Power Systems Business Presentation

June 18, 2009
Koji Tanaka
Vice President and Executive Officer
President & Chief Executive Officer, Power Systems Group
Hitachi, Ltd.
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1. Market Trends
2. Management Policy
3. Nuclear Power Business
4. Thermal Power Business
5. Renewable Energy Business
6. Conclusion
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1–1 Worldwide Trends for Reducing CO₂

- Increasing expectations for power generation to play a central role in decreasing global warming.
- Heightened investment in infrastructure for creating a low-carbon society.

Global CO₂ Emissions

Baseline scenario: 62.0 bn tons
Power generation: 38%
Industry, households, etc.: 62%
50%-reduction scenario: 14.0 bn tons

Country/Region Government Policy Trends

- **Japan**
  - 15% GHG reduction by 2020 (vs. 2005)
  - 15 new nuclear power plants

- **U.S.**
  - “Green New Deal”
    - US$150 Bn earmarked for clean energy; create 5 M jobs

- **Europe**
  - Establishing CO₂ capture facilities mandatory for new thermal power plants
  - 20% renewable energy rate by 2020

- **New Economies**
  - Nuclear power cooperation agreements between U.S./India, U.S./UAE
  - 15% renewable energy rate by 2020 (China)

Source: Prepared based on International Energy Agency’s (IEA) “Energy Technology Perspective 2008”

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1–2 Domestic Market Trends

**Power Plant Investment**

<table>
<thead>
<tr>
<th>Year</th>
<th>Nuclear</th>
<th>Thermal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>100%</td>
<td>102%</td>
</tr>
<tr>
<td>2006</td>
<td>124%</td>
<td>146%</td>
</tr>
<tr>
<td>2007</td>
<td>146%</td>
<td>158%</td>
</tr>
<tr>
<td>2008</td>
<td>158%</td>
<td>160%</td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*FY08 estimated actual, FY09 and FY10 planned

**Power Capacity Development Plans**

<table>
<thead>
<tr>
<th>Nuclear</th>
<th>Under Construction (MW)</th>
<th>No. of Plants</th>
<th>Planned (MW)</th>
<th>No. of Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>BWR*</td>
<td>(2,760)</td>
<td>(2)</td>
<td>(11,890)</td>
<td>(9)</td>
</tr>
<tr>
<td>Thermal</td>
<td>10,320</td>
<td>20</td>
<td>11,520</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>13,990</td>
<td>23</td>
<td>28,070</td>
<td>46</td>
</tr>
</tbody>
</table>

*Source: Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry, *Summary of Electricity Supply Plan, FY2009*

*BWR: Boiling Water Reactor*
Increasing electricity demand over medium and long terms (1.8 times)

Ongoing construction of coal-fired thermal power plants

Increasing demand for AQCS

Construction of new nuclear power plants to create a low-carbon society (72 GW by 2020)

Increasing use of renewable energy (Wind power, solar power)

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Electricity Generating Capacity by Type

1.8 times by 2030 (Compared to 2005)

- **Renewable energy**: 100%
- **Nuclear**: 6.8 Tr kWh (134%)
- **Natural gas**: 3.8 Tr kWh (9.5%)
- **Oil**: 0.9 Tr kWh (2.6%)
- **Coal**: 184% (9.5 Tr kWh)

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Source: U.S. Department of Energy

"International Energy Outlook 2009"

AQCS: Air Quality Control System

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Power System demand is increasing globally.

- **Europe**: 22→30 GW/Year
- **Eastern Europe, Russia, CIS**: 3→14 GW/Year
- **Middle East, Africa**: 15→19 GW/Year
- **Asia and Oceania**: 57→83 GW/Year
- **North America**: 40→35 GW/Year
- **South America**: 7→12 GW/Year

Left of arrow: ’99 to ’06 actual orders, Right of arrow:’07 to ’20 orders (Commencement year basis)

Sources: Prepared from various statistical data, including IAE’s “World Energy Outlook 2008”
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2-1 Key Policies

Assisting creating highly reliable, highly efficient social infrastructure as a core for the Social Innovation Business.

- Contribute to the Creation of a Low-Carbon Society
  - Promote development of innovative energy technologies
  - Promote renewable energy businesses

- Promote Globalization
  - Nuclear: Collaborative creation, focused on promising overseas markets with GE
  - Thermal: Strengthen core Group companies in Europe, North America, Asia and expand business

- Increase Profitability
  - Bolster project management
  - Strengthen competitiveness in global markets
2–2 Contributing to the Creation of a Low−Carbon Society
(CO$_2$ Reduction Targets)

Contribute to Hitachi Group’s Environmental Vision:
Achieve 70% reduction of CO$_2$ in power systems business

Hitachi Group Environmental Vision 2025
Reduce 100 million tons of CO$_2$ emissions (FY2025)

CO$_2$ Reduction Target from Hitachi Products

- Highly efficient thermal power plants
- Nuclear power plants
- Renewable energy
- Energy conservation

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### Products and Technologies

<table>
<thead>
<tr>
<th>Nuclear power plant</th>
<th>ABWR reactor</th>
<th>IGCC development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear power use</td>
<td>Clean use of coal</td>
<td>CO₂ reduction technologies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mobile carbon capture equipment</th>
<th>AQCS integrated research facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use and stable supply of renewable energy</td>
<td>Downwind turbine</td>
</tr>
</tbody>
</table>

### Environmental Initiatives

#### 【Nuclear Power Plants】
- Higher output, larger capacity
- Longer life with advanced maintenance technologies
- Faster development of future reactors

#### 【Thermal Power Plants】
- Higher efficiency (A-USC, IGCC development)
- Carbon capture (Oxygen combustion, chemical absorption)
- Low NOx combustion, high-performance AQCS development

#### 【Wind Power, Solar Power】
- Wind power systems, mega solar power systems
- Grid stabilization technologies, storage batteries
- Greater sophistication by coordinating power systems and ICT

**Note:**
- ABWR: Advanced Boiling Water Reactor
- IGCC: Integrated Gasification Combined Cycle
- AQCS: Air Quality Control System
## 2-4 Promoting Globalization

Sharp growth in overseas revenues through globalization.

<table>
<thead>
<tr>
<th>Year</th>
<th>Japan</th>
<th>Overseas</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2006</td>
<td>566.7</td>
<td>100%</td>
</tr>
<tr>
<td>FY2008</td>
<td>845.7</td>
<td>185%</td>
</tr>
<tr>
<td>FY2009 (Target)</td>
<td>865.8</td>
<td>210%</td>
</tr>
<tr>
<td>FY2011 (Target)</td>
<td>1,000</td>
<td>260%</td>
</tr>
</tbody>
</table>

(Bn yen)

- **Overseas**: Growth in overseas revenues approx. 2.6 times (FY2006⇒FY2011)

### Group subsidiaries worldwide

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>Established Babcock–Hitachi Europe GmbH (Now Hitachi Power Europe GmbH)</td>
</tr>
<tr>
<td>2004</td>
<td>Established Hitachi Power Systems America, Ltd.</td>
</tr>
<tr>
<td>2004</td>
<td>Established Hitachi Power Africa Pty. Ltd.</td>
</tr>
<tr>
<td></td>
<td>Formed nuclear power business alliance and JVs with GE</td>
</tr>
<tr>
<td></td>
<td>Acquired Mechanical Dynamics &amp; Analysis Ltd.</td>
</tr>
<tr>
<td></td>
<td>Acquired Donges</td>
</tr>
<tr>
<td></td>
<td>Acquired Meeraner Dampfkesselbau GmbH</td>
</tr>
</tbody>
</table>

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2-5 Promoting Globalization (Main Group Companies)

Continuing to localize operations around the world centered on core Group companies

[Group Total: 17 companies (Japan), 23 companies (Overseas)]

Europe
- Hitachi Power Europe
- Hitachi, Ltd.
- Babcock–Hitachi K.K.
- Hitachi–GE Nuclear Energy, Ltd.

Asia
- Hitachi Power Systems America, Ltd.
- Hitachi–GE Nuclear Energy, Ltd.
- Babcock–Hitachi Dongfang Boiler Co., Ltd.
- Hitachi Industrial Machinery Philippines

Americas
- Hitachi Power Systems America, Ltd.
- GE–Hitachi Nuclear Energy LLC
- Hitachi Canadian Industries

- Hitachi Asia Ltd.
- Hitachi Australia Pty. Ltd.

- Hitachi Power Africa
- Babcock–Hitachi (Philippines) Inc.
- Clyde Babcock–Hitachi (Aust) Pty. Ltd.
- Hitachi Industrial Machinery Philadelphia
- Dalian Hitachi Machinery & Equipment Co., Ltd.
- HITACHI (CHINA) LTD.

- Hitachi Europe Ltd.
- Meeraher Dampfkeselbau
- Dongsan

Manufacturing and engineering subsidiaries
- Sales subsidiaries
- Service subsidiaries
- Core Group companies

- Expand coal-fired thermal power systems sales centered on boilers (Europe top share)
- Further develop Africa, Eastern Europe and other regions with expanding demand

- Expand thermal power business in China, India and elsewhere through cooperation with partners
- Expand into promising markets such as the Middle East and India

- Meet increasing demand for renovation of existing thermal power plants, AQCS, etc.
- Expand sales of ABWR with GE, and strengthen uranium-enrichment business

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Strengthen Project management

- Improve project management capabilities
  - Increase project management, engineering tools, and number of project managers
- Pre-order review and risk-prevention initiatives
- Strengthen reviews through establishment of “Supervisory Office for Overseas Plant Construction Business”

Strengthen competitiveness in global markets

- Strengthen capabilities of core Group companies worldwide
  - Promote localization
- Increase products with high market shares by expediting development
  - One of the world’s largest coal combustion testing facilities, AQCS integrated research facility
- “Strengthening The Base ’08–’09”–Group Workforce Activity
  - Global procurement and collective purchasing, quality improvement and reduction of loss cost, etc.
2–7 Power Systems Group Targets

FY2011 Targets
Revenue: 1 trillion yen
Operating margin: 5%

Overseas revenue ratio
FY2006: 34%
FY2008: 42%
FY2009 target: 45%
FY2011 target: 50%
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3-1 Basic Policy

Revenue

FY15: 300 bn yen
FY08: 200 bn yen

- Steadily construct ABWRs in Japan
- Develop business overseas

Steadily promote business in Japan

- Continue participating in construction of ABWR plants in Japan
- Promote continuous maintenance business using advanced technologies

Strengthen overseas business

- Accelerate sales expansion in promising markets such as the U.S. and the Middle East
- Target countries that may introduce nuclear power plants in the future

Develop advanced technologies

- Apply advanced construction technologies and highly efficient turbines
- Increase output of existing plants, develop and promote advanced maintenance technologies
- Develop ABWRs (increase output), ESBWRs, next-generation BWRs

ABWR: Advanced Boiling Water Reactor
ESBWR: Economic and Simplified Boiling Water Reactor

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3–2 Promoting Business in Japan

Nuclear Power Plant Construction Plans in Japan

- Predominantly ABWR plants
- Steady progress with plans and construction

Shimane Nuclear Power Station Unit No. 3 (under construction)
The Chugoku Electric Power Co., Inc.

*Nuclear Power Plant Construction Plans*

4 PWRs
11 ABWRs

*Source: Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry, *Summary of Electricity Supply Plan, FY2009*
Leading Player in ABWR Plant Construction in Japan

No. 1 market share in ABWRs (67%*)

Participating in construction of all ABWR plants

Start of Operations 1996

- TEPCO/Kashiwazaki Kariwa Unit No. 6 (First ABWRs)
- Chubu Electric/Hamaoka Unit No. 5

1997

- Teku Electric/Shika Unit No. 2

2005

2006

(Plan) 2011

- Chugoku Electric/Shimane Unit No. 3

(Plan) 2014 (FY)

First ABWRs

Full plant construction

Electric Power Development/Oma

World’s first full MOX

MOX: Mixed Oxide Fuel

* Includes plants under construction. Reactors and turbines counted as 0.5 of a plant each.

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3-4 Strengthening Overseas Business

Worldwide Nuclear Renaissance

- Ensure stable energy supply
- Global warming prevention

Increasing overseas demand for nuclear power plants
72 GW by 2020 (Equivalent to 72 plants)

GW: Gigawatt, Source: “International Energy Outlook 2009” (DOE/EIA), excluding Japan
3-5 Strengthening Overseas Business (Strategic Alliance With GE)

- **Alliance Goals**
  - Obtaining License (License and certification)
  - Marketing
  - Production system (Products and construction technologies)

- **Optimal Framework**
  - GEH: License (U.S. design certification already obtained)
  - Hitachi: Proven abundant construction track record, equipment supply
  - GNF: Supply and development of reactor cores and fuel

- **Develop Fuel Enrichment Business**
  - GLE is developing a uranium-enrichment business (Laser-based)
  - Alliance with Cameco Corp., world’s largest uranium producer

GEH: GE-Hitachi Nuclear Energy, GNF: Global Nuclear Fuel
GLE: GE Hitachi Global Laser Enrichment

Provide state-of-the-art BWR plants to the global market
3-6 Strengthening Overseas Business (Expanding Sales of ABWRs)

The Latest Proven Nuclear Power Plants

- One of the world's largest generation capacities (1,350 MW)
- Proven operating results in Japan
- U.S. design certification already obtained (GHE)
- Uses modular technique, latest construction technologies

Focus on Promising ABWR Markets (U.S., Middle East, etc.)

- Apply proven systems and designs
- Leverage abundant construction track record

ABWR: Advanced Boiling Water Reactor
Target New Markets and Countries Adopting Nuclear Power

- India: Alliance with engineering and construction major (GEH)
- China: Highlight ABWRs merits for energy diversification
- Southeast Asia, etc.: Support plans to introduce nuclear power from 2020
  ⇒ Appeal site planning, personnel training, etc., participate in new plans

1st ABWR Seminar for Thai Gov’t and Power Industry Representatives

March 2009
(Approx. 400 people/ongoing program)

Beijing, China
China International Exhibition on Nuclear Power Industry

April 2009
(Attracted approx. 3,000 visitors)

Shimane Unit No. 3 ABWR Construction Site Visit by Overseas Parties

Held 18 times for 80 people from 6 countries
(Hitachi guests received FY2008)
Hitachi’s advanced technologies for increasing reliability and competitiveness

Key equipment supplied from within Group

Advanced construction technologies

Advanced maintenance technologies

Stronger manufacturing capabilities

Increased reliability and competitiveness
Equipment Design and Manufacturing

- Supply key equipment from Hitachi Group
- Continuous supply of reactor equipment

Babcock-Hitachi K.K.

Hitachi Works

Hitachi Plant Technologies, Ltd.

Hitachi Works

Hitachi Works

Nuclear reactor equipment

Internal pumps

Turbines

Generators
Increasing Sophistication and Efficiency featuring the Latest Technologies

- Modular construction

  - Upper Drywell (Approx. 650 tons)
  - Generator Stator (Approx. 400 tons)
  - RPV Pedestal (Approx. 400 tons)
  - Hydraulic Control Units Room Module (Approx. 300 tons)

- Automated and high-quality construction management using RFID

- Access management
- Installation register management, etc.

- RFID: Radio Frequency Identification

- Operator ID
- Product ID
- Measurement equipment
- IC chip (0.4mm square)
- Tag antenna 54mm square
Development of Advanced Maintenance Technologies

Advanced Maintenance Market
- Extend life: Life 40 years ⇒ 60 years
- Increase output: 100% ⇒ 120%

Advanced Stress Improvement Technologies
- Narrow passage WJP
- IHSI technique

Technology synergies with GEH
- Noble Metal Chemical Addition (NMCA)
- Stress improvement (ReNew)

Developing Output-Raising Technologies
- Highly reliable dryer
- Highly efficient jet pump

More Advanced Inspection Technologies
- Inspection robots (Remotely operated vehicles (ROV))
- Ultra-sound damage analysis/Eddy current analysis

Multi-joint-type WJP
WJP for CRD stub tubes/ICM.H

Thrusters for proceeding left/right, rotating and going up/down
Larger thrusters
Camera

WJP: Water Jet Peening, IHSI: Induction Heating Stress Improvement
CRD: Control Rod Drive, ICM.H: In Core Monitoring Housing
NMCA: Noble Material Chemical Addition

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Systematic Strengthening of Manufacturing Capabilities

- Introduced large turn-mill machine (2006)
- Hitachi Utility Steam Test Leading facility (2009)
- Installed laser welding machine, control rod earthquake-resistance testing facility (2009)

<Plan>
- Control rod and control rod drive testing facility
- Strengthen machine processing facilities, extend reactor building production
## Accelerate Development Using Core Technologies

<table>
<thead>
<tr>
<th>Reactor Type (Output)</th>
<th>Recirculation Method</th>
<th>Safety System</th>
<th>FY</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABWR</td>
<td>Forced circulation</td>
<td>Active safety system</td>
<td>'80 '90 '00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>'10 '20 '30 '40</td>
</tr>
<tr>
<td>ESBWR (1,550 MW)</td>
<td>Natural circulation</td>
<td>Passive safety system</td>
<td>Development</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Construction</td>
</tr>
<tr>
<td>Next-generation BWR (1,700-1,800 MW)</td>
<td>Forced circulation</td>
<td>Hybrid safety system</td>
<td>Development</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Construction</td>
</tr>
</tbody>
</table>
Development of Advanced Technologies
(Hitachi’s Next-Generation BWRs)

- Promote development as national project
- Standardize specifications for basic performance and common requests from all countries, aiming to develop global-standard reactors
- Meet replacement demand in Japan from 2030

Increase electricity output (1,700 to 1,800 MW)

Low-uranium reactor core (10%: 24-month operation)

Optimal mix of passive and active safety systems

Separation of reactor building and containment vessel

SC structure first containment vessel (30-month construction time)

Seismic-isolated reactor building

SC: Steel Plate Reinforced Concrete
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4-1 Basic Policy

Strengthen coal-fired power plant business

- Maximize global performance
- Strengthen BTG integration capabilities
- Manage projects rigorously and reduce costs

Expand medium-capacity gas turbine business

- Accelerate business development on highly efficient Hitachi gas turbines

Promote development of environmental technologies

- Increase generation efficiency
- Clean flue gases, capture CO₂
4-2 Market Trends

- Coal: Abundant reserves, little geographical dependence, core power source for the world
- Natural gas: Relatively few CO₂ emissions, major power source after coal

### Proven Resource Reserves

- **Coal**: 133 years (847.5 bn tons)
- **Natural gas**: 60 years (117 tr m³)
- **Oil**: 42 years (1,237.9 bn barrels)

### Reserve Distribution by Region

<table>
<thead>
<tr>
<th>Region</th>
<th>Oil (tr barrels)</th>
<th>Natural gas</th>
<th>Coal (bn tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>18.0</td>
<td>20.6</td>
<td>26.0</td>
</tr>
<tr>
<td>Latin America</td>
<td>20.6</td>
<td>20.0</td>
<td>22.0</td>
</tr>
<tr>
<td>Europe and Eurasia</td>
<td>22.0</td>
<td>4.0</td>
<td>40.0</td>
</tr>
<tr>
<td>Middle East</td>
<td>40.0</td>
<td>3.0</td>
<td>31.8</td>
</tr>
<tr>
<td>Africa</td>
<td>4.0</td>
<td>3.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Asia/Oceania</td>
<td>3.0</td>
<td>3.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Source: "BP Statistics 2008"

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4-3 Strengthening Coal-Fired Thermal Power Plant Business
(Maximize Global Performance)

Collaborative creation with overseas Group companies and partners

- Expand scale, increase profitability
- Promote development of environmental technologies

Revenue

2007

- HPE, HPA: 390 bn yen
- HPSA, MD&A: 520 bn yen
- Hitachi, Ltd., BHK, etc.: 600 bn yen

2009

2011
Boiler Market Share (5 MW and Above): 2004 to 2008 Orders

Global Boiler Share

No. 1 share

Hitachi 22.0%

Market

Europe

Share: 35%
(Rank: 1st)
Market size:
Approx. 35 GW

North America

Share: 12%
(Rank: 4th)
Market size:
Approx. 22 GW

Source: McCoy Reports 2008
(Excluding Chinese and Indian markets)
No. 1 Global Share in DeNOx for Denitrification

- Help prevent atmospheric pollution globally
  - Decomposition of NOx
    → Prevent acid rain, photochemical smog

First Commercialization to Worldwide market
- 1963: Developed titanium oxide-based catalysts with ammonia
- 1973: Commercialized DeNOx system

Develop and manufacture in-house
- Only Hitachi can do as a boiler manufacturer

Global No.1 share
- Global No. 1 in cumulative deliveries
- Expand production facility
  → keep top share
4-6 Strengthening Coal-Fired Thermal Power Plant Business
(Strengthen BTG Integration Capabilities ③)

No. 1 share in boilers and AQCS
Able to supply “BTG + AQCS” by Hitachi based on top-share products

Optimize Boilers, AQCS, Steam Turbines and Generators

- High-performance catalysts
- Integrated system (DeNOx equipment, precipitator, desulfurization equipment)

Boiler (B)
- Highly efficient combustion, NOx・CO₂ reduction
- Compatible with different types of coal

AQCS (Flue gas treatment system)
- No. 1 share in catalysts
- Highly efficient and reliable

Steam turbine (T)
- Cooling water

Generator (G)
- Electricity

No. 1 share in boilers

AQCS: Air Quality Control System

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Rigorous Project Management

- Strengthen control of operation, profit/loss, risk management
- Increase and improve project management tools
- Increase and improve high-speed, high-accuracy engineering tools
- Train and increase number of project managers

Strengthen Cost Reduction Activities

- Standardization, procurement with optimized engineering
4-8 Expanding the Medium-Capacity Gas Turbine Business

Accelerate Business Development Centered on Own Highly Efficient Equipment

**H-25 Series**

- Orders (Cumulative 127 units)

<table>
<thead>
<tr>
<th>Units</th>
<th>Japan</th>
<th>Overseas</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>30</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>60</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>90</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>120</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

- Top-class performance in heavy-duty gas turbines*1
- Low-NOx combustors, compatible with different fuels

*1: Thermal efficiency of 34.8% (when burning natural gas)

**80 MW**

- Up-scaled model of H-25 series turbine
- Greater efficiency as replaces existing oil- and gas-fired turbines.
- Plan to deliver first replacement unit to Kyushu Electric Power Co., Inc. (by Dec. 2009)

**AHAT*2 Gas Turbine**

- Higher efficiency and lower cost than Combined cycle

- 4 MW pilot plant achieved 43%* efficiency (*World first, figure with correction)

*2: Advanced Humid Air Turbine

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### 4–9 Accelerating Development of Environmental Technologies

<table>
<thead>
<tr>
<th>Atmospheric Pollutants</th>
<th>Emission–Reduction Technology Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂, NOₓ, SOₓ, PM</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>2005</td>
</tr>
<tr>
<td>2010</td>
<td>2015</td>
</tr>
<tr>
<td>2020</td>
<td></td>
</tr>
</tbody>
</table>

- **More efficient power generation**
  - Highly efficient steam turbines (Increased efficiency and reliability)
  - 700°C–class (46%) A-USC
  - 750°C–class (48%)

- **Coal gasification pilot test**
  - Large-scale verification machine
  - Commercial plant

- **Flue gas cleaning**
  - Low-NOₓ combustion, high-performance AQCS (Higher performance)

- **CO₂ capture**
  - CO₂ capture and storage technology (demonstration)

---

One of the world’s largest coal combustion testing facilities

AQCS integrated research facility

**Raise Steam Temperature and Pressure to Increase Efficiency**

- **Reduce CO₂ emissions with USC**
  - Sub-critical: - 7% approx.
  - Super critical: - 2% approx.

- **USC (Ultra Super Critical):**
  - Ultra super critical (Steam temperature exceeds 566℃)

- **USC construction track record**
  - Japan: 8 units
  - Overseas: 23 units (Incl. under construction)

**Present Average efficiency worldwide:** approx. 35%

---

*SC (Super Critical): Steam pressure at least 22.1MPa and steam temperature up to 566℃
*USC (Ultra Super Critical): Steam temperature exceeds 566 ℃
*Sub-Critical: Steam pressure less than 22.1MPa (Drum-type boiler)

---

**Walter Scott, Jr. Energy Center Unit 4**

*(Power Magazine “2007 Plant of the Year”)*
High-efficiency Steam Turbines

- Optimized degree of reaction
  (Increase efficiency by optimizing output in stages)

- High-performance nozzle blade/rotor blade
  (Reduced loss via 3D rendering)

- Convert rotor blades to CCBs
  (Reduced steam leaks enhances efficiency)

- Low pressure-loss cascade

- High-performance nozzle blade
  (Reduced loss through 3D rendering)

- Extended length of last-stage blade
  (Increased annulus area to reduce loss)

- High-performance exhaust room

- Wet steam flow analysis

CCB: Continuous Cover Blade
Integrated Coal Gasification Combined Cycle (IGCC)

Conversion of coal into fuel gas
Higher efficiency by gas turbines and steam turbines

Increased steam temperature and pressure
Increased efficiency of energy-utilization

Developed 700℃-class Boiler
- Designed pipes using new boiler materials (nickel-based Alloy 617)
- Developed welding technology

Developed Alloy for 700℃
Low-cost Ni-Fe-based super alloy (FENIX-700) for turbine rotors

EAGLE: Coal Energy Application for Gas, Liquid and Electricity
Flue Gas Cleaning

- Developed low-NOx combustion technology (New-type burners/new multi-stage air-injection method verified at existing plants)
- Developed AQCS for U.S. environmental regulations

CO₂ Capture

- Joint development and field testing with European and U.S. universities and power utilities
- Oxy-combustion technology: Fortum (Finland), Aachen University (Germany) Chemical absorption technology: E.ON, Electrabel (Germany), University of North Dakota (U.S.)
5-1 Basic Policy

<table>
<thead>
<tr>
<th>Revenue</th>
<th>FY15: 200 bn yen</th>
<th>FY08: 25 bn yen</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Provide solutions to support the uptake of renewable energy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Renewable Energy &amp; Smart Grid Division to lead cross-organizational efforts</td>
<td></td>
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</tbody>
</table>

- **Expand sales of wind power systems**
  - Expand downwind turbine sales

- **Promote solar power systems**
  - Provide large-scale solar power systems
  - Control technologies to harmonize with power grids

- **Develop storage battery systems**
  - Step up development in conjunction with Battery Systems Division

- **Advance development of Smart Grid-related systems**
  - Develop and expand sales of power system stabilization equipment and systems
  - Increase sophistication by coordinating electricity infrastructure technology and ICT
5-2 Initiatives to Promote Renewable Energy

Wind power, solar power and other renewable energies will contribute to the creation of a low-carbon society, but…

- Such power output is so unstable due to the weather, etc.
- Further prevalence could destabilize the grid (transmission and distribution network)

Grid-related issues associated with the spread of renewable energy
- Grid stability
- Reverse power flow, etc.

The key is to provide solutions for these problems

- Promote initiatives across the Hitachi Group
- Strengthen collaboration in power systems and ICT fields

Hitachi, Ltd.

Supervisory Office for Business Coordination

Power Systems Group

Renewable Energy & Smart Grid Division

Industrial Systems Group

Information & Telecommunication Systems Group

Research & Development Group

Battery Systems Division

New org as of Apr. 09

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5-3 Initiatives to Promote Renewable Energy
(Key Equipment and Systems)

- **Solar Power**
  - Solar power systems
  - Power conditioners for mega-solar systems

- **Wind Power**
  - Wind turbines
  - Generators
  - Converters

**Power Grid Systems**
Telecommunications networks/monitoring and control systems/SVC/storage batteries

**Telecommunications Network**

- **SVC**
- Load
- Storage batteries
- Substation
- High-voltage power lines
- SVR
- Low-voltage power lines
- Sensor
- Communications node

**Key Equipment and Systems**

- SVR
- Solar power generation

- SVC
  - Static Var Compensator
- SVR
  - Step Voltage Regulator

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5–4 Expanding Sales of Wind Power Generation Systems

World’s Largest Downwind Turbines (Output 2MW)

- Provide system with Fuji Heavy Industries Ltd.
- Increase output on mountains, hillsides and other areas where wind blows upward using downwind turbines
- Designed to withstand typhoons and strong thunder
- Outstanding power control for grids
- Provided by Japanese manufacturers

Downwind Turbine Features

1st Commercial Unit
(Completed Feb. 2008)
(Kashima Works, Hitachi Chemical)
5-5 Promoting Solar Power Generation Systems

- Use Accumulated Control Technologies to Harmonize With Power Grids

- Solar power generation depends on weather
- Prevent lower power quality due to output fluctuations
- Smooth connection with power grid

**Grid interconnection system**

- Power Conditioners
- Voltage fluctuation control (Curb voltage fluctuation due to variation in power output)

**Power Grid**

- AC
- DC

**Solar Power**

- Voltage fluctuation control
- Prevent dropout during grid disturbance (FRT control)

**Storage batteries and grid interconnection systems**

**FRT**: Fault Ride-Through is a function that ensures continuous operation and grid stability in the event of a voltage or frequency fluctuation due to a grid accident.

: Hitachi Group technologies
Focus on the battery business with efforts spearheaded by Battery Systems Division
Promote development to advance Social Innovation Business

Social Innovation Business

Wind power generation, solar power generation

- Lead storage batteries for wind and solar power generation
  - Features
    - Long life
    - Easy Maintenance

Motors

Batteries

Inverters (Control)

Automobiles

- Hybrid vehicles
- Plug-in hybrids
- Electric vehicles

Consumer

- Mobile phones
- Game consoles
- Home appliances

Power tools

Industrial machinery

Construction machinery

Railway cars

Typical applications:

- Industrial machinery
- Construction machinery
- Railway cars
- Motors
- Motors (Control)
- Inverters
- Automobiles (Electric vehicles)
- Plug-in hybrids
- Electric vehicles
- Trucks

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5–7 Promoting Development of Smart Grid–related Systems

Develop and Provide Products/Solutions in 5 Fields

- Grid control
  - Distributed power source harmonization
  - Higher administrative efficiency
- Customer services
  - Facility & investment optimization
- EMS
  - DMS
- SVC
- Facility management systems

Coordinate Power Systems and ICT

Power System Infrastructure Technology
- Power facility and monitoring/control systems
- Development, manufacturing and maintenance technologies

ICT Infrastructure Technology
- Information system technology
- Telecommunications network integration technology

AMI solutions

SVC: Static Var Compensator
AMI: Advanced Metering Infrastructure
EMS: Energy Management System
DMS: Distribution Management System
Power Systems Business Presentation

June 18, 2009

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1. Market Trends
2. Management Policy
3. Nuclear Power Business
4. Thermal Power Business
5. Renewable Energy Business
6. Conclusion

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6. Conclusion

Contribute to Creation of a Low-Carbon Society

FY2011 Targets
Revenue: 1 trillion yen
Operating margin: 5%

Promote Globalization

Increase Profitability
Cautionary Statement

Certain statements found in this document may constitute "forward-looking statements" as defined in the U.S. Private Securities Litigation Reform Act of 1995. Such "forward-looking statements" reflect management's current views with respect to certain future events and financial performance and include any statement that does not directly relate to any historical or current fact. Words such as "anticipate," "believe," "expect," "estimate," "forecast," "intend," "plan," "project" and similar expressions which indicate future events and trends may identify "forward-looking statements." Such statements are based on currently available information and are subject to various risks and uncertainties that could cause actual results to differ materially from those projected or implied in the "forward-looking statements" and from historical trends. Certain "forward-looking statements" are based upon current assumptions of future events which may not prove to be accurate. Undue reliance should not be placed on "forward-looking statements," as such statements speak only as of the date of this document.

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- fluctuations in product demand and industry capacity, particularly in the Information & Telecommunication Systems segment, Electronic Devices segment and Digital Media & Consumer Products segment;
- increased commoditization of information technology products and digital media related products and intensifying price competition for such products, particularly in the Information & Telecommunication Systems segment, Electronic Devices segment and Digital Media & Consumer Products segment;
- uncertainty as to Hitachi's ability to continue to develop and market products that incorporate new technology on a timely and cost-effective basis and to achieve market acceptance for such products;
- rapid technological innovation, particularly in the Information & Telecommunication Systems segment, Electronic Devices segment and Digital Media & Consumer Products segment;
- exchange rate fluctuation for the yen and other currencies in which Hitachi makes significant sales or in which Hitachi’s assets and liabilities are denominated, particularly against the U.S. dollar and the euro;
- fluctuations in the price of raw materials including, without limitation, petroleum and other materials, such as copper, steel, aluminum and synthetic resins;
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- general socio-economic and political conditions and the regulatory and trade environment of Hitachi’s major markets, particularly Japan, Asia, the United States and Europe, including, without limitation, direct or indirect restrictions by other nations on imports, or differences in commercial and business customs including, without limitation, contract terms and conditions and labor relations;
- uncertainty as to Hitachi's access to, or ability to protect, certain intellectual property rights, particularly those related to electronics and data processing technologies;
- uncertainty as to the outcome of litigation, regulatory investigations and other legal proceedings of which the Company, its subsidiaries or its equity method affiliates have become or may become parties;
- the possibility of incurring expenses resulting from any defects in products or services of Hitachi;
- uncertainty as to the success of restructuring efforts to improve management efficiency and to strengthen competitiveness;
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