The Nuclear Power Market in China
Forecasts and opportunities
2009
Agenda

- The Chinese industry
- Regulation
- The Forging industry
- Additional information
- Our Services
The Chinese Industry
Forecast of NPP construction

Half of Nuclear Power Plants will use AP1000 technology between 2020 and 2030

Source: DPS 2009
Production of Electricity per Region

Electricity generated by NPP in 2030

Hainan, Henan, Chongqing, Sichuan, Anhui, Hubei, Shandong, Hunan, Jiangxi, Guangxi, Liaoning, Fujian, Jiangsu, Zhejiang, Guangdong
Nuclear Industry Organizations

Operators
- CNNC
- CGNPEC
- CPI
- Datang
- Huaneng
- Huadian
- Guodian

Operators applicants

Third Generation Technology Importer
- SNPTC
- CGNPC
- CNEA

Nuclear Organizations

Nuclear Research Institutes and Universities
- CNPE (CNNC)
- CIRP (CGNPC)
- CIAE (CGNPC)
- CNPRI (CGNPC)
- CNPDC (CGNPC)
- CNPEC (CGNPC)
- SNERDI (SNPTC)
- CAMST
- Shanghai Jiaotong University
- Tsinghua University

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Dynabond Powertech Service
The process for an NPP site

- The choice for the site depends on the planification and regulations.
Regulations
Regulations

- The regulation of the supervision and management of imported safety related nuclear equipment (HAF604) from the Ministry of Environmental Protection in China (MEPC) was announced on January 1st, 2008.

- Published on January 1st, 2008, it requires foreign corporations to register at the NNSA.

- Foreign companies which do not get the HAF604 certification cannot participate in any bidding in China.
Application for the Forging Industry

Suppliers of large forging parts have to get a certificate to provide their parts (i.e. forging for steam generator, reactor vessel, reactor internals) to NPPs in China. The HAF604 certificate is required for foreign suppliers and HAF601 for local suppliers.

So far, the following companies have got HAF604 certificate.

- France: Creusot Forge, Manoir Industries Custines
- Japan: JSW Corp.
- Austria: Bohler Welding Company
- Italy: Forge Monghieri Spa, SDF, SAFAS Spa, Fomas Spa
- USA: Westinghouse Electric Corporation
Domestic Companies with HAF 601

- Anhui Yingliu Group, Huoshan Forging Co., Ltd.
- CFHI (China First Heavy Industries)
- China National Erzhong Group Co.
- Dalian DV Valve Co., Ltd.
- Guizhou Aerospace Xinli Castings and Forgings Co., Ltd.
- Shanghai Heavy Machine Co., Ltd.
- Shanghai Xinmin Heavy Duty Forging Co., Ltd.
- Shanghai Zhongxing Jiqi Chang Co., Ltd.
- Shenyang Kejin Special Material Co., Ltd.
- Sichuan Sanzhou SCMP Nuclear Equipment Manufacture Incorporation
- Wuxi Flang Forging Co., Ltd.
- Yingliu Group, Huoshan Casting Co., Ltd.
- CITIC Heavy Industries Co., Ltd.
- Neway Valve (Suzhou) Co., Ltd.
The Forging Industry
Main Forgers for NPP in China

- CFHI (China First Heavy Industry Co., Ltd):
  - Forging parts of reactor vessel, steam generator, pressurizer and pump barrel of the main pump.

- China Er-zhong:
  - Forging rotator of the electric generator

- Shanghai Electric Heavy Industry Group:
  - Forging parts of reactor vessel, steam generator, pressurizer and reactor internals for 600MW PWR NPPs

No joint venture for the moment, but Westinghouse remains close to CFHI
Case Study: SEHIG

- Among the 3 Chinese forgers, Shanghai Electric Heavy Industry Group (SEHIG) is the smallest one. It needs more foreign support and is willing to cooperate with foreign companies. SEHIG is a subsidiary of Shanghai Electric Corporation (SEC). SEC is the supplier of complete equipment and could be a good buyer of forgings manufactured by a joint-venture between SBS and SEHIG.
## Market Opportunities

### Direct sale

Though China emphasizes localization, there is still a limited space for selling equipment directly. First, for AP1000 projects, they are not qualified to provide key forging parts. For example, CFHI is considered to be the most powerful supplier of forging parts in China, but its products for AP1000 were rejected just a few months ago. Secondly, the manufacturing capacity of Chinese forgers is not enough to support the current demand.

### Cooperation with a Chinese partner

By cooperating with Chinese and foreign manufacturers (based in China) SBS can share the profits. One approach is to provide some key parts to Chinese companies and have them assembled in China. The other is to set up a joint venture.
Conclusion

- The Chinese nuclear power market program is the most ambitious in the world at Euros 70 Billion

- China does not have the human ressources neither the expertise to achieve all its goals

  => China will continue to seek for strong international support

- Good communication and knowledge adapted to the Chinese, is a key to success
Additional Information
Status of Main Equipment Manufacturing for the AP 1000
Main Forger for AP1000

- Doosan was chosen by SNPTC to supply steam generators and reactor vessels for unit 1 of Haiyan NPP and Unit 1 of Sanmen NPP, which are both AP1000 based. CFHI is the partner of Doosan and is supposed to supply some forging parts to Doosan for the two projects. In the future, Doosan shall transfer some manufacturing technology to CFHI according to the agreement signed between SNPTC, Doosan, Westinghouse and CFHI. However, according to recent information, the forging parts manufactured by CFHI did not meet ASME standards. Right now, SNTPC is considering giving China Er-zhong and Shanghai Electric more shares in the AP1000 projects.
Reactor Vessel

Upper Shell Course

Upper Head (After Heat Treatment)
Steam Generator

Upper Head

Channel Head (Rough Machining)

Upper Shell Course

Lower Shell Course (A) (after pre-fabrication)

Transitional Cone

Lower Shell Course (B)
Reactor Coolant Pump

Flywheel Test Sample

Test Loop Pump Casting

Rotor

Impeller-sectional view

Impeller-top view

Motor
**Containment Vessel (CV)**

The CV welding test was completed in the middle of Nov., 2008

- Formed CV upper header (testing plate)
- CV Pre-assembly Bench
Reactor Coolant Loop

431 steel ingot

Main Piping (test pieces)
Modules Fabrication

Part s of Module CA20

Stainless steel for Module
Sichuan District

Dongfang Electric Corporation, China ErZhong
1000MW Steam Generator of Lingao Phase II

Nuclear Half-speed Steam Turbine of Lingao Phase II
Main Forge Capacity

160 MN free forging hydraulic press
Northeast District

Harbin Electric Corporation (HEC) - China First Heavy Industries (CFHI)

Steam Generator of AP1000
Researched by CFHI

Moisture separator/reheater of Lingao
Phase I Manufactered by HEC
China First Heavy Industries

300 MW nuclear reactor pressure vessel for Chashma NPP

600 MW nuclear reactor pressure vessel for Qianshan Phase II
China First Heavy Industries

AP1000 reactor pressure vessel Head for Sanmen Phase Ⅱ

AP1000 steam generator part for Sanmen Phase Ⅱ
Main Forge Capacity

150 MN free forging hydraulic press
Shanghai District

Shanghai Electric- Shanghai Electric Heavy Industry Group
Shanghai Electric Heavy Industry Group

- 600MW steam generator of Qinshan phase II
- 600MW pressurizer of Qinshan phase II
- 600 MW reactor pressure vessel of Qinshan phase II
Shanghai Electric Heavy Industry Group

600MW reactor internals of Qianshan phase II

Polar Crane

Refueling machine
Main Forge Capacity

1.65MN free forging oil press
Our services
Mission

- Dynabonds’ mission is to create value within the nuclear market in China through the structuring and integrating of international and domestic buyers, manufacturers and administrative bodies.

- **Structuring involves delivering world class consulting** on product qualification to manufacturers.

- **Integrating involves bringing together international and domestic manufacturers and buyers** creating a 'virtual warehouse' making trade easier, assisting in outsourcing and partner selection for foreign companies looking to enter the Chinese market, as well as helping Chinese clients find suitable investment opportunities.
Objectives

- **Lobby with the procurement departments** of the Institute of Research and Design, in particular from the SNERDI, NPIC, CNPE and CGNPC for our foreign clients.

- **Technology transfer from foreign companies** to assist domestic nuclear improvement and competitiveness through enhanced product quality.

- **Establish 'ten year minimum' contracts** with Chinese component manufacturers to source our nuclear power clients in China.

- **Support the Chinese SME** throughout the production of components to nuclear qualification standards.

- **Work with Chinese regulators** to improve the legislation and create a more attractive business climate for growth and foreign investment.
Dynabond offers clients a ‘one-stop-shop’ in business development and planning, strategic marketing, assisting Chinese and foreign partnering for localizing production into China:

- Retainer consulting
- Project consulting
- Market research
We act as an 'extension' to the clients business, absorbing the roles of business and market development on a subscription basis. Our approach involves developing an in-depth understanding of our clients value proposition, business objectives, and operation. With this in mind, we research, assess new opportunities, negotiate with potential partners and establish product channels.

Major clients: Eupen Kabelwerk (Belgium), Gesellschaft für Anlagen- und Reaktorsicherheit (Germany), Hamon (France-Belgium), Institut de Radioprotection et Surete Nucleaire (France), International Nuclear Services (United Kingdom), LS (South Korea), Phoenix Armaturen (Germany), TUV Sued (Germany), Industrial Audit (Canada), Haiyan Nuclear Industrial Park (China)...
We offer Foreign clients access consulting resources to assist in product certification (HAF601/604) and qualification, market entry, expertise on engaging with Chinese businesses. Billing is on a per-project, per-milestone basis.

**Major clients:** ABB Service (Germany), Baumer (France), Cymi (Spain), Eupen Kabelwerk (Belgium), Groupe ADF (France), Hirata Valve (Japan), LS (South Korea), Man Diesel (Germany and France), Meggitt (USA), Phoenix Armaturen (Germany), Rotork (United Kingdom), **SBS (France)**, Schott (Germany), SPX (Belgium and Netherlands)...
We offer group studies available to selected foreign clients. Examples include studies of developing distribution channels or implications of licensing foreign components in China.

Major clients: International Nuclear Services (United Kingdom), Industrial Audit (Canada), L3 Mapps (Canada).
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