Mitsubishi Electric
Business Strategy of Power Systems

March 8, 2017

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Executive Officer
Group President
Energy & Industrial Systems
1. Business Portfolio

Business Portfolio of Mitsubishi Electric

**Energy & Electric Systems**
- **Power Systems**
  - Power generation systems,
  - Transmission & distribution systems,
  - Power distribution systems,
  - Particle therapy systems, etc.
- **Transportation Systems**
  - Inverters, main motors and air conditioning systems for railcars,
  - Train Vision, Train control and management systems,
  - Railcar operation management systems, etc.
- **Building Systems**
  - Elevators, Escalators,
  - Building management systems, etc.
- **Public Systems**
  - Water treatment systems,
  - Disaster prevention systems, etc.

**Industrial Automation Systems**
- **Factory Automation (FA) Systems**
  - PLCs, AC servomotors,
  - CNCs, Industrial robots,
  - Laser processing machines, etc.
- **Automotive Equipment**
  - Starters, Alternators, Car multimedia,
  - Electric power steering, etc.

**Information & Communication Systems**
- **Space Systems**
  - Satellites, Ground systems for satellite control, etc.
- **Defense Systems**
  - Radar equipment, Antennas, etc.
- **Communication Systems**
  - Optical, wireless and satellite communications systems, etc.
- **Video Monitoring Systems**
  - Network cameras, Car Vision, etc.
- **IT Solution**

**Electronic Devices**
- **Power Devices**
  - SiC modules, IGBT modules, etc.
- **High Frequency and Optical Devices**
  - High frequency devices (GaN and GaAs), Optical devices, etc.
- **TFT LCD Modules**

**Home Appliances**
- **Air-Conditioning & Refrigeration Systems**
  - Room and package air conditioners,
  - Multiple AC units for buildings,
  - Lossnay ventilation systems, etc.
- **Housing Equipment**
  - Smart appliances, Lighting, HEMS, etc.
- **Kitchen and Other Household Appliances**

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*PLC: Programmable Logic Controller, CNC: Computerized Numerical Controller, IGBT: Insulated Gate Bipolar Transistor, GaN: Gallium Nitride, GaAs: Gallium Arsenide, HEMS: Home Energy Management System*
1. Business Portfolio

**Power Systems**
- Power generation systems,
- Transmission & distribution systems,
- Power distribution systems,
- Particle therapy systems, etc.

**Transportation Systems**
- Inverters, main motors and air conditioning systems for railcars, Train Vision, Train control and management systems, Railcar operation management systems, etc.

**Building Systems**
- Elevators, Escalators,
- Building management systems, etc.

**Public Systems**
- Water treatment systems,
- Disaster prevention systems, etc.

**1924** produced 2,300kVA vertical shaft water turbine generators

**1968** produced the first Gas Insulated Switchgear (GIS) in Japan

**1991** supplied the first Static Synchronous Compensator (STATCOM) in the world

**1996** developed 51,300kW DC generator (World record)

**2010** started operation of in-house test facilities for Smart grid, Smart community

**2016** started building in-house test facilities for High Voltage DC transmission (HVDC) etc.

Introduced many ground breaking products, leading industries since its establishment
2. Business overview

Energy & Industrial Systems Group

Providing / advancing / enhancing electric infrastructure to promote an active and socially responsible society.

Our Customers

◆ Electric Utilities (Domestic/Overseas)
◆ Others (New Power Producer, Hospital etc.)

Our business

Products and system development / manufacturing / sales / engineering for customers in energy markets

Supply equipment / systems in each area, “Power generation” → “Transmission” → “Distribution”

Thermal, Hydro, Nuclear, Photo Voltaic etc.

Substation, Load dispatching / control systems

Factory, Building, Home etc.
Committed to environmental emissions reductions and efficient energy use

### Power generation systems (Thermal / Nuclear / Hydro)

- **Turbine Generator**
- **Total advanced digital I&C system for Nuclear power plant**
- **Water turbine generator**
- **I&C system for thermal power plant**
- **Radiation detector**
- **I&C system for Hydro power plant**

#### Business overview

(Business category / product line-up)

- Power generation systems (Thermal / Nuclear / Hydro)

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2. Business overview (Business category / product line-up)

Transmission & Distribution Systems

- high quality and efficient power supply

Switchgear

Power Transformer

Power distribution systems

- distribute electric power safely and certainly to all users

Vacuum circuit Breaker

Substation Administrative System

Cubicle-type Gas Insulated Switchgear (C-GIS)
2. Business overview
   (Business category / products line-up)

**Power Electronics Systems**

Meeting market needs (FACTS*¹, HVDC*²) from increased renewable energy integration

※1 Flexible AC Transmission System
※2 High Voltage Direct Current

Static Var Compensator

**T&D ICT* Systems**

Support smart and efficient operations of electric power market with keeping grid reliability and stability

- BLEndEr®
- Package Software for Power ICT system
  - Protection relay
  - Smart meters
- Load dispatching system
- Energy storage system

*Information and Communication Technology
Expand medical business and superconductor business using newly developed technologies such as analyzing technology for electromagnetic fields, and new manufacturing technology for electromagnets.

**Medical system / Superconductivity system**

- **Developed Technologies for the Energy Systems Business**
  - Analyzing Technology for electromagnetic fields
  - Manufacturing technology for electromagnets

- **Accelerator**
- **X-ray Technology for medical**
- **Particle therapy system**
- **Superconducting magnet for MRI**
- **Superconductive coils for R&D systems of nuclear fusion**

*Illustration: National Institutes for Quantum and Radiological Science and Technology*
3. Sales trends

- Under demand growth situation due to recovery demand after the great east Japan earthquake in 2011 and demand for deregulation in electricity market in 2016, consolidated sales volume was stable around 330 ~ 350 billion JPY.

**Consolidated sales (Actual / forecast)**

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Actual / Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2010</td>
<td></td>
</tr>
<tr>
<td>FY2011</td>
<td></td>
</tr>
<tr>
<td>FY2012</td>
<td></td>
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<tr>
<td>FY2013</td>
<td></td>
</tr>
<tr>
<td>FY2014</td>
<td></td>
</tr>
<tr>
<td>FY2015</td>
<td></td>
</tr>
<tr>
<td>FY2016</td>
<td>(Forecast)</td>
</tr>
</tbody>
</table>

Recovery demand (Power resources development etc.)

Deregulation in electricity market in 2016
4. Business strategy

Corporate Management Policy

~Maintain balanced corporate management for sustainable growth~

Growth

- Accelerate growth of strong business
- Further global expansion
- Create new strong business
- Reinforce the solutions business

Profitability Efficiency

- Enhance capital efficiency
- Create a stronger business foundation

Soundness

- Constantly review and refresh business portfolio
- Maintain sound financial standing
- Promote thorough Ethics and Compliance and CSR initiatives

~Toward a Higher Level of Growth~

Growth target to be achieved by FY2020

- Net sales: 5 trillion JPY or more
- OPM: 8% or more

Group Management Policy

Challenge to the innovation targeting to be a global top player in Power Systems Business

~ take the next “STEP” ~

Strategic, Technology, Efficiency, Priority

Growth target in FY2020

- Net sales: 470 billion JPY or more
- OPM: 8% or more
5. Business environment (Domestic)

■ Capital investment trend of Japanese domestic utilities

Until FY2013 capital investment was following a downward trend
- Capital investment is recovering due to additional power resources deployment (mainly thermal); nuclear power plants remain under a long-term outage situation
- Expect steady growth of capital investment until FY2020

■ Steps in the electricity system reform

<table>
<thead>
<tr>
<th>Schedule of reform</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2015</td>
</tr>
<tr>
<td>Found OCCTO*</td>
</tr>
<tr>
<td>FY2016</td>
</tr>
<tr>
<td>Deregulation in electricity market (incl. retail sector)</td>
</tr>
<tr>
<td>FY2017</td>
</tr>
<tr>
<td>Establish “Negawatt Power” trading market</td>
</tr>
<tr>
<td>~</td>
</tr>
<tr>
<td>Enhance trading menu</td>
</tr>
<tr>
<td>FY2020</td>
</tr>
<tr>
<td>Unbundling</td>
</tr>
</tbody>
</table>

*Organization for Cross-regional Coordination of Transmission Operators, Japan

● By 2020, Utilities will be split into three categories: generation, T&D, and retail. Trading will be enhanced to closer match true market needs of supply and demand.
- Expect demand growth of “ICT System solution business” (incl. division / integration / modification of existing daily operation system in Utilities)
5. Business environment (Global)

- Expanding global electrical generating capacity mainly in Asia and Mid east
- Expect demand growth in T&D sectors corresponding to the capacity expansion

- Showing steady growth in Thermal, Hydro, and Nuclear
- Expanding renewable energy sources such as PV and Wind
- Grid stabilization requirements after the expansion of unstable renewable energy sources

【reference】IEA World Energy Outlook 2016
6. Growth strategy

**Market**
- Realize Grid stabilization needs after the expansion of unstable renewable energy
- Expect demand growth of “ICT System solution business” as part of unbundling efforts until FY2020
- Global demand for Power generation, T&D, and Power Distribution equipment
- Expect significant electricity demand growth in overseas markets compared to domestic

**Approach to target in FY2020**

1. **Progress in growth business areas**
   - Power electronics business
   - ICT business

2. **Maintain and expand existing business areas**
   - Strengthen After-sales business
   - Strengthen product competitiveness (T&D / Power generation / Nuclear etc.)

3. **Accelerate globalization**

**Business Plan (consolidated basis)**

**Overseas sales ratio**

- **32%** in FY2016
- **50%** in FY2020

**Growth business areas**
- Power electronics
- System solution (ICT)

**Existing business area**
- T&D
- Power generation, Nuclear etc.

Deregulation demand in FY2016
6. Growth strategy

① Progress in growth business areas
6. Growth strategy ① Progress in growth business areas

**Power Electronics**

**Market trend and subjects / needs**

- **Expanding renewable energy sources such as PV and Wind.**
  - Expansion of renewable energy such as PV / Wind
    - can cause **unstable situations of the AC power grid**
  - Expanding power sources far from load centers such as off-shore wind farms
    - **increase HVDC transmission needs** which cause lower losses than AC transmission

- **Progress of electricity system reform**
  - Strengthen cross-border grid activity (Facilities enhancement and review operation)

**Business opportunities**

- **Rapid market expansion of power electronics**
  - expect rapid market expansion of self-excited HVDC business

**Growth strategy ① Progress in growth business areas**

- **Progress of electricity system reform**
- **Actualization in domestic market**
  - frequency converter station project
  - cross-region grid project

[Graph showing billion JPY for different years: FY2015 (220), FY2020 (420), FY2025 (720), FY2030 (310, 1,040)]
6. Growth strategy ① Progress in growth business areas

**Power Electronics**

**Our Strengths**

- **Supply record & experience**
  - Power system analysis technology covering initial system planning to actual detailed design
  - 30 year supply record of grid stabilizing system equipment (Top 3 supplier in US)

- **Gain differentiated technology by development and investment**
  - Investing 6 billion JPY during FY2012 ~ 2018

- **Comprehensive technology**
  - Development of key devices “large capacity power semiconductors”
  - Capabilities for full-turn-key projects (electric / I&C, installation)

<table>
<thead>
<tr>
<th>2010</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power systems analysis technology</td>
<td>Simulator for power systems analysis (hybrid, full-digital simulator)</td>
</tr>
<tr>
<td>Supply power electronics systems (FACTS)</td>
<td></td>
</tr>
<tr>
<td>US : 24 projects</td>
<td>US : 24 projects</td>
</tr>
<tr>
<td>Mid-east : 2 projects</td>
<td>Mid-east : 2 projects</td>
</tr>
<tr>
<td>Domestic : 7 projects</td>
<td>Domestic : 7 projects</td>
</tr>
<tr>
<td>SVC in US</td>
<td>SVC in US</td>
</tr>
<tr>
<td>Development of self-excited SVC-Diamond®</td>
<td>Development of self-excited HVDC-Diamond®</td>
</tr>
<tr>
<td>Building HVDC scale model verification facilities (2018 start operation)</td>
<td>Power semiconductors</td>
</tr>
</tbody>
</table>
6. Growth strategy

1. Progress in growth business areas

**Power Electronics**

**Visions**

**FACTS (SVC, STATCOM)**

- Expand from existing business markets (US, Mid-east, Domestic) into developing markets (EU, South-east Asia etc.)

  FY2020 target sales
  10 billion JPY sales or more per year
  *(internal investigation)*

**DC transmission related system (HVDC etc.)**

- Gain orders using HVDC scale model verification facilities & demonstrator
  Target markets: US, EU, and Domestic

- Develop a high quality, competitively priced **DC circuit breaker** for use in future multi-terminal HVDC systems expected starting 2025~2030 in Europe.

  Target order volume by FY2020
  50 billion JPY in total

  Be a global top player in 2020s
ICT business

Market trends and subjects / needs

◆ Progress of the electricity system reform

- Improvement in power exchange markets
  FY2019 baseload power exchange market
  FY2020 real-time exchange market etc.

- Tough competition in power generation retail business

- Cost reductions required in regulated T&D fields

◆ Expansion of renewable energy
  - Unstable PV and wind farms
    (2015 new regulation for output power)

Business opportunities

◆ System business for power exchange
  New system business for new markets
  improving the power exchange markets

◆ New system business for players in a tough competitive field
  Power supply and demand control system
  (system for balancing) for supporting the most economical operation using planning functions for power exchange

◆ Advanced system business for T&D sectors
  Asset management system using online condition monitoring for aging facilities based IoT*1 technology

◆ Smart grid related business
  Energy storage control system boosting expansion of renewable energy

- Expect 1 trillion JPY market in 5 years from FY2016 to FY2020

*1: Internet of Things
6. Growth strategy ① Progress in growth business areas

### ICT business

#### Our Strengths

- **Technology and Know-how developed in-house and demonstrated in collaboration with power utilities**
  - Advanced verification test since 2000
  - Accelerated technology development using in-house verification facilitating since 2010

- **Know-how and experience in deregulated markets**
  - Installed Japan Electric Power Exchange system in FY2005
  - Installed infrastructure system for deregulated market

- **Advanced technology**
  - **Grid control** (Automatic distribution system, power system control)
  - **ICT** (power system operation system, wireless communication system etc.)
  - **Monitoring** (sensors etc.)
  - **Security technology** (encryption technology etc.)

#### System example

- FY2012~FY2014 demonstration experiment with Kyushu Electric in Iki islands
- FY2014~FY2017 demonstration experiment of hybrid battery system with Chugoku Electric in Oki islands

#### FY2005 installed Japan Electric Power Exchange system

<table>
<thead>
<tr>
<th>System / Meters</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheeling system</td>
<td>5/9 utilities</td>
</tr>
<tr>
<td>Smart meters (communication unit)</td>
<td>5/10 utilities</td>
</tr>
<tr>
<td>Smart meters (meter)</td>
<td>around 35% (in FY2014)</td>
</tr>
</tbody>
</table>

#### FY2005

- 2001 Start supply Packaged Software “BLEnDer”

#### FY2005

- 2005 Power supply control system for Kansai electric

#### FY2011

- 2011 Plant engineering facilities management system for Chubu Electric etc.

#### FY2012~FY2017

- Demonstration experiment of hybrid battery system with Chugoku Electric in Oki islands

#### FY2016

- Established Power Systems ICT center
  - Aggregated resources at 1 location in Yokohama
  - Accelerate merging technologies, Control + ICT + Monitoring
6. Growth strategy ① Progress in growth business areas

ICT business

- Build ICT / IoT framework utilizing sensor / control / communication technology
- Accelerate development of applications for market needs such as facilities operation, maintenance management (asset management), and power exchanges.

ICT / IoT framework (concept)

Applications (Electric Power ICT Service Packages)

- Power generation Monitoring
- Power generation management
- Fuel management
- Remote monitoring
- Transmission monitoring
- DAS and voltage management
- Distributive service
- Equipment management
- Wheeling
- Operation trading

Data Integration

Maintenance

Operation and maintenance improvement

Operation

Strategic Support

Risk Management

PL management

Assets operation optimization

Strategic asset management

Power generation monitoring

Supply and demand control

Storage battery control

Monitoring Environment information

Emergency assistance

Monitoring / Transmission information

Equipment failure prediction

Power generation management

Remote monitoring

Electric Power IoT Platform

Monitoring control system

Informatio gathering control

IED

PLC

PCS

Grasp equipment

Machine

Generator

PDE

GIS

Transformer

Facility

Sensors

Generator coil vibration

Breaker rotational displacement

Conductor connection temperature

In partially discharged oil

Gas component

Other’s Appl

Other’s Appl

Other’s Appl

Compatible with other company systems

GIS: Gas Insulated Switchgear
IED: Intelligent Electronic Device
PCS: Power Conditioning System
PLC: Programmable Logic Controller
PDE: Power Distribution Equipment
6. Growth strategy ① Progress in growth business areas

**ICT business**

**Visions**

Domestic ICT business (~FY2020)
- Prior to investment, pick up the latest regulations and needs in the domestic market

FY2016~2020,
Gain **Target market share: 30%** in 1 trillion JPY market

Accelerate globalization of ICT business
- Advance marketing activities for energy storage control systems in overseas markets where there is expanding renewable energy use

1st Target market: US
⇒ Expand in surrounding area

- Propose our smart meter systems to countries developing smart meter infrastructure

1st Target market: South-east Asia
⇒ Expand in surrounding area
6. Growth strategy

② Maintain and expand existing business areas
### Market trend and subjects / needs

- **Demand growth for equipment replacements needed to improve energy supply stabilization and efficiency**
  - Aging equipment
    - [in Power generation/ T&D/ Power Distribution field]
  - New replacements needed to improve efficiency and reduce CO₂
    - [in Power generation field]

- **Demand growth for electricity infrastructure equipment**
  - Particularly in developing countries, demand for new power systems has been expanding, synchronized with the demand for increasing electric generating capacity
    - [in Power generation/ T&D / Power distribution field]

- **Tough competition in global markets**
  - Rise of Chinese / Korean competitors
  - Foreign competitors are entering into the domestic market

- **Customer needs**
  - High quality, low environmental impact (incl. high efficiency), compact, short delivery period, etc.

### Business opportunities

- **Expand after-sales business opportunities**
  - Provided many products after expanding global businesses in the 1960s
  - Equipment installed before 1970s will come up for repair or replacement
    -(Turbine Generator, Transformer, Switchgear etc.)

- **Expanding opportunities by differentiation and by meeting customer needs**
  - Even in tough competition, there are customers who evaluate our product’s “high quality” and “high performance”
  - **Differentiate** by supplying new technology and products which meet customer needs
6. Growth strategy

② Maintain / expand existing business areas

Expand After-sales business (Turbine Generator)

**Turbine Generator for After-sales business**

- Our supply record: 2,100 units.
- Target: 1,000 units or more that need rewinding due to deterioration

<table>
<thead>
<tr>
<th>Target for After-sales business</th>
<th>About 1,000 (Japan: 500, Overseas: 500)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total units</td>
<td>About 2,100 (Japan: 1,100, Overseas: 1,000)</td>
</tr>
</tbody>
</table>

**Customer needs**

- Shortened outage period
- Improved efficiency and ratings by replacement
- Minimize the cost for condition based monitoring and investment

**Our proposal**

- Inspection without removing the rotor using special robots
- Apply the latest technologies to improve efficiency (low loss bearing, high efficient fans, high performance insulation)
- On-line monitoring system for partial discharge, anomaly detection, and analysis of remaining equipment life

**Strong point**

1. Because of a thin 19.9-millimeter, it is capable of inspecting Mitsubishi Electric mid-and large-sized generator.
2. Because of original vibration analysis technology, the robot is able to accurately detect the stator wedge tightness in detail.

**Ultra-thin Robot for Power Generator Inspection**

- 19.9mm thickness
- Close-up view of generator
- Wide view of generator

**Strong point**

- 1. Because of a thin 19.9-millimeter, it is capable of inspecting Mitsubishi Electric mid-and large-sized generator.
- 2. Because of original vibration analysis technology, the robot is able to accurately detect the stator wedge tightness in detail.
6. Growth strategy
② Maintain / expand existing business areas

Expand After-sales business (Power Transformer, GIS)

**Power Transformer for After-sales business**
- Our supply record: 9,400 units.
- Target: about 6,000 units or more aged equipment to be replaced.

<table>
<thead>
<tr>
<th></th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target for After-sales business</td>
<td>About 6,000 (Japan: 1,500, Overseas: 4,500)</td>
</tr>
<tr>
<td>Total units</td>
<td>About 9,400 (Japan: 1,900, Overseas: 7,500)</td>
</tr>
</tbody>
</table>

**GIS for After-sales business**
- Supply record: 12,000 units.
- Target: about 3,600 units or more aged equipment to be replaced.

<table>
<thead>
<tr>
<th></th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target for After-sales business</td>
<td>About 3,600 (Japan: 1,900, Overseas: 1,700)</td>
</tr>
<tr>
<td>Total units</td>
<td>About 12,000 (Japan: 6,500, Overseas: 5,500)</td>
</tr>
</tbody>
</table>

**Customer needs**
- Shorten outage period
- Condition based monitoring and optimized timing for replacement

**Our proposal**
- Shorten site work by partial replacement, reuse foundation, and expand full assembly transportation
- On-line system for partial discharge to diagnose insulation performance
- Sensor for partial discharge

Target for After-sales business
- About 6,000 units
- About 9,400 units

Total units
- About 12,000 units
6. Growth strategy
② Maintain / expand existing business areas

Strengthen products competitiveness

◆ Maintain and expand new equipment business by supplying new products which match customer needs.

<table>
<thead>
<tr>
<th>Customer needs</th>
<th>Example of products</th>
</tr>
</thead>
</table>
| **Turbine Generator**
  ◆ High efficiency
  ◆ Compact to reduce investment |
  **High-efficient turbine generator “VP-X series”**

| **Power Transformer**
  ◆ EX: Installed in a densely populated urban area underground for safety |
  **Power Transformer (Gas insulated)**

| **Switchgear**
  ◆ Increased demand for compact switchgear due to difficulties to secure space in developing countries
  ◆ Easy maintenance and operation |
  **420kV single break GIS**
  **C-GIS for off-shore wind firm**

| **Designed specifically for off-shore wind firms (Compact, easy maintenance.)** |

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6. Growth strategy
② Maintain / expand existing business areas

**Strengthen products competitiveness**

◆ High-efficient turbine generator "VP-X series"

◆ Power Transformer (Gas insulation)

**Strengths**

1. Indirect hydrogen cooling for stator conductors in the 900MVA class turbine generators (World’s-first)
2. **Extra-high efficiency rating of 99%**.
3. **Compact** (20% smaller than conventional indirectly hydrogen-cooled generators)
4. **Shorten delivery time** by new parallel manufacturing methods for the stator core and stator frame

**Future activities**

✓ Proceed with differentiation marketing activities

**Strengths**

1. **Non-flammable and explosion-proof** to ensure safety in densely populated areas and in underground applications
2. **Reduced total life-cycle costs** due to space-saving specifications and easy maintenance

**Future activities**

✓ Marketing activities focused for densely populated urban areas and the like
6. Growth strategy
② Maintain / expand existing business areas

**Strengthen products competitiveness**

**Strengths**

1. **World’s smallest** 420kV class GIS (cf. 30% of existing model)
   - Reduced footprint for substations and shortened installation period
2. **Easy maintenance and improved operability.**
   - Reduce the number of breaking chamber and centralize operation panels in the front

**Future activities**

- Acquire the high demand markets, mainly in Mid-east area
- Gain above 10% share in target markets, mainly Mid-east area

**Strengths**

1. **Compact** due to three-phase structure
   - Can be installed within the space in the wind turbine
2. **Easy maintenance**
   - Features solenoid vacuum circuit breakers which reduce mechanical wear

**Future activities**

- Market to off-shore wind firms, mainly in Europe

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* Our research in 2016

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**420kV single break GIS**

**C-GIS for Offshore wind firm**
6. Growth strategy
② Maintain / expand existing business areas

◆ Increase sales volume and profit through new business models with newly applied technology

**Power generation systems (Thermal / Nuclear)**

◆ Participate electricity supply business (invest to SPC)

◆ **Develop new domestic business in Nuclear back-end field in Japan**
   (1) Increase sales of electric equipment and I&C system for nuclear fuel cycle field at Rokkasyo
   (2) enter into Intermediate storage and decommissioning field with radiation monitoring technology

◆ Participate the development of SMR in US

**Medical systems / Superconductive system**

◆ Expand global business in particle therapy field

◆ **Develop high functionality and invest in a mass-production line for Super conducting magnet for MRI**

◆ Join the ITER and JT-60SA projects

*1: Special Purpose Company  *2: Small Modular Reactor  *3: International Thermonuclear Experimental Reactor  *4: JT-60 Super Advanced
6. Growth strategy

③ Accelerate Globalization
6. Growth strategy ③ Accelerate Globalization

**Business opportunities**

- Significant generation capacity growth overseas compared to domestic markets
  - **Generation Capacity (GW)**

<table>
<thead>
<tr>
<th></th>
<th>① FY2014</th>
<th>② FY2030</th>
<th>variance (② - ①)</th>
<th>ratio (② / ①)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>300 GW</td>
<td>330 GW</td>
<td>+30 GW</td>
<td>110%</td>
</tr>
<tr>
<td>Overseas</td>
<td>5,800 GW</td>
<td>9,000 GW</td>
<td>+3,200 GW</td>
<td>155%</td>
</tr>
</tbody>
</table>

【reference】IEA World Energy Outlook 2016

- Expansion of renewable energy sources such as PV and Wind in Europe and USA
- Realize grid stabilization needs for the integration of renewable energy

- **Electrical generation (TWh) shares of PV and Wind**

<table>
<thead>
<tr>
<th></th>
<th>① FY2014</th>
<th>② FY2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>2.9%</td>
<td>9.4%</td>
</tr>
<tr>
<td>Overseas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>9.7%</td>
<td>22.5%</td>
</tr>
<tr>
<td>USA</td>
<td>4.5%</td>
<td>14.3%</td>
</tr>
</tbody>
</table>

【reference】IEA World Energy Outlook 2016
Global facilities (Japanese base)

- Develop advanced technologies in Japanese factories
- Support overseas facilities from Japanese factories as “mother factory”
- Provide service to domestic customers from HQ and regional offices

Facilities in Japan

- **HQ/branch offices**
  - Fukuyama Works [Fukuyama] <Factory Automation Systems Group>
  - Power Device Works [Fukuoka · Kumamoto] <Semiconductor & Device Group>
  - Power Distribution Systems Center [Marugame]

- **Related division’s factory**
  - Energy Systems Center [Kobe · Nagasaki]

- **Facilities in Japan**
  - Transmission & Distribution Systems Center [Amagasaki · Ako · Kobe]
6. Growth strategy ③ Accelerate Globalization

Global facilities

- Started globalization in the 1980s and currently have facilities located in global markets

<table>
<thead>
<tr>
<th>Area</th>
<th>Main facilities</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Americas</td>
<td>Mitsubishi Electric Power Products, Inc. (MEPPI)</td>
<td>Manufacturing / Marketing / Engineering</td>
</tr>
<tr>
<td>Middle East</td>
<td>Dubai Branch (MELCO – DUBAI)</td>
<td>Marketing / Engineering</td>
</tr>
<tr>
<td>Kuwait</td>
<td>Middle East Electric Company W.L.L. (ME-KWT)</td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>Mitsubishi Electric Europe B.V. Power Systems Group (MEU-PSG)</td>
<td>Marketing / Engineering</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>Mitsubishi Electric Asia (Thailand) Co., Ltd. (ME-TH)</td>
<td>Marketing / Engineering</td>
</tr>
<tr>
<td>China</td>
<td>Mitsubishi Electric Power &amp; Electrical Infrastructure Systems (Beijing) Co., Ltd. (MEPIC)</td>
<td>Marketing</td>
</tr>
</tbody>
</table>

Main facilities

- <MEU-PSG>
- <ME-TH>
- <ME-KWT>
- <MEPIC>
- <MELCO-DUBAI>
- <Japanese base>
- <MEPP>
Localization in USA

- Mitsubishi Electric Power Products, Inc. (MEPPI) founded in 1989
- Started operation of a new transformer factory in Memphis, Tennessee in 2014
- Accelerating localization of manufacturing, marketing, engineering

About MEPPI

- Sales: about 100 Billion JPY
- Employees: more than 1,000
- Business (Power Systems)
  - Products and sales of gas circuit breakers, vacuum circuit breakers, power transformers, and power electronics
  - Generator services

MEPPI’s facilities:

- Generation systems division in Lake Mary, Florida
- Transformer factory in Memphis, Tennessee
- Headquarters in Warrendale, Pennsylvania

Growth strategy ③ Accelerate Globalization
6. Growth strategy ③ Accelerate Globalization

Mid-term Strategy for overseas

- **Strengthen and expand the functions of global facilities (systems engineering)**
- **Expand businesses into neighboring areas of each facility**

<table>
<thead>
<tr>
<th>Area(facilities)</th>
<th>Main Initiative</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Americas (MEPPI)</td>
<td>✓ Accelerate localization of manufacturing, marketing, engineering</td>
</tr>
<tr>
<td></td>
<td>✓ Expand power electronics business</td>
</tr>
<tr>
<td></td>
<td>✓ Expand businesses into Latin America</td>
</tr>
<tr>
<td>Mid-east (MELCO-DUBAI)</td>
<td>✓ Increase orders of FTK business</td>
</tr>
<tr>
<td></td>
<td>✓ Get a toehold in new markets including Africa</td>
</tr>
<tr>
<td>South-East Asia (ME-TH)</td>
<td>✓ Expand business in Thailand and its surrounding countries</td>
</tr>
<tr>
<td>China (MEPIC)</td>
<td>✓ Strengthen partnership with Chinese partners</td>
</tr>
<tr>
<td>Others</td>
<td>✓ Expand businesses into target markets such as India</td>
</tr>
<tr>
<td>Europe (MEU-PSG)</td>
<td>✓ Secure demand of off-shore wind firms and Cross-regional grid projects</td>
</tr>
</tbody>
</table>

**Sales plan (oversea)**

(Billion JPY)

<table>
<thead>
<tr>
<th>Area</th>
<th>FY2016</th>
<th>FY2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Americas</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Mid-east</td>
<td>150</td>
<td>300</td>
</tr>
<tr>
<td>Asia</td>
<td>100</td>
<td>250</td>
</tr>
<tr>
<td>Others</td>
<td>50</td>
<td>150</td>
</tr>
</tbody>
</table>

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7. Development of Fundamental Technologies
For growth beyond FY2020, develop fundamental technologies for future power systems.

- **Future image of power systems**
  - **Advanced asset management**: Decrease unexpected stops from monitoring anomalies.
  - **Substation**: Battery, FACTS equipment.
  - **Power grid**: HVDC, Offshore wind.
  - **Advanced distribution network**: Advanced distribution network with expansion of renewable energy.
  - **Electricity markets**: Real time markets, Capacity markets.
  - **Advanced trading in the electricity markets**: Optimal supply and demand response operation.
  - **Effective utilization of customer’s assets**: Using distributed power sources/battery/EV.

- **Power plant**: Gas pipeline, battery.
- **Power grid**: Substation, FACTS equipment, MVDC, FACTS equipment, Smart meter.
- **Advanced distribution network**: Distribution network.
- **House**: MVDC.
- **Train**: EV, PHV, FCV, Self-driving car.

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**Conclusion**

**Growth target for FY2020**
- Net sales: 470 billion JPY or more
- OPM: 8% or more

**Growth Strategies for FY2020**

1. **Progress in growth business areas**
   - Power electronics business
   - ICT business

2. **Maintain and expand existing business areas**
   - Strengthen after-sales business
   - Strengthen products competitiveness (T&D / Power generation / Nuclear etc)

3. **Accelerate globalization**

**Sales plan**

- **Overseas sales ratio**
  - FY2016: 32%
  - FY2020: 50%

**Growth business areas**
- Power electronics business
- System solution (ICT)

**Existing business areas**
- T&D
- Power generation, Nuclear etc

**Deregulation demand in FY2016**
Cautionary Statements
The expectation of operating results herein and any associated statement to be made orally with respect to the Company’s current plans, estimates, strategies and beliefs, and any other statements that are not historical facts are forward-looking statements. Words such as “expects,” “anticipates,” “plans,” “believes,” “scheduled,” “estimated,” “targeted,” along with any variations of these words and similar expressions are intended to identify forward-looking statements that include but are not limited to projections of revenues, earnings, performance and production. While the statements herein are based on certain assumptions and premises that the Company trusts and considers to be reasonable under the circumstances to the date of announcement, you are requested to kindly take note that actual operating results are subject to change due to any of the factors as contemplated hereunder and/or any additional factor unforeseeable as of the date of this announcement. Such factors materially affecting the expectations expressed herein shall include but are not limited to the following. As such, additional factors may arise at any given time.

1. Any change in worldwide economic and social conditions, as well as laws, regulations, taxation and other legislation
2. Changes in foreign currency exchange rates, especially yen/dollar rates
3. Changes in stock markets, especially in Japan
4. Changes in balance of supply and demand of products that may affect prices and volume, as well as material procurement conditions
5. Changes in the ability to fund raising, especially in Japan
6. Uncertainties relating to patents, licenses and other intellectual property, including disputes involving patent infringement
7. New environmental regulations or the arising of environmental issues
8. Defects in products or services
9. Litigation and legal proceedings brought and contemplated against the Company or its subsidiaries and affiliates that may adversely affect operations or finances
10. Technological change, the development of products using new technology, manufacturing and time-to-market
11. Business restructuring
12. Incidents related to information security
13. Occurrence of large-scale disasters including earthquakes, typhoons, tsunami, fires and others
14. Social or political upheaval caused by terrorism, war, pandemic by new strains of influenza and other diseases, or other factors