Strategies for the Energy & Environment Business

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Takato Nishizawa
Executive Vice President
Energy & Environment Business

MITSUBISHI HEAVY INDUSTRIES, LTD.

Contents

Introduction

We humbly extend our heartfelt sympathies to all those affected by the Great East Japan Earthquake, and offer warm wishes for the swift recovery of the affected areas.

For its part, MHI intends to make a concerted effort to support earthquake disaster reconstruction.

1. The Role of the Sustainability Energy & Environment Strategic Planning Department

The Role of the Sustainability Energy & Environment Strategic Planning Department

Leading Role at MHI in Energy & Environment Business Development

- Formulates Medium-to-Long-Term Development Policies
- Makes Recommendations to Governmental and Industrial Circles
- Promotes the Creation of Business Opportunities on a Company-wide Basis

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Leading Role at MHI in Earthquake Disaster Reconstruction Support

- Support Related to the Fukushima Nuclear Power Plant
- Waste Disposal
- New Town Development

2. Initiatives for Earthquake Disaster Reconstruction

Overview of the Great East Japan Earthquake (Comparison with the Great Hanshin-Awaji Earthquake)

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Great Hanshin-Awaji Earthquake:	Urban-centered earthquake. Damages from the earthquake were primarily caused by widespread disruption to lifelines, and the collapse of buildings and homes and the outbreak of fires.
Great East Japan Earthquake:	Widespread earthquake that affected Tokyo and nine prefectures, mainly Iwate, Miyagi and Fukushima prefectures. In addition to damages caused by the earthquake itself, damages due to the ensuing tsunami, fires, liquefaction phenomena, incident at the Fukushima Daiichi Nuclear Power Plant and so on were wide-ranging.

Damages		Great Hanshin-Awaji Earthquake	Great East Japan Earthquake (data released as of May 10, 2011)	
Date and Time of Occurrence		January 17, 1995 at 5:45:52 a.m.	March 11, 2011 at 2:46 p.m.	
Earthquake Type		Inland Epicentral Earthquake (M7.2)	Offshore Epicentral Earthquake (M9.0)	
Damages		Damage due to the collapse of buildings Damage due to fires	Damage due to the collapse of buildings Damage due to tsunami Damage due to incident at the Fukushima Daiichi Nuclear Power Plant	
Regions where Damage Occurred		Region centered around Southeast Hyogo (Awaji/Hanshin districts)	Damage in Tokyo and nine prefectures including Iwate, Miyagi and Fukushima prefectures	
Casualties	Deaths	6,434 people	14,786 people	
	Missing Persons	3 people	9,982 people	
	Injured	43,792 people	8,402 people	
Evacuees (Maximum)		At least 300,000 people	At least 450,000 people	
Housing Damage	Completely Destroyed	104,906 homes	83,586 homes	High percentage completely destroyed
	Partially Destroyed	144,274 homes	31,747 homes	
	Partially Damaged	390,506 homes	273,114 homes	
Fire Damage		7,483 homes	265 cases	
Other Damage	Roads	10,069 locations	2,126 locations	Direct damage to infrastructure such as roads and bridges comparatively less
	Bridges	320 locations	56 locations	
	Rivers	430 locations	4 locations	
	Landslides	378 locations	136 locations	
Amount of Rubble Produced		Approx. 20 million tons	Approx. 24.9 million tons (Estimate for three prefectures of Iwate, Miyagi and Fukushima)	
Power Outages		2.6 million cases	8.45 million households	
Total Amount of Damage		Approx. 10 trillion yen	Approx. 25 trillion yen or more	

Sources: Produced based on information from the Ministry of the Environment, Fire and Disaster Management Agency, National Police Agency, Wikipedia, etc.

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MHI Response Status on Emergency and Temporary Measures

1) Restoration of damaged power plants
2) Support for the Fukushima Daiichi Nuclear Power Plant
3) Removal of rubble (shielded forklift trucks, mobile radiation shielded control rooms, etc.)
4) Other measures (“Mega-Float”, etc.)

Use of MHI-owned aircraft to transport medical supplies


Transportation of emergency supplies via MHI helicopter


Mobile radiation shielded control rooms


Modification of “Mega-Float”


Free loan of MHI-owned electric vehicles to electric power companies


Large, special forklift trucks with shielded cabin

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Direction and Challenges in the Reconstruction Process Ahead

➢ Apart from reconstruction of the disaster-affected areas, it is necessary to clarify energy problems and action plans for non-affected areas.

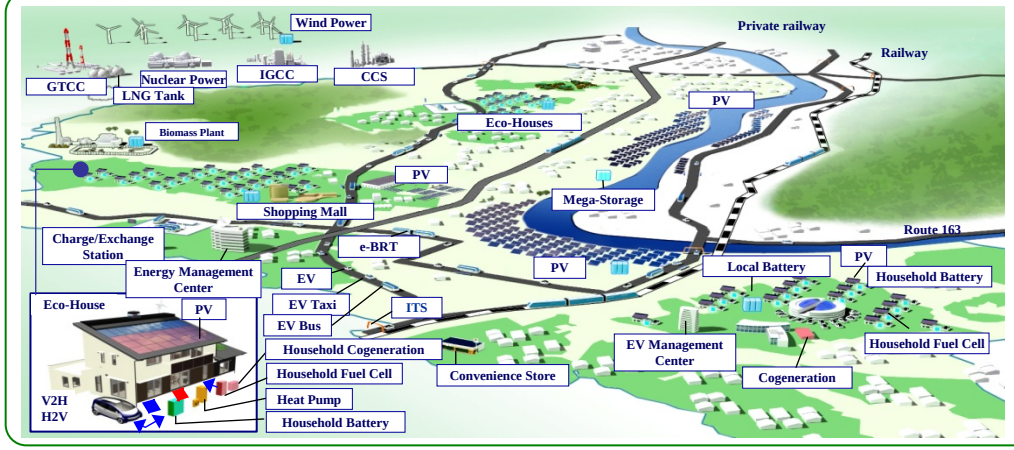
	Item	Direction of Response	Envisaged Challenges
Energy Problems	Response to power shortages as an immediate problem	Full load operation of conventional power generation. Introduction of privately-owned power generating equipment Responding to government calls to conserve electricity	● Securing power in the disaster-affected areas ● Higher consumer-side costs due to increased demand for fossil fuels and the operation of in-house power generation ● Increased costs for business operators due to the adoption of conventional power generating equipment ● Sluggish business activity due to energy-saving measures
	Review of long-term energy plans	Maintenance and promotion of nuclear power after a review of safety standards Higher percentage of conventional power generation Adoption of renewable energy	● Rising unit price of power generation in the long term (The unit cost of generating power through conventional power generation and renewable energy is higher) ● Overconfidence in renewable energy (Photovoltaic power, wind power, etc. are more difficult to establish than major sources of electricity) ● Increased CO_2 emissions
Direction of Reconstruction	Reconstruction efforts in the disaster-affected areas	Restoration to former state Reconstruction with the provision of measures to prevent disaster recurrence Reconstruction with the provision of other added value	● Possibility of recurrence of disaster ● Likelihood that residents, industries, etc. will not return to normal even if infrastructure is restored to its former state ● What degree of investment costs for disaster prevention measures or added value are expected? ● Is reconstruction being carried out in a manner consistent with the characteristics of the region?
	Response for non-affected areas	Town revitalization with disaster prevention functions Town revitalization accounting for diversification of dispersed power sources and communications, etc. Town revitalization with the provision of other added value	● What degree of investment costs for disaster prevention measures or added value are expected? ● Is reconstruction being carried out in a manner consistent with the characteristics of the region? ● Burden of costs and recovery methods associated with response in non-affected areas.

Community Concept for Reconstruction

Normal Situation

Low-Carbon Society

Concept of Smart Community from an Energy Perspective



Realization of a Low-carbon Society

- Coordinate with the existing energy infrastructure and implement energy management that accommodates the adoption of renewable energy on the consumer side and the utilization of unused energy.
- Promote and improve convenience of low-carbon transportation system, such as through the electrification of transportation and a modal shift from cars to public transportation.

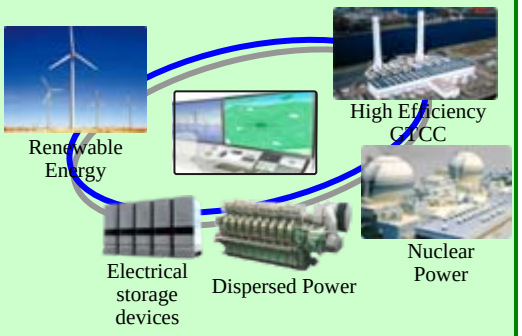
During Emergency

Robust and Highly Resilient Society

Concept of community for disaster recovery utilizing Smart Community System

Robust

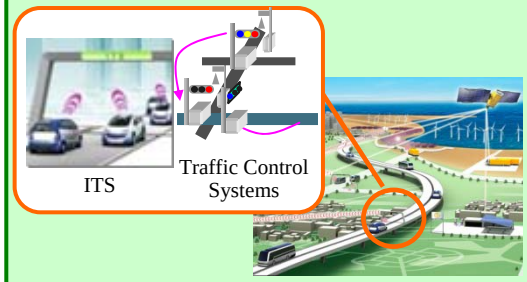
Integrated energy management that combines the existing energy infrastructure with dispersed power and DSM*.



*DSM: Demand Side Management

Reliable

Traffic system that provides road information and gives priority to emergency vehicles even during an emergency



Secure

Management to secure and supply the necessary energy even during an emergency

Securing the necessary electricity with smart houses

Supply of electricity from storage batteries and electric vehicles

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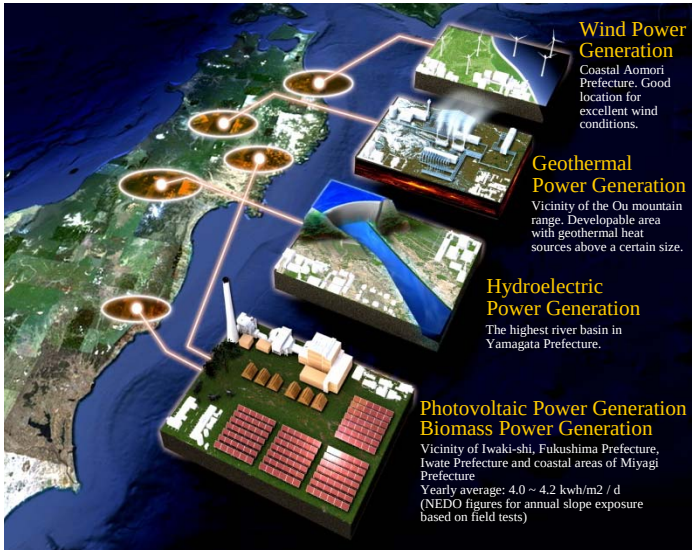
Forming Communities Consistent with Regional Diversity

➢ Required management and combination of systems based on regional characteristics

Examples of combinations of elemental technologies derived from smart communities based on regional characteristics

Region	Regional Characteristics		Combinations of Renewable Energy Applied (Energy Efficiency Optimization)					Other Technologies Applied	
	Major Industry	Abundant Energy Potential	Wind Power	Geothermal Power	Hydropower	Solar Energy	Biomass	Hot/Cold Heat Supply System	Electrical Storage Device
Region A	Fishing	Wind	✓	—	—	✓	—	✓	✓
Region B	Agriculture	Water	—	—	✓	✓	—	—	✓
Region C	Forestry	Biomass	—	—	✓	—	✓	—	—
Region D	Tourism	Geothermal	—	✓	—	✓	—	—	✓
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
Region X	Industrial	Exhaust Heat	✓	—	—	✓	—	✓	✓

Conceptual Image of Communities that Make Use of Regional Characteristics



Features of the Reconstruction Project

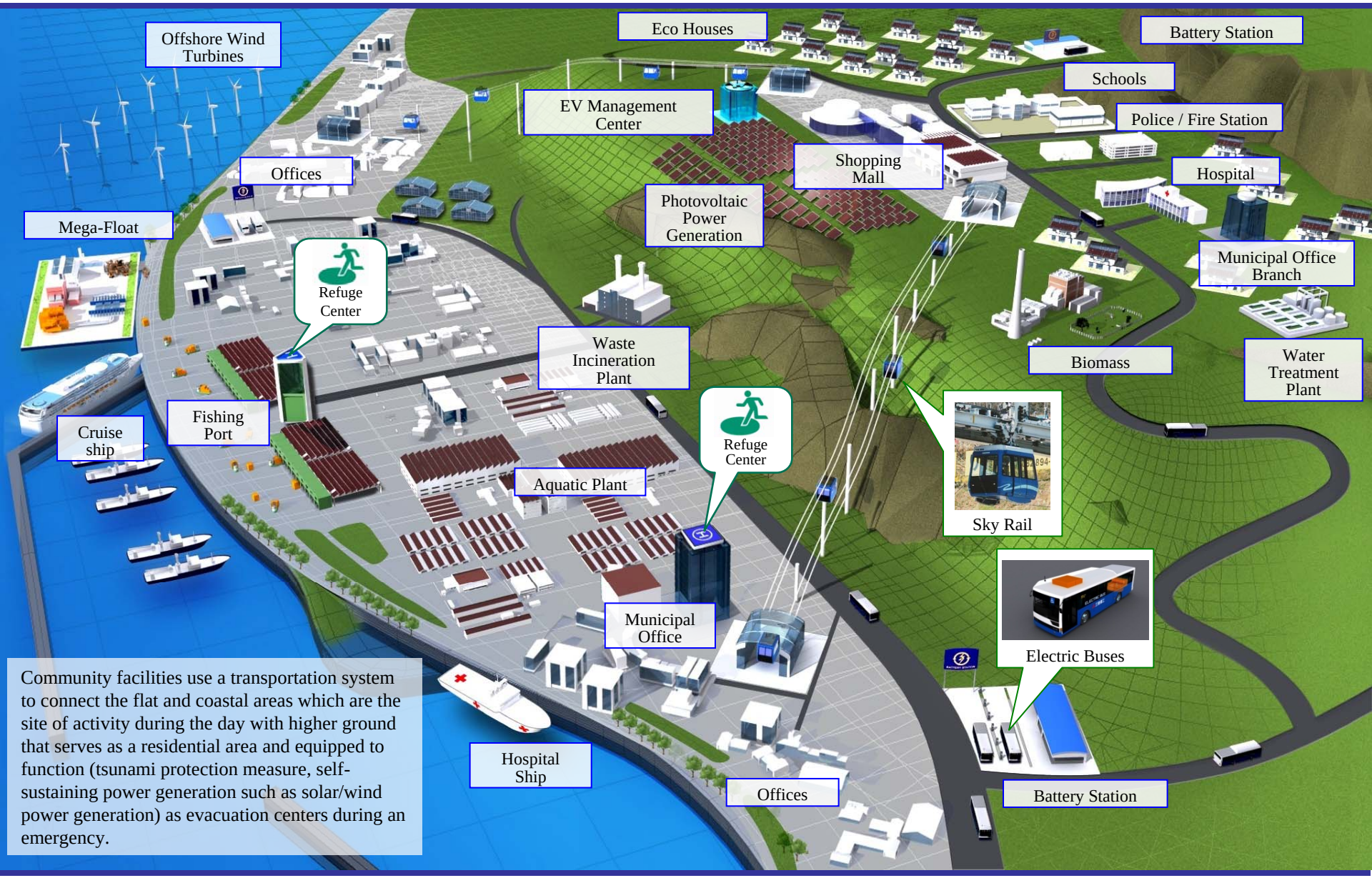
- Variety of reconstruction plans based on regional characteristics
- Use of a wide variety of technologies
- Management of phased construction spanning long periods
- Coordination with many stakeholders
- Creation and management of requirement specifications
- Assurance of performance in terms of budget, work schedule and overall

The key to success of the Reconstruction Project

Human resources and organizations equipped with project management & system integration techniques are essential

MHI's Strengths

Conceptual Image of a Community Designed for Disaster Recovery (Fishing Industry)



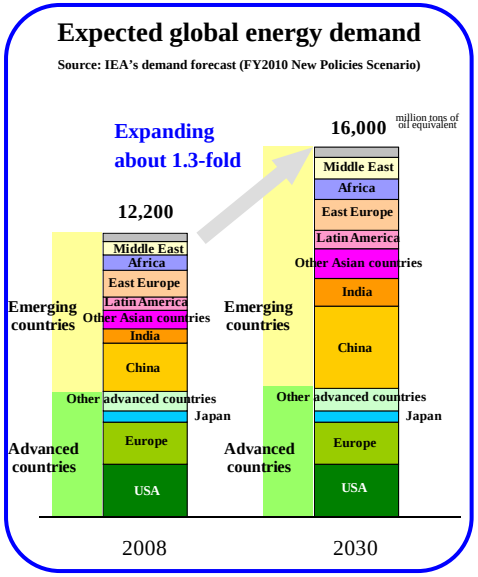
Community facilities use a transportation system to connect the flat and coastal areas which are the site of activity during the day with higher ground that serves as a residential area and equipped to function (tsunami protection measure, self-sustaining power generation such as solar/wind power generation) as evacuation centers during an emergency.

3. Initiatives for the Energy & Environment Business

MHI Initiatives for the Energy & Environment Business

Market Environment

- Review of government energy policies due to the earthquake
  (Nuclear power is needed, after utilizing the lessons learned from the earthquake and reviewing safety standards)
- In the medium-to-long term, the global tide of “transition to a low-carbon society” remains unchanged.



The Four Key Technological Fields for the Energy & Environment Business

- Carbon-free Energy
- Transportation and Logistics Systems
- High-efficiency power generation
- Energy Management

MHI’s Role

The provision of solutions that address the needs of the market with a wide array of product technologies and the integration capability.

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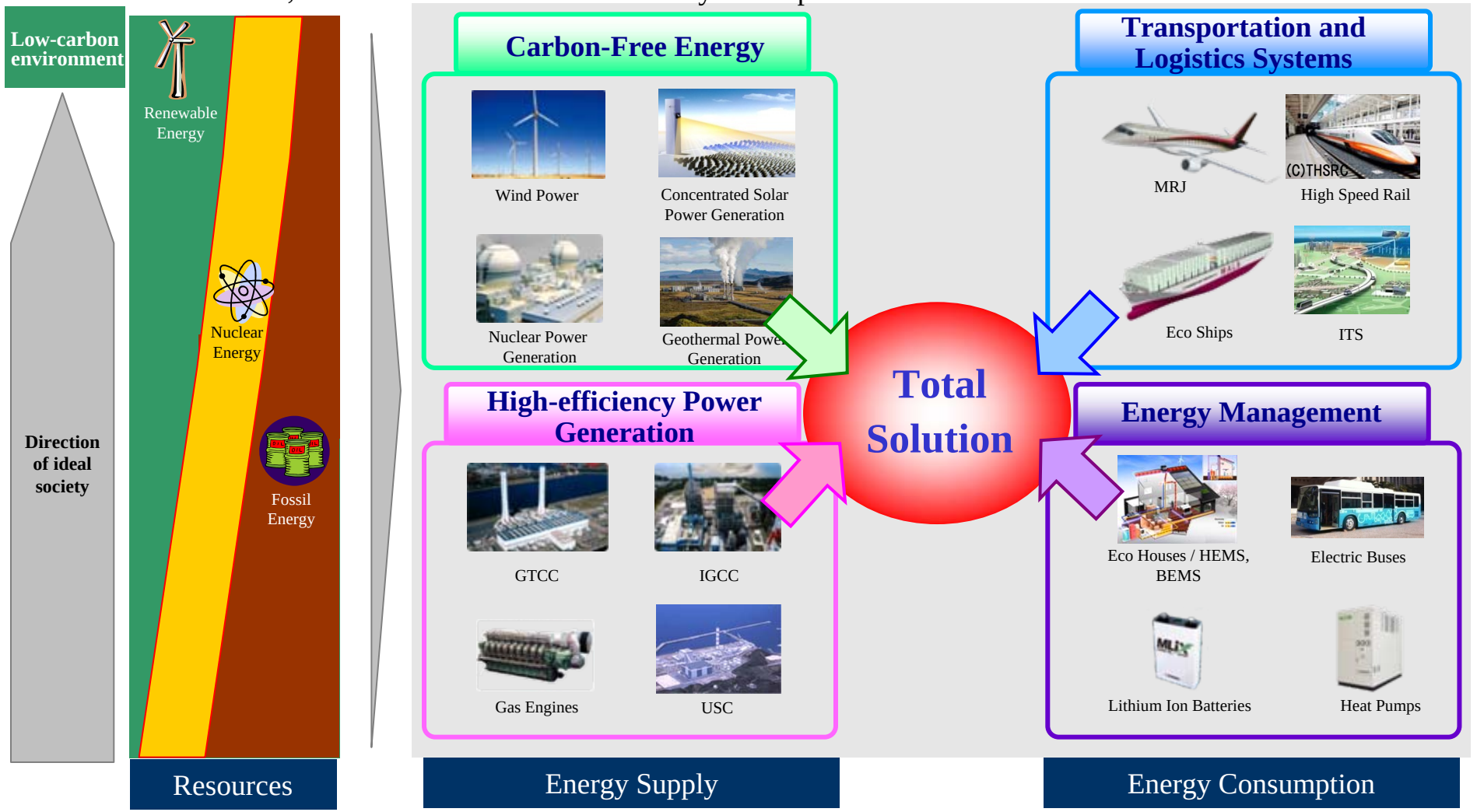
Key Technologies and System Integration

- Integrate key technologies that straddle multiple divisions and provide total solutions in the Energy & Environment Business.
- Contribute to safe, secure and comfortable community development.



GTCC: Gas Turbine Combined Cycle
IGCC: Integrated Coal Gasification Combined Cycle
USC: Ultra Super Critical
MRJ: Mitsubishi Regional Jet
ITS: Intelligent Transport System
HEMS: Home Energy Management System
BEMS: Building Energy Management System

State of Progress for Each Project

Project		State of Progress
Smart Community	India	Pre-Feasibility study regarding development of the Changodar-Sanand district of Gujarat State, India completed. MHI has proposed the promotion electrification of the transportation infrastructure and the adoption of renewable energies in line with improvements to power generating facilities and the stage of economic development. In January 2011, a memorandum of understanding (MOU) regarding urban development was concluded between the state government and the Delhi-Mumbai Industrial Corridor (DMIC) development consortium. A feasibility study is scheduled to be conducted by March 2012.
	China	Joined the Eco-city concept as a Project member. Proposing an electric and thermal energy management business in the region.
	Spain	Agreement reached to conduct demonstrations of an EV management center, power management, information system management, etc. in Malaga, Andalusia. A feasibility study will be completed by July 2011, with the demonstration project scheduled to be conducted by March 2016.
	Keihanna Area	In addition to demonstrations of demand-side energy management, demonstrations of regional energy management including EVs and lifestyle-oriented aspects will be conducted by March 2015 at KEIHANNA, Kansai Science City in Kyoto Prefecture.
Lithium Ion Battery Business	Japan	Construction of the Nagasaki Plant finished in November 2010 ahead of a full-scale entry into the field. In February 2011 in Kyoto and March 2011 in Aomori, trial operations of electric buses carrying regular passengers were conducted.
	Canada	In December 2010, MHI signed an MOU with the Manitoba Provincial Government concerning the expanded use of renewable energy and the development of related technologies. A three-year electric bus development and demonstration project commenced in May 2011.
Offshore Wind Turbines	U.K.	Concluded an MOU with the U.K. government, and currently being subsidized to work on a development project for offshore wind turbines. In July 2010, concluded an MOU with U.K.-based Scottish and Southern Energy plc on the development of low-carbon energy. In December 2010, MHI acquired Artemis Intelligent Power for its gearless hydraulic system.
Concentrated Solar Power Generation	Australia	Aiming for the early development and market launch of dry-type solar thermal power generation utilizing MHI's gas turbine technologies, and the deployment of this type of power generation in desert regions. Experiments on heat receivers in conjunction with Australia's CSIRO are currently under way.
Overseas Nuclear Power Plants	U.S., Southeast Asia, Middle East, Europe	There have been concerns over the impact of earthquakes, but MHI is continuing to provide support for locations in the U.S., Europe, Vietnam and Jordan.
IGCC High-Efficiency GT	Australia, U.S., China, Japan	Working on IGCC projects in Australia and China. Succeeded in the demonstrated operation of gas turbines with the world's highest inlet temperature of 1,600°C. Attained 60% efficiency, a world high.
Geothermal and Hydroelectric Power Generation	Africa, Turkey	Working in conjunction with Iceland-based Reykjavik Energy on the development of geothermal power generation in Africa. Proposing a feasibility study for a electric power stability system that combines wind power generation with pumped-storage generation in Turkey.

DMIC: Delhi Mumbai Industrial Corridor IGCC: Integrated Coal Gasification Combined Cycle

Concepts for Smart-Adoption

➢ Smart concepts are also applied to other public services, and being further developed.

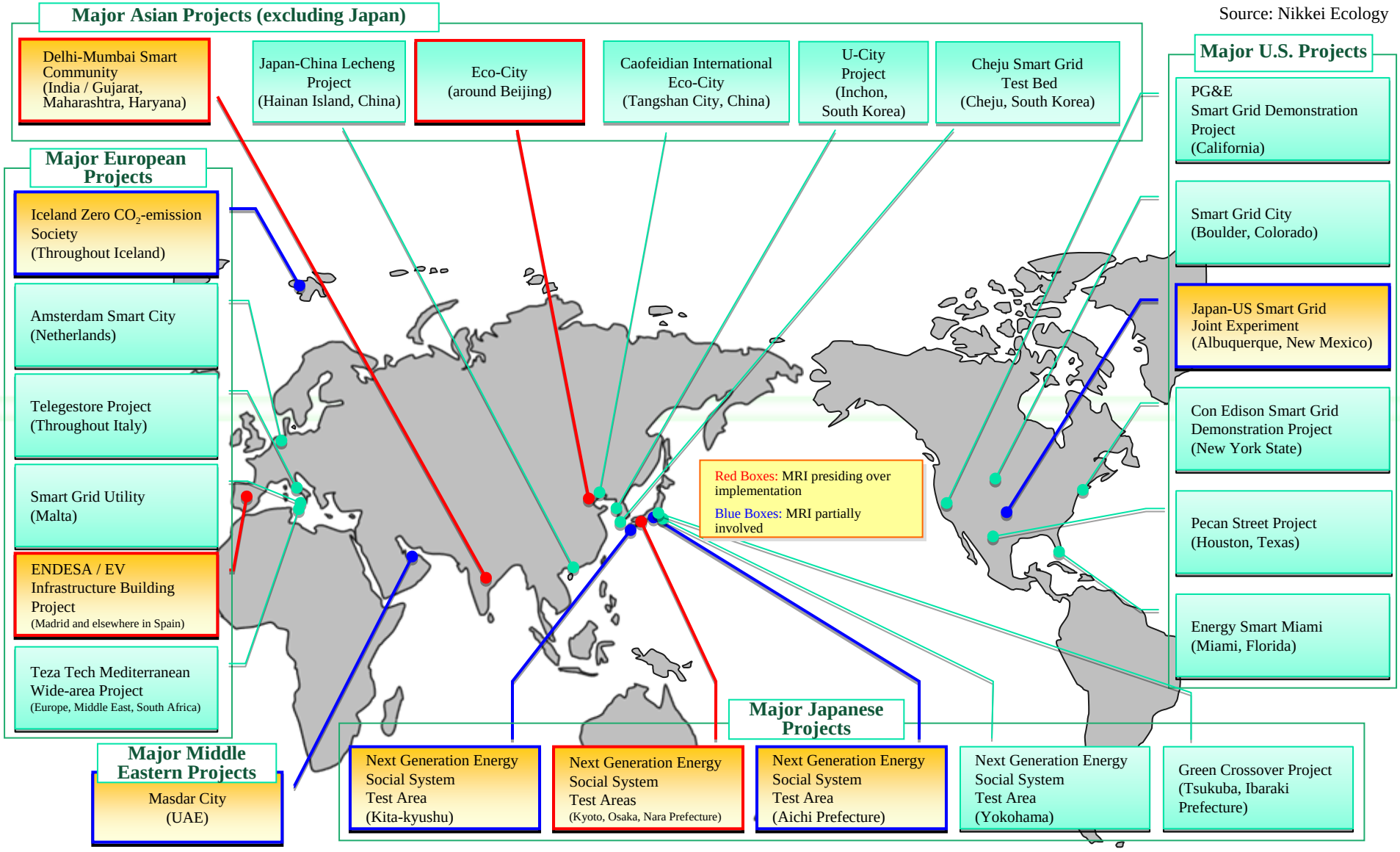
	Electric Power	Gas	Heat Supply	Water	Road Traffic
Input from End Points	Reverse power flow through photovoltaic power generation and Ene-farm	Injection of methane gas into city gas lines	Use of sludge carbides for fuel	Introduction of reclaimed water	-
Response to Load Fluctuations	Adoption of storage batteries, EVs Demand Management	Adjustment of hot-water supply times and hot-water storage	Adoption of high-efficiency heat sources on a small-to-medium scale, heat storage tanks	Tracking of changes in water treatment levels	Overall optimization of navigation
Dynamic Control	Line duplexing and Distribution automation	-	-	Pipeline control	Autonomous distributed traffic signals
End-point Measurement Tools	Smart Metering	Smart Metering	Smart Metering	Smart Metering	Probe information through in-car device
Inducing Consumers (Incentives)	Dynamic Pricing	Dynamic Pricing	Dynamic Pricing	Dynamic Pricing	ERP Automated Road Pricing System
Payment and Billing Management	Common points, unified billing				

MHI's Strengths: Not only various product technologies, but MHI also uses project management and system integration technologies to provide total solutions.

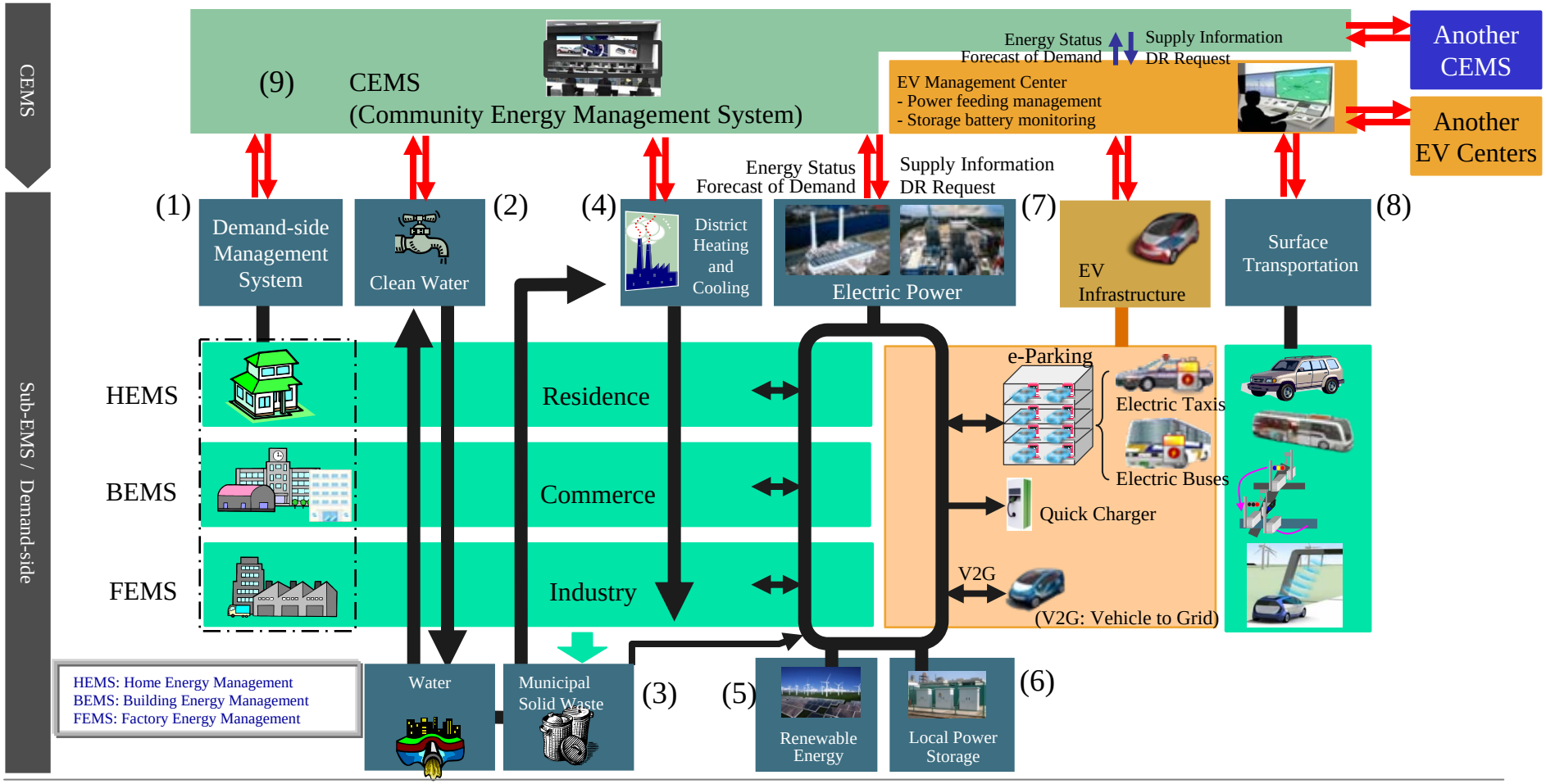
Major Smart Community Projects

➢ By the year 2020, between 300 and 400 projects worldwide worth 180 trillion yen will be planned or under way.

Source: Nikkei Ecology



Smart Community Initiatives



Handled by MHI

Major Projects	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9) CEMS
Japan (Keihanna)	—	✓	✓	—	—	✓	✓	✓	—
India (Gujarat State)	—	✓	✓	—	✓	✓	✓	✓	—
China (Eco-City)	—	✓	✓	✓	✓	✓	✓	✓	✓
Spain (Andalusia)	—	—	—	—	—	—	✓	✓	—

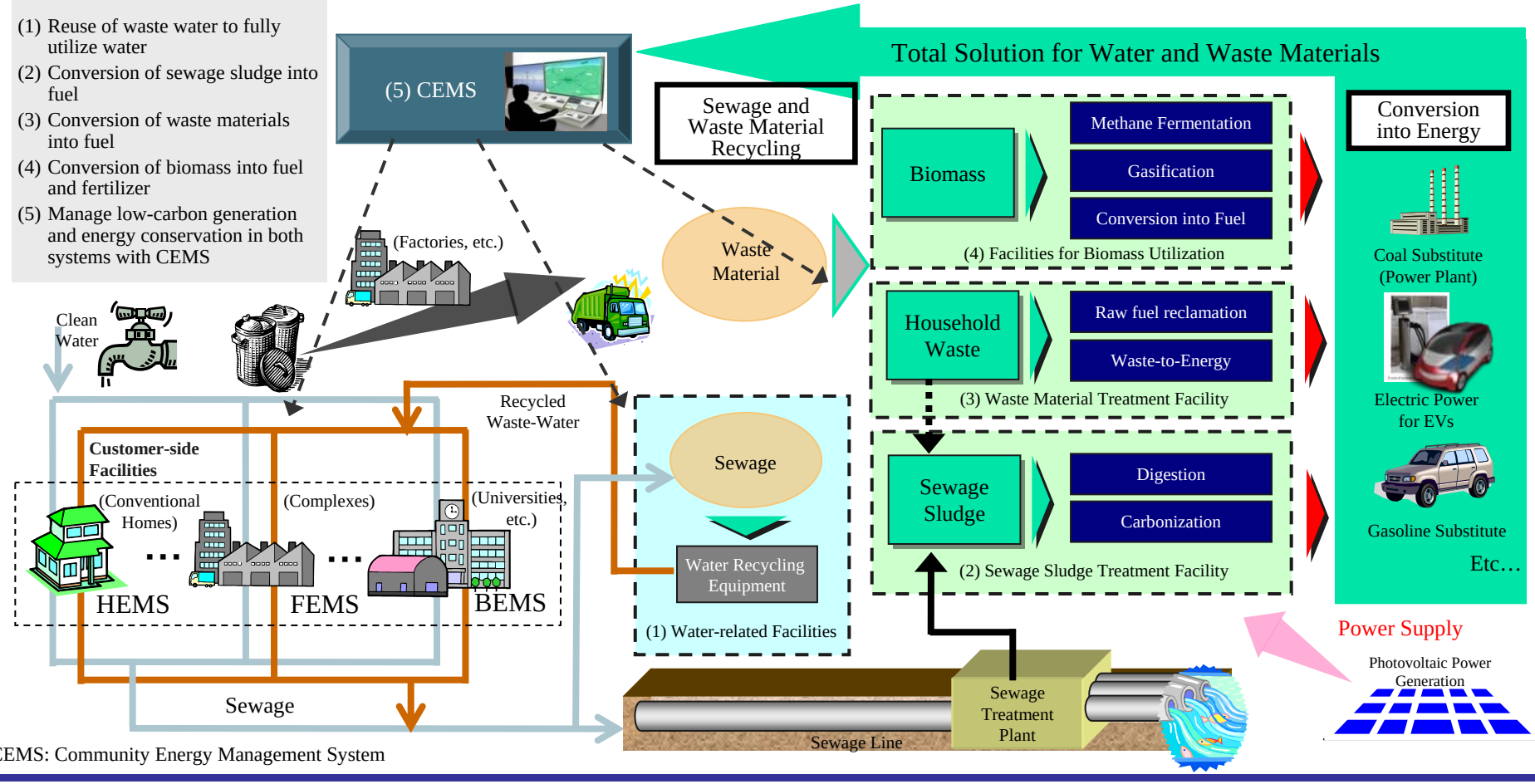
Smart Community: Life System Example (Keihanna)

- By building total solutions for water and waste materials that utilize existing infrastructure into a CEMS, realize a low-carbon community in both arterial and venous systems.

Arterial System Area

(1) Reuse of waste water to fully utilize water
(2) Conversion of sewage sludge into fuel
(3) Conversion of waste materials into fuel
(4) Conversion of biomass into fuel and fertilizer
(5) Manage low-carbon generation and energy conservation in both systems with CEMS

Venous System Area

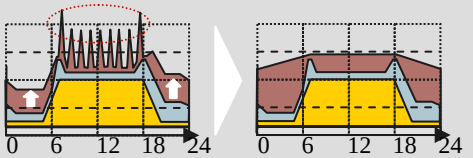


* CEMS: Community Energy Management System

Smart Community: Traffic System Example (Spain)

- By combining EVs into a CEMS as a type of energy equipment, realize energy management such as the smooth charging of EVs, peak cut, and so on.

Peak Cut / Peak Shift



Demand Response

Community Management System
CEMS (Community Energy Management System)
- Node of supply management
- Node of demand management

Realize to optimize all needs

Integrated Functions

OODA
- Observe: Aggregate
- Orientate: Estimation
- Decide/Act: Management

EV Management Center

Improve usability for EV-penetration

Vehicle Management Functions

Parking Management Functions

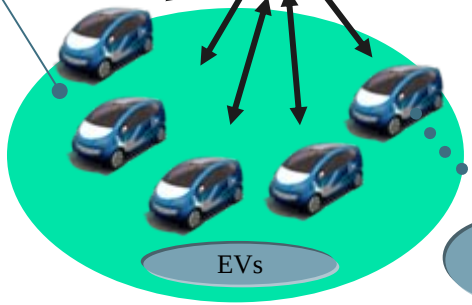
Maximize ratio of Parking Utilization

Access to charger
Accuracy to keep driving schedule
- Routing
- Charging time

Information flow

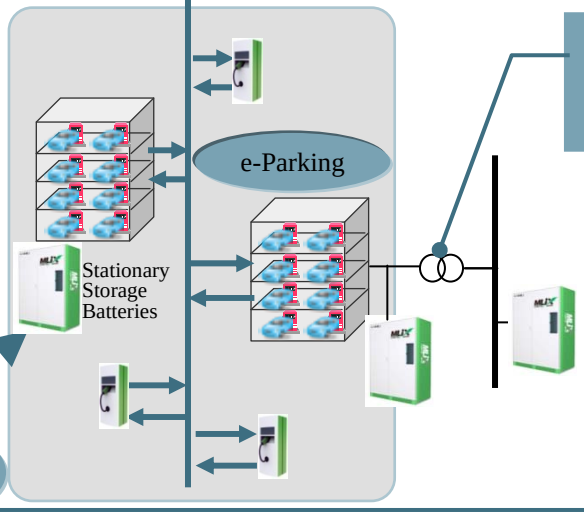
Information flow

Wireless



EVs

Used Battery Packs



Minimization and Optimization of incoming power volume

4. New Initiatives on a Company-wide Basis

Company-wide Initiatives (Water Business)

Market forecast to be worth approx. **86 trillion yen** by 2025 (METI estimate)

(Breakdown) Volume Zone (Traditional area of water supply and sewage) 74 trillion yen

Growth Zone (Recycling, desalination, industrial water/sewage) 12 trillion yen

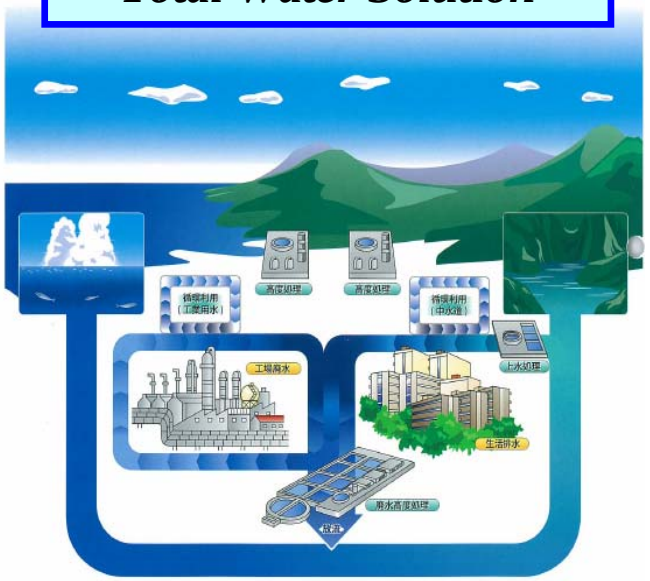
MHI will aim for business expansion by primarily targeting the Growth Zone.

Business Field / Operational Field	Materials/Component Supply Consulting Construction and Design	Management and Operation Services	Total
Clean Water	19 trillion yen	20 trillion yen	39 trillion yen
Seawater Desalination	1 trillion yen	3 trillion yen	4 trillion yen
Industrial Water / Industrial Sewage	5 trillion yen	1 trillion yen	6 trillion yen
Recycled Water	2 trillion yen	—	2 trillion yen
Sewage	21 trillion yen	14 trillion yen	35 trillion yen
Total	49 trillion yen	38 trillion yen	86 trillion yen

: Volume Zone (Markets set to double or more)

: Growth Zone (Markets set to triple or more)

Total Water Solution



MHI possesses all of the necessary technologies

Corresponding Technology / Operational Field	Activated Sludge Treatment	Filtration	Condensation of Precipitation	MBR (UF Membrane)	Advanced Sewage Treatment (Activated Carbon Treatment, Ozone Treatment	Seawater Desalination (RO Membrane)	Sludge Treatment (Dehydration / Drying / Incineration / Carbonization)
Clean Water		●	●			●	
Seawater Desalination		●	●			●	
Industrial Water / Industrial Sewage	●	●	●	●	●		●
Recycled Water		●	●	●	●	●	
Sewage	●	●	●	●			●

: Necessary Fields : Unnecessary Fields ●: Technologies possessed by MHI

* MBR: Membrane Bio Reactor, UF: Ultra Filtration, RO: Reverse Osmosis

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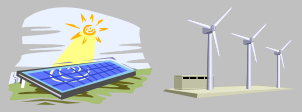
An example of Water Business (Total Solution for the Water Cycle)

Total Solution for the Water Cycle

EMS

Use of Renewable Energy as Auxiliary Power



Selection of Optimum Treatment Process based on the System

(Example)	Desalination Methods	
Method	RO membrane	Flash Process
Energy	Electric Power	Heat

Water Treatment Technologies

Seawater Desalination Facilities

Fresh Water

Industrial Water Production Facilities

Factories

Waste Water

Industrial Waste Water Treatment Facilities

Clean Water Production Facilities

Filtration
RO membrane
Coagulating sedimentation, etc.

Use of Recycled Waste Water

Cities / Towns

Fresh Water

Seawater Desalination Facilities

Filtration
RO membrane
Coagulating sedimentation, etc.

Industrial Water Treatment Facilities

Activated carbon treatment, MBR, etc.

General Waste Water Treatment Facilities

Pressure flotation, solids contact clarifier, etc.

Reuse

Recycled Water Treatment Facilities

High-functionality Water Production Facilities

Ultrapure water, etc.

Semiconductor Plants, etc.

Household wastewater

Life system Wastewater Treatment facilities

Activated sludge treatment, filtration, RO membrane, MBR, etc.

Ultrapure Water Supply Facilities

Ion-exchange resin, RO membrane, UV treatment, etc.

Rivers

Water Resources

Sea

Treated Wastewater

Sewage Treatment Facilities

MBR
Sludge disposal, etc.

Technologies that produce water efficiently

Technologies that increase water utilization rates

Water-making technologies required based on intended use

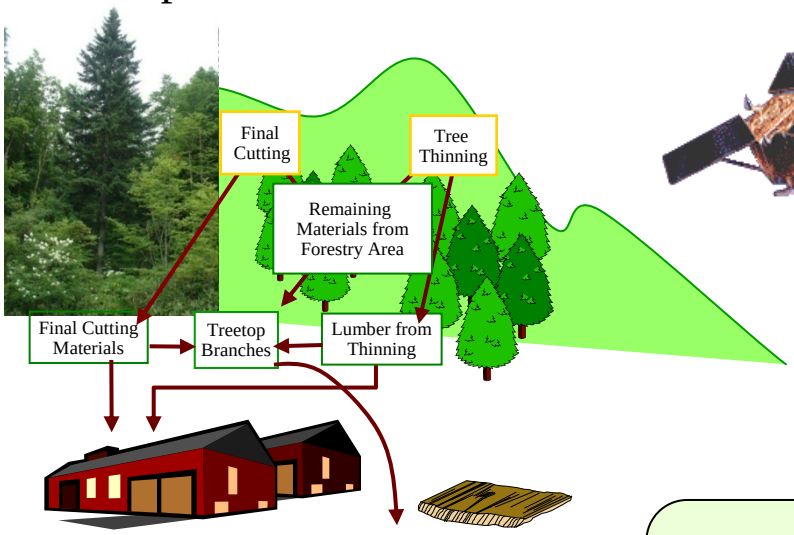
Technologies that clean wastewater

MBR: Membrane Bio Reactor
RO: Reverse Osmosis

Company-wide Initiatives (Biomass)

➢ Concept for Biomass Utilization

- Use of biomass based on regional characteristics
- Effective utilization of organic resources for energy and products
- Revitalization of local forestry industry and economy



Satellite Information

Rice paddies, farmland, pasture

Information Utilization

Lumber mills
Furniture factories
Chip mills

Wood waste biomass
- Remaining materials from forestry areas
- Factory scrap wood

Dairy Farmland

Collection / Receipt

Livestock Excreta

Agricultural Waste

Provision of forest management / agricultural information

Greenhouse gas monitoring

Crop status, weather information
Appropriate thinning locations, etc.

Biomass Utilization Plant

Crushing
Direct Combustion
Power Generation
Carbonization, conversion into gasification fuel

Hot water supply
Electric power selling
Carbide Gas

Methane Fermentation
Power Generation
Moisture-controlled dehydration
Ammonia recovery / recycling
Compost
Compost Creation

Energy
Waste heat, electric power, compost, carbide

Vegetable/flower growing facilities

Agricultural Produce Processing Plants

Sale of Agricultural Produce

An example of biomass (MHI's Achievements)

Food

Local Government

Processing waste from school and other provided lunches

Food Companies

Bean sprouts, bean curd refuse etc. (solids)

Food processing company

Livestock Excreta

Pasture

Dairy cattle shed

Dairy cattle manure

Beef cattle/ nursery shed

Beef cattle/ nursery manure

Chicken coop

Poultry manure

Food

Coffee grounds

Food processing company

Income from For-profit collection

Jointly operated with Koiwai Agriculture & Stockfarming, Shizukuishi Town, and others since April 2006

Biomass Business Operators

Power Generation Facilities

Desulphurization equipment

Gas holder

Gas engine generator (Capacity: 250 kW x 1 unit)

Electric Power

Self Use Approx. 2,000kWh / day

Methane Fermentation Facilities

Receiving Facilities

Receiving Facilities

Approx. 52 tons / day

Methane Fermentation Tanks

Tanks for Liquid Fertilizer

Compost Conversion Equipment

Approx. 52 tons / day

Primary fermentation tank

Secondary fermentation tank

Stock yard

Income from Sale

Pasture

Electric Power

Selling of Electricity Approx. 2,000kWh / day

Liquid Fertilizer

Used in pastures Approx. 52 tons / day

Compost

Fields, fed crop, etc. Approx. 29 tons / day

5. Summary

Summary

Fulfillment of Company-wide Functions

The Sustainability Energy & Environment Strategic Planning Department will continue to fulfill company-wide functions assuming a **leading internal role in the development of the Energy & Environment Business and support for earthquake reconstruction efforts**, and will promote business development and reconstruction support.

Contributing to Community Development Based on Regional Characteristics

With regard to support for earthquake reconstruction efforts, MHI will apply **a wide range of its product technologies** in a flexible manner and **contribute to development of robust & resilient community against disasters** based on regional diversity.

Development of New Business Areas with Future Growth Prospects

Regarding development of the Energy & Environment Business, we will continue to challenge aggressively the **development of new business areas** with future growth prospects such as **smart communities, the water business and biomass**.

Provision of Total Solutions

We will continue to **provide total solutions in the Energy & Environment Business area** by using of **Project Management** and **System Integration technologies** which are strengths of MHI Group.

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Forecasts regarding future performance in these materials are based on judgment made in accordance with information available at the time this presentation was prepared. As such, those projections involve risks and insecurity. For this reason, investors are recommended not to depend solely on these projections for making investment decision. It is possible that actual results may change significantly from these projections for a number of factors. Such factors include, but are not limited to, economic trends affecting the Company's operating environment, currency movement of the yen value to the U.S. dollar and other foreign currencies, and trends of stock markets in Japan.