Session III of the U.S. - JAPAN Roundtable Series: Partners in Nuclear Energy


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MITSUBISHI HEAVY INDUSTRIES, LTD.
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1. Nuclear Energy As a Key Player
Growing Needs for Clean & Affordable Energy
- Concern About Climate Change Continue
- Energy Security
- Energy Needs in the Developing World
- Proliferation Issues
- No Single Winner, No Loser in Energy Portfolio

The Role of Nuclear Power
- Solution to Cover Spectrum of Needs
- Engineering / Technological Advances
- Safe, Clean and Economical NPP Development
U.S.- Japan Cooperation As a Key Player

- New Build in US and Japan
- Efficient and Safe Operation
- Emerging Market
2. Overview of MHI Nuclear
Mitsubishi Nuclear Organization

Approximately 4,500 employees on a consolidated basis (as of April 2010)

- **Mitsubishi Nuclear Fuel Co., Ltd.**
- **Nuclear Fuel Transport System Co., Ltd.**
- **Nuclear Development Corporation**
- **Nuclear Plant Service Engineering Co., Ltd.**
- **Nuclear Power Training Center, Ltd.**
- **Takasago R&D Center**

- **MFBR** (MITSUBISHI FBR SYSTEMS, INC.)
- **ATMEA.SAS.**

- **Kobe Shipyard & Machinery Works** (Nuclear Island)
- **Takasago Machinery Works** (Turbine Island)
- **Mitsubishi Electric Corporation** (Electrical Equipment)

- **U.S.A. : MNES**
  - (Mitsubishi Nuclear Energy Systems, Inc.)

(Control/Managing of Nuclear Business)
Kobe Shipyards & Machinery Works

- Established: 1905
- Employees: 3,900
  (For Nuclear Division: 1,700)
- Land Area
  1. Main Plant: 669,100 m²
  2. Futami Plant: 501,100 m²
- Nuclear products
  • Steam Generator
  • Reactor Vessel etc.

RV (Reactor Vessel)  Steam Generator  Steam generator facility  Nuclear reactor vessel / reactor internal facility (Futami)

Kobe Engineering Center
Takasago Machinery Works

- Established: 1962
- Employees: 3,300
  (For Nuclear Division: 500)
- Land Area
  1. Main Plant: 873,800 m²
  2. Iwanai Plant: 7,100 m²
  3. Orland Service Center: 60,000 m²
- Nuclear products
  - Steam Turbine
  - Condenser etc.

Steam Turbine

Nuclear turbine rotor facility

Education and Training Center of Technical and Human Skill
Total EPC Capability

MHI supports all fields with total engineering including conceptual planning, basic, & detailed design, R&D, procurement, manufacturing, construction and maintenance services for both the Nuclear Island and the Turbine Island.
Mitsubishi Cutting Edge  
Continuous Track Record in Japan

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<tr>
<th>Period</th>
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<th>2000s</th>
<th>2010s</th>
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<td><strong>Replacing Fleet</strong></td>
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<td><strong>Planned Units</strong></td>
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**Major Replacement Projects**

- Steam Generators: For 12 plants
- Reactor Vessel Heads: 20
- Reactor Internals: 4
- Turbine Rotors: 14
- Main Control Boards: 6

Sendai #3: '19, to be commercially on line
Extensive Experiences of New Builds

- Contribution to All of the 27 Japanese PWR Plants
- From First PWR Power Plant Mihama Unit1 in 1970 to the 21st Century’s Latest APWRs
- New Build (or Replacement) Projects Continued Constantly even in the 80-90’s “Nuclear Stagnation” in the US and Europe
- Developed Our Own Technologies throughout Long History to Our Core Competence

- 24 PWRs in operation
- Tsuruga -3/4 APWRs under Licensing
- Sendai #3 APWR under Planning

TOMARI P/S
TSURUGA P/S
MIHAMA P/S
OHI P/S
GENKAI P/S
IKATA P/S
TSURUGA P/S

Monju
Fast (Breeder) Reactors
Joyo
Rokkasho Reprocessing Plant
Component Supply to Global Market

MHI exported over 85% of all nuclear components exported from Japan

Belgium
- SG: 10 units

Sweden
- RVCH: 3 units

Finland
- RV: 1 unit

China
- RVCH: 3 units
- SG: 6 units
- RCP: 8 units
- CHP: 24 units

Sweden
- RVCH: 3 units

U.S.A
- RVCH: 16 units
- SG: 6 units
- Prz: 1 unit

Brazil
- RVCH: 1 unit

France
- SG: 15 units
- Turbine: 1 unit

Spain
- Turbine: 1 unit
- Turbine Rotor: 2 sets

Toshiba Heavy Industries, Ltd.

SG: Steam Generator
RV: Reactor Vessel
RVCH: Reactor Vessel Closure Heads
RCP: Reactor Coolant Pump
CHP: Charging Pump
Prz: Pressurizer
MHI’s Overseas Bases and Strategic Partners

Strategic partners selected taken into consideration MHI strategic needs and capabilities of partners

- Project-wise collaboration with Iberinco for EU-APWR
- Collaboration with AREVA in development of ATMEA1
- Collaboration with COMEX for maintenance
- Collaboration with WEIR for nuclear power pumps
- Cooperation with 5 Japanese companies for “International Nuclear Energy Development of Japan” for NPP project in Vietnam
- License supply & production collaboration with Harbin Group for nuclear turbines

North America
- URS
- B&V

Europe
- A
- COMEX
- ATMEA
- MHI

Asia
- Harbin Group
- MHI

US Potential Partners

PROJECT BY PROJECT COLLABORATION WITH URS AND B&V AS EPC PARTNERS FOR US-APWR
Comprehensive Lineup of Nuclear Technologies

US/EU-APWR

- **The world’s largest light water reactor** (1,700 MWe class)

1. **US-APWR**
   - The US-APWR is selected for potential nuclear plants.
   - **[Owner]** | **[Site]**
     - Dominion | North Anna #3 | Virginia
     - Luminant | Comanche Peak #3&4 | Texas

2. **EU-APWR**
   - Conformance certification application to European Utilities Requirements (EUR).

Domestic newly constructed plants

- **Domestic PWR plants**

1. **HEPCO Tomari** #3 Reactor started commercial operation on December 22, 2009 (Latest 3rd generation reactor)

    - The 24th newly constructed PWR plant in Japan.

2. **Sendai** #3 preparation for establishment license application started

3. **JAPCO Tsuruga** #3 and #4 Reactors (Domestic 1,538 MWe class APWR)

    - Under safety review, expected to start operation in 2017 and 2018

ATMEA1

- **Globally compatible intermediate light water reactors** (1,100 MWe class)

1. A joint venture established with AREVA in 2007
2. Combine the world’s most advanced/proven technologies of both companies.
3. Complete basic design and start marketing activities in 2009.

Future reactors

- **Next generation Light Water Reactors** (1,780 MWe)
  - Participation in the national project.

- **Fast Breeder Reactors (FBR)**
  - Make Japanese technology adopted as a global standard.
Strategy of Global Business Operation (including Nuclear)

**Overseas Orders received**

- 4,400 bil. yen
- 3,200 bil. yen

Japan: 180% increase from 2007-2009 average to 2014
Overseas: 49% increase from 2007-2009 average to 2014

**Overseas procurement**

- 180% increase from 2007-2009 average to 2014

**Overseas manufacturing**

- 200% increase from 2007-2009 average to 2014

**Overseas Orders received by region FY2014**

- North America: 43%
- Asia: 24%
- Europe: 15%
- Latin America: 6%
- Middle East: 7%

**Overseas group company**

Overseas office, representative
Nuclear Emerging Country Market

Major nuclear players

- **Government Lead and/or Government Owned companies**
  - Russia (Atomstroyexport)
  - South Korea (KEPCO + Doosan)
  - France (EDF + AREVA)
  - Canada (AECL)

- **Private Company**
  - USA (GE/Hitachi, Westinghouse)
  - Japan (Mitsubishi Heavy Industries, Hitachi/GE, Toshiba)
Idea: Export Model for Nuclear Emerging Countries

Utilities
- Participation of Utilities (need incentive for the Utilities)

Nuclear Emerging Country
- Labor Supply, Locally Procured Equipment

Governments
- Regulation, Licensing, Standard, Finance etc.

Private Company
- Export

MHI
- Nuclear Main Component
- Project Management
- Nuclear Supply Chain

Partners
MHI Contribution: Experience and Ability

- **Experiences in Nuclear Advanced Countries**
  - QA Experiences in Component Export
  - CMIS (Configuration Management Information System)
  - Project Execution Plan
  - WBS (Work Breakdown Structure)

- **Own Facilities to support launching Nuclear Power Plant Operation**
  - Plant Operation Training Center
  - Service and Maintenance Training Center

- **Capability to contribute in various ways**
  - Training for nuclear engineer
  - Collaboration with Utilities (R&D)
  - As various kind of infrastructure Maker
  - Education of local industry
Expectation to US and Japanese Government

- Harmonization of design licensing activities through international organization such as MDEP
- Promoting to make world wide rules on export Nuclear Power Plant (No dumping, Sales within Peaceful use etc.)
- Support to establish Nuclear Infrastructure (Nuclear related law, Nuclear Safety Authority)
- Support to educate and bring in non-proliferation measures to meet IAEA rules (Safeguard etc.) on Nuclear Power Plant
- Support of Nuclear Power Plant Operation Activity (together with Utilities)
- Preparation of an attractive financial proposal
4. Closing
MHI has **Abundant experiences** to supply **Safe, Reliable and Economic PWR plants** and to render **Excellent services with Highest reliability**.

MHI has extensive capability to carry out **Integrated activities**, such as conceptual design, engineering, manufacturing of main components, construction, commissioning and maintenance.

MHI is ready to collaborate with U.S. and Japanese Governments, Utilities and Vendors to promote nuclear introduction in the emerging countries.

A Leading Company in the Global Nuclear Energy Field

~ Sophisticated Production Capabilities
Contribute to Low-Carbon Society ~
Our Technologies, Your Tomorrow