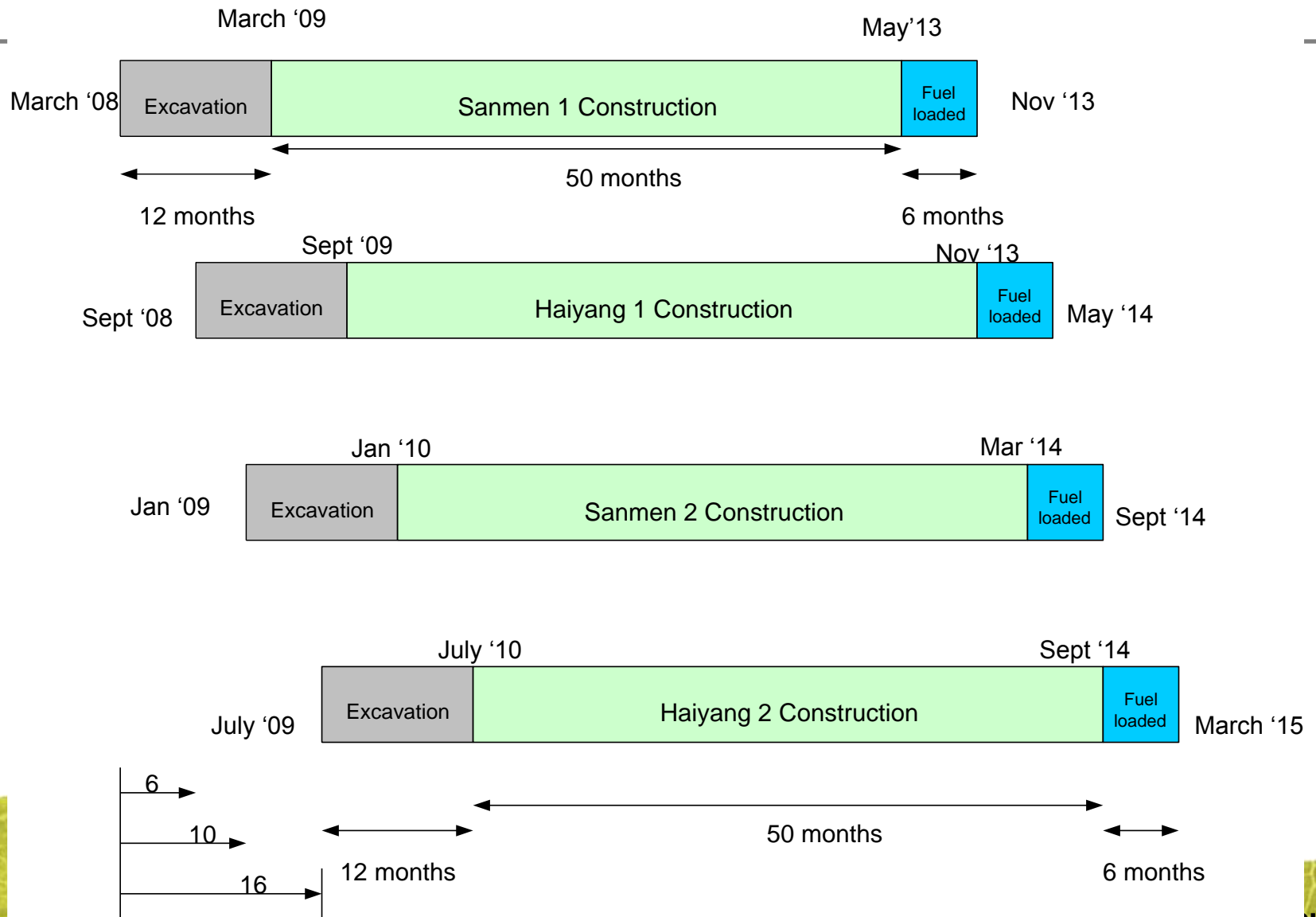
China Project Key Milestones

- February 28, 2007 – Framework Contract Signed
- July 24, 2007 – Contracts Signed
 - Nuclear Island
 - Consortium Technology Transfer
 - Fuels
 - Sub-supplier Technology Transfer Contracts
- September 24, 2007 – All Contracts Effective
- December 31, 2007 – Authorisation to Proceed
- March 31, 2009 – Sanmen 1 First Concrete
- September 27, 2009 – Haiyang 1 First Concrete
- November 2013 – Sanmen 1 Operational
- May 2014 – Haiyang 1 Operational

Site 1 Milestones	Unit 1
Framework Contract	Feb 28, 2007
Contract Signing	Jul 24, 2007
Contract Effective Date	Sep 24, 2007
Authorisation to Proceed	Dec 31, 2007
Start NI Excavation	Mar 31, 2008
First Concrete	Mar 31, 2009
Two Steam Generators Delivered on Site	Aug 31, 2011
Start Cold Functional Test	Oct 31, 2012
Start Hot Functional Test	Dec 31, 2012
Start Fuel Load	May 31, 2013
End of Performance Test	Nov 30, 2013

Rule of thumb – Haiyang 1 schedule is +6

Schedule Overview – All 4 Units



First Concrete



Sanmen Unit 1
March 31, 2009



Sanmen Unit 2
December 17, 2009



Haiyang Unit 1
Sept 24, 2009

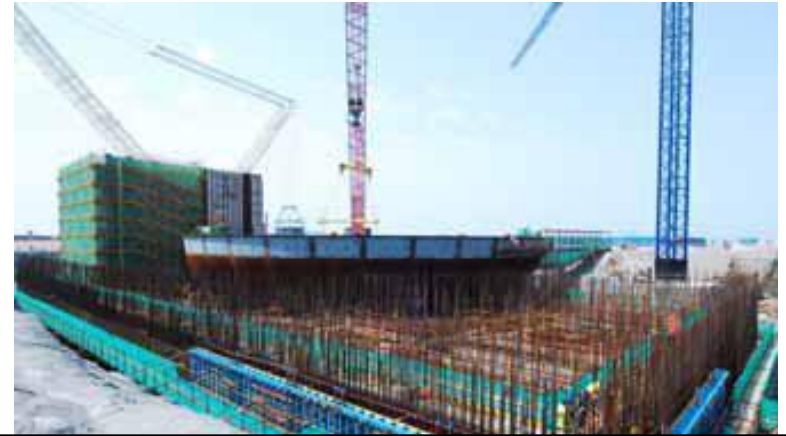


Haiyang Unit 2
June 22, 2010

Four China AP1000 Units under Construction



Sanmen 1 – RV to set in April 2011



Haiyang Unit 1 – CVBH Set April 2010

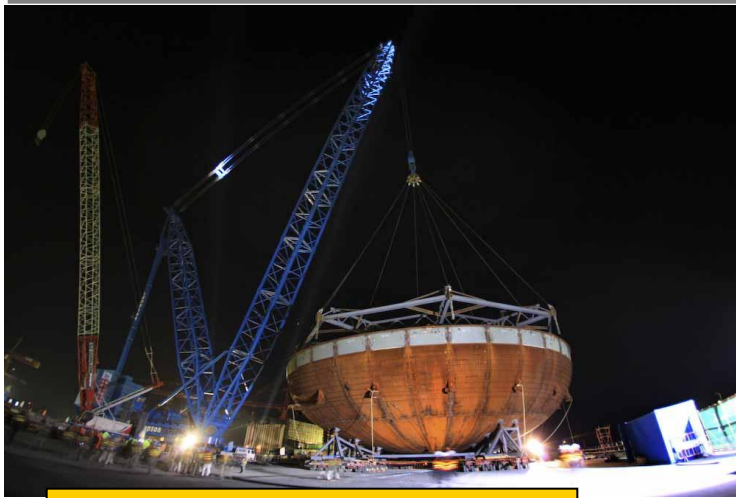


Sanmen 2 - CVBH Set June 2010



Haiyang Unit 2 – FCD June 20th

Containment Vessel Bottom Head (CVBH)



Sanmen Unit 1
December 21, 2009



Sanmen Unit 2
June 13, 2010



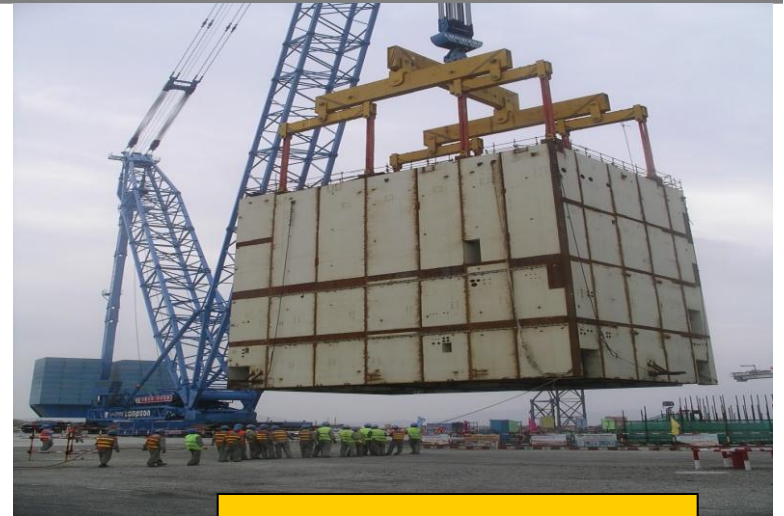
Haiyang Unit 1
April 10, 2010

Haiyang Unit 2 CVBH – October 31, 2010

CA20 Auxiliary Building



Sanmen Unit 1
June 29, 2009



Sanmen Unit 2
June 27, 2010



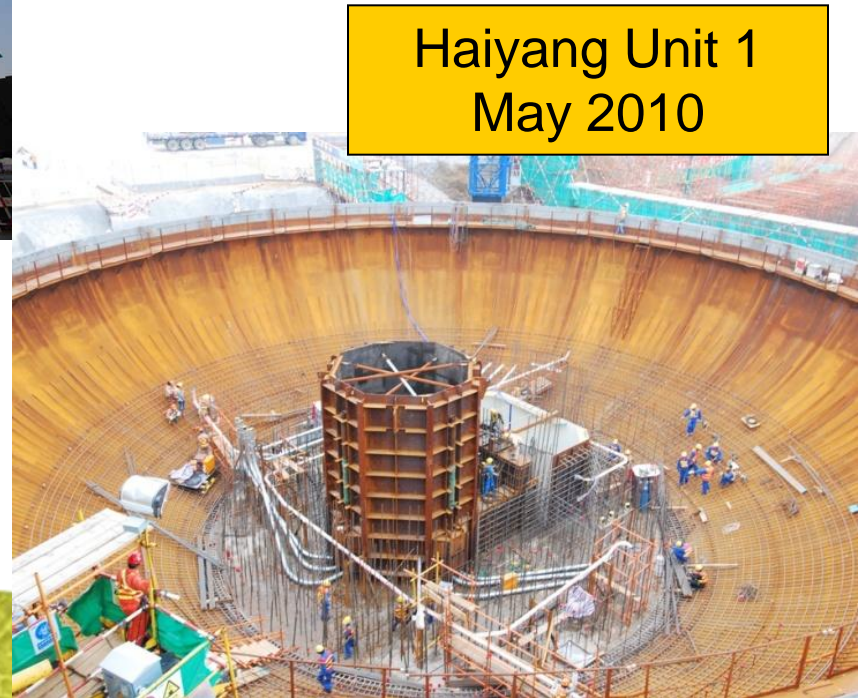
Haiyang Unit 1
January 30, 2010

Haiyang Unit 2 CA20– September 30, 2010

CA04 (Reactor Cavity)



Sanmen Unit 1
January 26, 2010



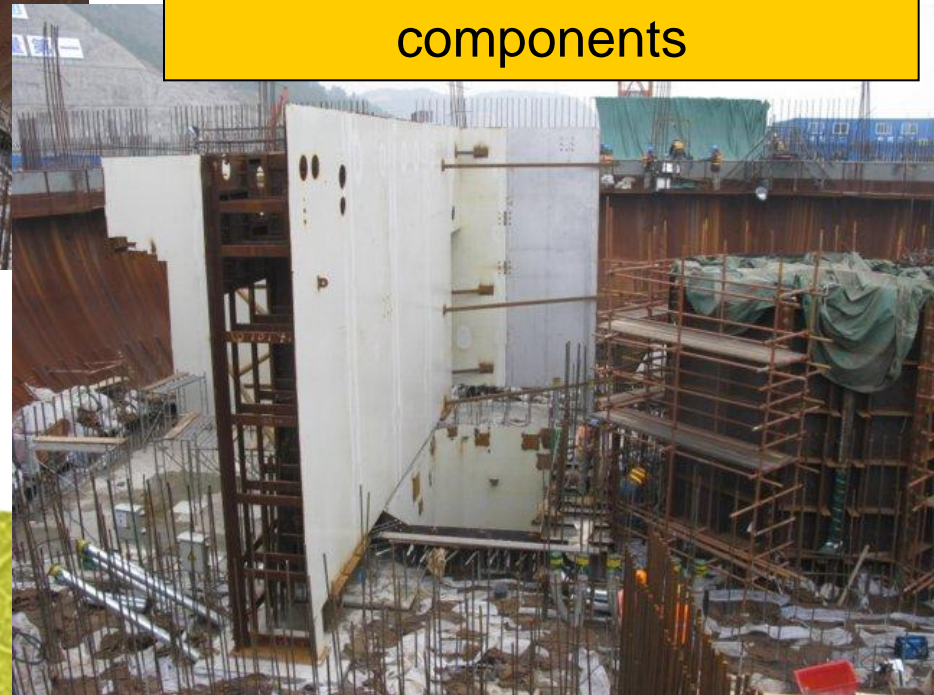
Sanmen Unit 2 CA04 – July 20, 2010
Haiyang Unit 2 CA04 – November 30, 2010

CA05



CA05, forms the walls around the demineralisers and other components

Sanmen Unit 1
February 28, 2010



Haiyang Unit 1 CA05 – June 28, 2010
Sanmen Unit 2 CA05 – August 4, 2010
Haiyang Unit 2 CA05 – December 29, 2010

CV Ring 1



Sanmen Unit 1
March 18, 2010

Haiyang Unit 1
Set on July 1, 2010



Sanmen Unit 2 CV R1– October 31, 2010
Haiyang Unit 2 CV R1 – April 29, 2011

CA01

(Steam Generator & Refueling Canal Module)



Sanmen Unit 1
March 27, 2010

Haiyang Unit 1 CA01– August, 2010
Sanmen Unit 2 CA01– September, 2010
Haiyang Unit 2 CA01 – January 31, 2011

Positive Effects of Modular Construction

	Feb 2007 plan	Actual	Delta
First Concrete Milestone Completed	31-Mar-09	26-Mar-09	0
Auxiliary Building Module Set in Place	31-May-09	29-Jun-09	1
CV Bottom Head Set in Place	31-Jun-09	21-Dec-09	6
CV 1st Ring Set in Place	31-Dec-09	18-Mar-10	3
CV 2nd Ring Set in Place	31-May-10	2-Jun-10	0

With the setting of the CV 2nd Ring, against the construction schedule milestones Sanmen Unit 1 has basically recovered the 6 month delay in setting the CVBH.

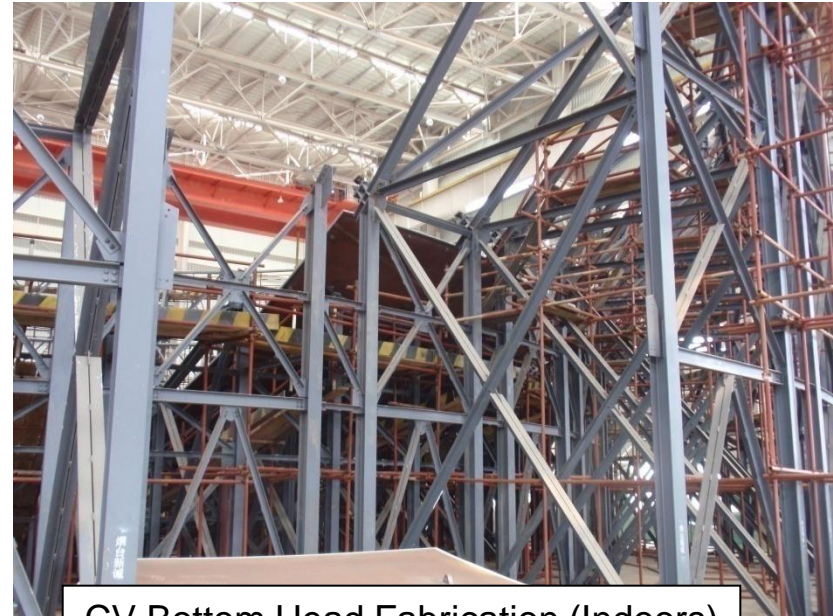
This would not have been achievable if it were not for modular construction.



Application of Lessons Learned

First of a Kind (FOAK) Activities for Sanmen 1 and AP1000 equipment design & manufacturing have led to a number of Lessons Learned, resulting in:

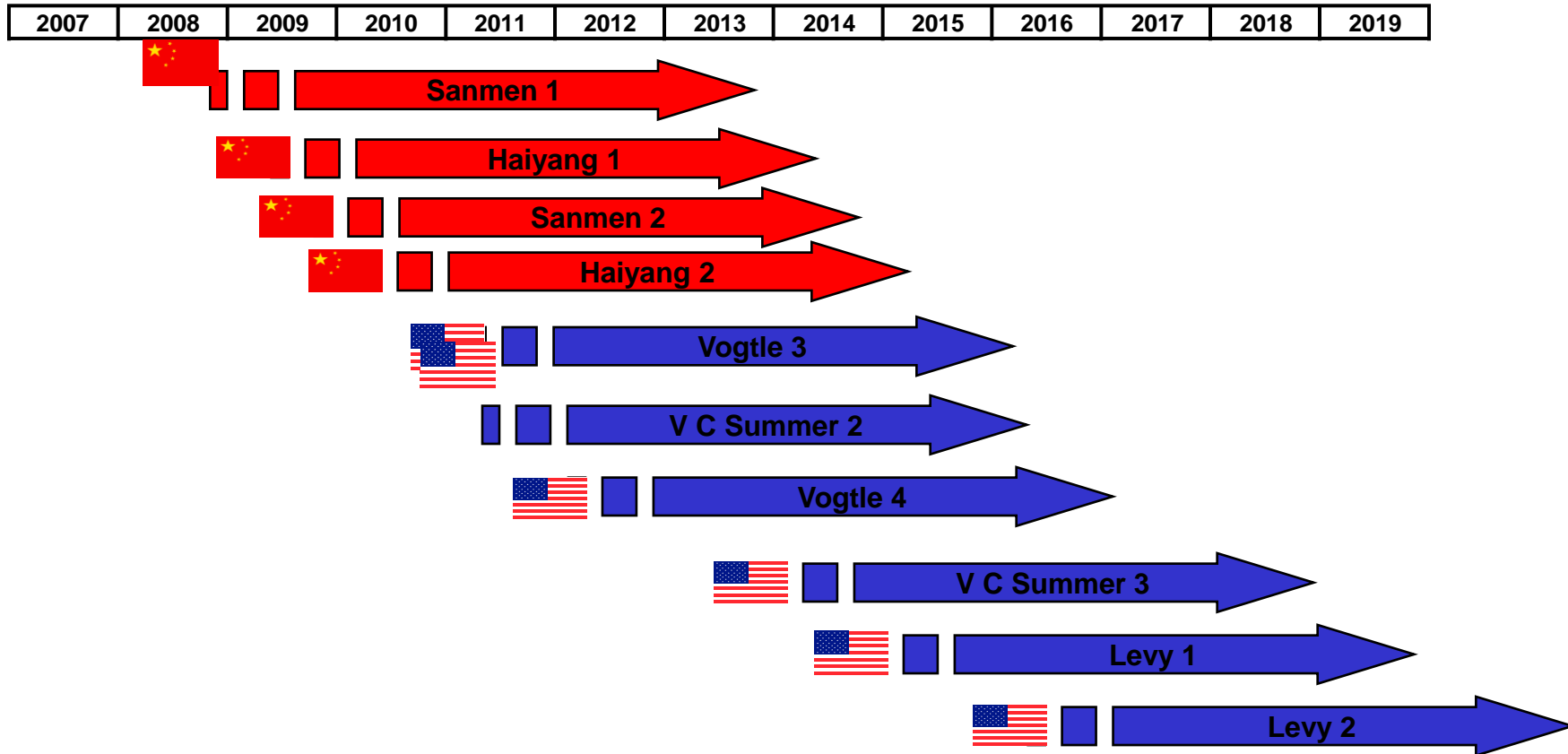
- NI Basemat at Haiyang 1 and Sanmen 2 laid in less time than Sanmen 1
- Ultra-large SG & RV forging lead times were reduced for the 3rd and 4th units
- Squib Valve designs have been optimised
- CA20 (Auxiliary Building) module fabrication for Haiyang 1 took far less time than for Sanmen 1
- CV Bottom Head fabrication for Haiyang 1 took far less time than for Sanmen 1
- CV Bottom Head welding at Haiyang is within a fully-enclose building



CV Bottom Head Fabrication (Indoors)
at Haiyang

Westinghouse is using modern and proven ways of capturing lessons learned and applies a process that ensures their implementation.

AP1000 Units Under Contract



11GW – enough to replace the whole UK nuclear fleet

Modular build Experience

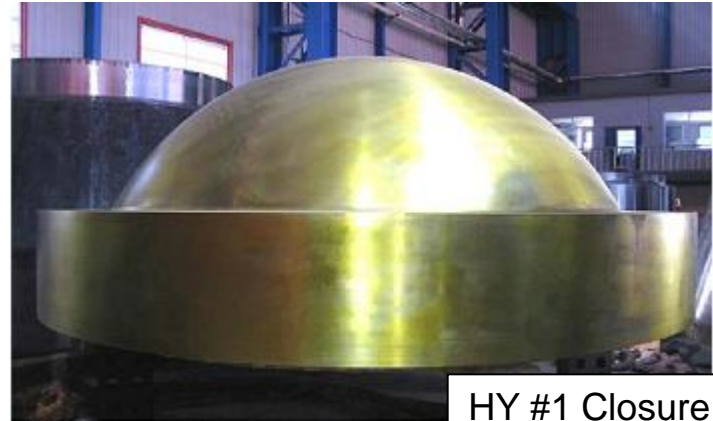


Fabrication Facilities located at Haiyang capable of producing modules and CVs for 4 AP1000s per year

Supply Chain – China Project

Summary of Major Orders Placed:

- Steam Generators
- Reactor Vessels
- Reactor Vessel Internals
- Reactor Coolant Pumps (RCP)
- RCP Variable Frequency Drives
- Control Rod Drive Mechanisms
- Polar Crane
- Containment Vessel
- Integrated Head Package
- Passive Residual Heat Removal Heat Exchanger
- Reflective Metal Insulation
- Valves



HY #1 Closure Head



SM #1 RV Upper Shell

Huge Opportunity – Huge Challenge

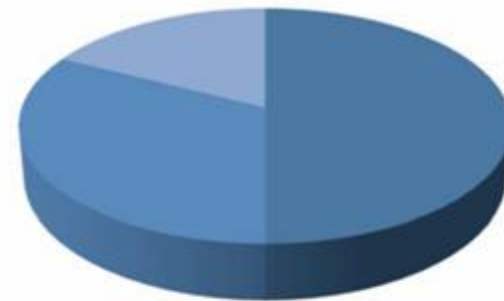
Potential £30 Billion value to UK economy



Around half from supply chain during construction

Around 35% from operation

Around 15% from fuel



- UK Supply Chain
- Operational Jobs
- Fuel Supply

UK Timeline for Suppliers?

- Now

Qualify supplier for global supply chain

Prepare for UK New Build

- 2011-2013

Qualify & Contract Suppliers for UK New Build

- 2013-2023

Construct & Commission at least 3300 MWe

Springfields Supplier Day – June 2010

- Around 40 exhibiting companies
- Over 300 visitors to the exhibition



Nuclear Power Delivery UK Supplier Event – Manchester, June 2010

- Around 300 attendees
- Around 170 companies
- Keynote presentations from OND and Horizon Nuclear Power



Still There Are Challenges To Overcome

- World financial conditions
- Short term energy options
- Deliver new plants on budget and on schedule
- Regulatory process
- Lack of certainty of CO₂ treatment
- Waste and security issues
- Maintain operating fleet performance
- Human resources
- Supply chain



Summary

- First AP1000 build is providing valuable experience.
- Significant benefit being gained from parallel modular build and construction.
- Lessons learned are being applied to next AP1000 construction.



Questions?

